

PhD Dissertation 02/2011

Ecological Fiscal Transfers in Indonesia

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Ecological fiscal transfers in Indonesia

Von der Wirtschaftswissenschaftlichen Fakultät

der Universität Leipzig

genehmigte

DISSERTATION

zur Erlangung des akademischen Grades

Doctor Rerum Politicarum

(Dr. rer. pol.)

vorgelegt von

M.Sc., Sonny Mumbunan

geboren am 19.06.1976 in Minahasa, Indonesien.

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Tag der Verleihung: 04.02.2011

B. Rumuat (1934–2003) und K. Mumbunan (1930–1987)

ist die Arbeit gewidmet,

in Dankbarkeit.

Executive summary

Environmental positive externalities from public provision, such as the benefits yielded from the public measure of nature conservation, are often not internalized. Potential sub-optimal public service provision can be expected from such a condition, leading to inefficiency, if the benefits at a greater territorial scale are not acknowledged. This holds particularly true for intergovernmental fiscal relations in a decentralizing multi-tiered governmental system. Moreover, in developing countries the fiscal capacities to perform measures of ecological public functions are limited with their fiscal needs for these functions often appearing to outweigh their fiscal capacities.

Research at the interface of the economic theory of fiscal federalism, the sustainability concept, and policies related to conservation and the environment is relatively new. Furthermore, in the literature on environmental federalism the emphasis tends to be comparatively less on the benefits of positive environmental externalities. The essential contribution of this study is an extension of this research field that is still in its infancy by applying the specific case of Indonesia as the context, on account of this tropical country's ecological significance as well as its recent developments during the fiscal decentralization process. The overall aim of this study is to assess the possibilities of ecological fiscal transfers as a set of instruments in the public sector to internalize environmental externalities. To this end, the study traces the development as well as the current state of intergovernmental fiscal transfers in Indonesia in terms of ecological purposes. On the basis of this knowledge, the study offers new policy perspectives by proposing a number of policy options for ecological fiscal transfers in the context of the functioning fiscal transfer system and institutions between the national and the subnational (province and local) governments as well as among jurisdictions at the same governmental level. The incorporation of an explicit ecological indicator into general-purpose transfers is the first option. The second option is derived from a revenue-sharing arrangement. In this arrangement, two sub-options are proposed: first, shared revenues from taxes are distributed on the basis of the ecological indicator and, second, shared revenues from natural resources are earmarked for environmental purposes. Finally, the third option suggests an extension of existing specific-purpose transfers for the environment. The potential and limitations of the respective options are addressed.

Additionally, a short treatment is given to the discourse on the possible mobilization of fiscal resources in the context of tropical deforestation and global climate change.

The research concentrates mainly on the first option, namely the incorporation of an ecological indicator into the structure of general-purpose transfer allocation. In order to substantiate an explicit ecological dimension in the transfer, it extends the present area-based approach by introducing a protected area indicator while maintaining the remaining socio-economic indicators in the fiscal need calculation. The parameter values of area-related indicators are adjusted and subject to the properties of the existing formula. The simulation at the provincial level yields the following results. *First*, more provinces lose rather than gain from the introduced ecological fiscal transfer when compared to the fiscal transfer that they received in the reference fiscal year. *Second*, on average the winning provinces obtain a higher level of transfer from the introduction of an ecological indicator in the fiscal need calculation. The extent of the average decreases for the losing provinces, however, it is lower compared to the extent of the average gain by their winning counterparts. In terms of spatial configurations of the general-purpose transfer with an ecological indicator, provinces in Papua would benefit most from the new fiscal regime whereas provinces in Java and Sulawesi, with a few exceptions, would suffer a transfer reduction. Kalimantan and Sumatera show a mixed pattern of winning and losing provinces. The analysis on the equalization effects of the general-purpose transfers makes the following important contributions. It suggests that, *first*, the transfers are equalizing and, *second*, the introduction of the protected area indicator into the structure of these transfers plays a significant role in the equalizing effect, particularly in the presence of provinces with a very high fiscal capacity and when the area variable is also controlled. All of these new insights are imperative in the design of fiscal policy which intends to integrate explicit ecological aspects into the instruments of intergovernmental fiscal transfers.

Since a formula-based fiscal transfer distribution is intrinsically zero-sum, the aforementioned configuration of winning and losing jurisdictions is conceivable. Among other future perspectives, it is the task of further research to explore ecological fiscal transfer instruments and associated measures that on the one hand seek to induce the losing provinces to join their winning counterparts and, on the other hand, are still subject to the requirements of the rational fiscal transfer mechanism.

Acknowledgements

This dissertation was written at the Helmholtz Centre for Environmental Research (UFZ) in Leipzig and submitted to the Faculty of Economics at the University of Leipzig, Germany. I wish to acknowledge the invaluable supervision of Professor Dr. Thomas Lenk and Professor Dr. Bernd Hansjürgens who served as research advisors for this dissertation. I was able to fully appreciate the seminars which they organized respectively at the Institute for Public Finance and Public Management at the University of Leipzig and at the Department of Economics at the UFZ. I would also like to thank them for their time in reading the manuscript and providing me with valuable comments. Special acknowledgement is due to Dr. Irene Ring, whose wide exposure to the field of ecological fiscal transfers helped me to venture into this field and form the course of the research. I also thank her for her scientific guidance and collegial exchange of ideas and for her inspiration in organizing effective research.

I have benefitted greatly from the facilities, hospitality and research atmosphere at the UFZ. I thank my colleagues in the economics department especially Dr. Felix Rauschmayer, Dr. Bernd Klauer, Professor Dr. Raimund Schwarze, Dr. Nele Lienhoop, Dr. Ines Dombrowsky, Dr. Heidi Wittmer, Professor Dr. Erik Gawel, Dr. Frank Messner, Dr. Jan Monsees, Dr. Johannes Schiller, Dr. Melanie Mewes, Dr. Paul Lehmann, Dr. Mi-Yong Lee-Peuker, Matteo Roggero (who also shared an office with me) and my fellow *Doktoranden*: Lena Horlemann, Monika Suskevics, Nina Hagemann, Yanyan Dong, Stephan Bartke, and Marcela Muñoz Escobar. The UFZ also provided me with numerous opportunities to discuss and learn from other external scientists who have helped to clarify a number of issues and contributed to my broader understanding of ecological economics. I also express my thanks to the very competent library staff at the UFZ.

This research received financial support from German tax payers through a long-term fellowship from the Heinrich Böll Foundation. A part of this written dissertation was also supported by the Helmholtz Centre for Environmental Research (UFZ) and the Britta Lohan Memorial Foundation. Furthermore, financial support from the European Commission enabled me to attend a summer school and a conference. Earlier ideas for

this research were drafted while I was pursuing a Masters degree at the Martin Luther University Halle-Wittenberg through a scholarship from the German Academic Exchange Service (DAAD). I am grateful to all of these institutions.

I am also indebted to the Ministry of Finance of the Republic of Indonesia, whose access to fiscal data has enabled me to proceed with the research, and especially to the researchers in its Department of Fiscal Analysis who discussed the research with me and provided useful suggestions. I would also like to thank the staff of the Ministry of Forestry of the Republic of Indonesia and the National Planning Agency (Bappenas) for providing me with useful information.

I have also benefited from the generous help provided to me by a number of people. Dr. Claas Leiner at the University of Kassel taught me how to use Quantum GIS software and Sarah Gwilym-Margianto proofread the manuscript for its use of the English language.

Much gratitude goes to my family, especially to my brothers and sisters – Vera, Utje, Ewi, Eda, Carry, Nina, Didi, Herry and the late Ka Udjit – whose prayers and encouragement have been a source of constant motivation. I am aware of how proud they are to have the first PhD in the family. I am also thankful to Professor Dr. Eugen Bruno and Cornelia Balss who have in many ways facilitated my study, research, and above all for the very memorable years that I have been able to spend in Germany. Grateful thanks are also given to friends of mine, who are too numerous to list individually here, for their assistance and off-research discussions. In particular I owe Cyanthi Manoppo my sincerest thanks for her support during good and demoralizing times.

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List of abbreviations

A	Area
APBN	The State Budgetary Revenues and Expenditures (Anggaran Pendapatan dan Belanja Negara)
BA	Basic allocation
CO ₂	Carbon dioxide
CBD	Convention on Biological Diversity
COP	Conference of Party
DAK	Specific-purpose fund (Dana Alokasi Khusus)
DAU	General purpose fund (Dana Alokasi Umum)
DBH	Revenue-sharing (Dana Bagi Hasil)
DBH-Pajak	Revenue-sharing from taxes
DBH-SDA	Revenue-sharing from natural resources
EFT	Ecological fiscal transfer
FG	Fiscal gap
FGM	Municipal General Fund (Fundo Geral Municipal, a general purpose fund in Portugal)
FY	Fiscal year
GERHAN	National Movement to Rehabilitate Forest and Land (Gerakan Nasional Rehabilitasi Hutan dan Lahan)
GDP	Gross domestic product
GRP	Gross regional product

Ha	Hectare
HDI	Human development index
ICMS	Brazilian value-added tax based on sales of goods and services (Imposto sobre Circulação de Mercadorias e Serviços)
IDR	Indonesian Rupiah (11.600 IDR are equivalent to 1 Euro, in June 2010)
INPRES	Presidential instruction
MOF	The Ministry of Finance of the Republic of Indonesia
MRV	Monitoring, reporting, and verification
PA	Protected area
PAD	Own source revenue (Pendapatan Asli Daerah)
PDN	Net domestic revenue (Pendapatan Domestik Netto)
PES	Payment for Ecosystem Service
REDD	Reducing Emissions from Deforestation and Forest Degradation
SDA	Natural Resource (Sumber Daya Alam)
VAT	Value-added tax
cf.	<i>confer</i> (latin: compare or consult)
e.g.	<i>exempli gratia</i> (latin: for example)
ff.	<i>folio</i> (latin: the following, plural)
Eq.	Equation
et al	<i>et alia</i> (latin: and others)
i.e.	<i>id est</i> (latin: that is)

CHAPTER 1

Introduction

1.1 Research motivation and problem

In 1997 widespread fires from tropical peatland and forest occurred in Indonesia. A dense smog from these fires blanketed a considerable part of Southeast Asia, affecting the lives and deteriorating the health of approximately 75 million people in six countries. The smog turned into a haze that blocked the sun for weeks. Days turned into night. Airports were closed down. Reported air crash and tanker collision were associated with the smog. People were subjected to wearing respiratory masks. The cities of Samarinda (East Kalimantan), Kuala Lumpur, and Singapore, were exposed to an unprecedented level of highly hazardous pollutants. For days, parts of Malaysia – a neighbouring country – were declared as a state emergency due to the air pollution. With extensive fires of such a scale, wildlife and biodiversity were under serious threat. Endemic species, such as the Orang Utan, were either directly killed or threatened by a loss of habitat. Parts of 17 Indonesian national parks were on fire.¹

The effects turned out to be not merely the exclusive affairs of the Indonesian provinces in Sumatera and Kalimantan that were the domestic sites of peatland and forest fires. Indeed, the effects of these fires stretched far beyond the borders of Indonesia and of particular concern was the amount of carbon emissions from the fires in terms of global warming. Indonesia's burning peat and vegetation that year released an amount of carbon that was equal to between 13 and 40 percent of the average annual global carbon emissions from fossil fuels (Page *et al*, 2002: 61). These emissions contributed significantly to the increase of CO₂ concentrations in the atmosphere, which was the largest annual increase in the history of documented atmospheric carbon concentrations (Page *et al*, *ibid*). The level of carbon emissions from burning peat that year – to put the magnitude into perspective, was higher than the level of annual

¹ The accounts in this opening paragraph are largely derived from Stolle and Tomich (1999: 22-23) and Dauvergne (1998: 13-14). The peat fires continued to smoulder until mid 1998.

emissions released from *all* power stations and cars in Western European countries (Dauvergne, 1998: 13). The country's peatland represents 5 percent of global and 50 percent of tropical peat; its below and above ground carbon storage is comparable to the Amazon rainforest – the single largest ecological carbon sink in the world (DNPI Indonesia, 2009). In addition to global carbon reservoir, Indonesia's Sundaland and Wallace biogeographical areas belong to the world's 25 most important biodiversity hotspots (Myers *et al*, 2000: 854-856). Endemic mammals and vertebrates in these areas have become extinct due to biodiversity loss or are threatened with extinction (Brooks *et al*, 2000). If the current rate of deforestation continues and without urgent conservation intervention in sight, in the words of Brooks *et al* (2000: 909), “we face mass extinctions” especially in Sundaland area covering the western part of Indonesia, which is the world's hottest hotspot of endemic plants and vertebrates after the tropical Andean (Myers *et al*, 2000: 865).

In 1997, the economic crisis also hit Indonesia. In a similar way that the haze from the fires spread beyond Indonesia's borders, the crisis also spread beyond purely economic spheres, leading to a socio-political crisis. The highly centralized quasi-military dictatorship, which had been in power for decades, was overthrown in 1998 with Indonesians demanding reforms. Regional and local governments demanded autonomy. Fundamental changes were introduced in an extraordinarily short period of time, including changes to accommodate regional autonomy and fiscal decentralization. Since the laws were passed in 1999, the country with a population of more than 200 million embarked on regional autonomy and fiscal decentralization in 2001. Following that, one of the world's largest most centralized countries suddenly turned into one of the world's most decentralized, the transition of which is often referred to as the “big bang” decentralization (Alm *et al*, 2004; Hofman and Kaiser, 2006). In this period, virtually all responsibilities were assigned to the regional level, that is to subnational and local governments. In the first years of decentralization, the share of regional spending sharply increased by up to 30 percent – from only around 15 percent in the 1990s – and continued to increase up to 40 percent after that (Hofman and Kaiser, 2004: 15).

What do the aforementioned accounts accentuate about dramatic fires and fiscal decentralization? Among other equally plausible questions, the accounts raise the

following two central issues. The first issue is the obvious problem related to cross-spatial costs (or benefits) from environmental external effects. The fact that, for instance, the haze from the fires recognizes no jurisdictional borders appears to highlight the problem of non-excludable negative externalities. The second issue related to regional autonomy and decentralization is concerned with the dimension of decision-making and responsibility assignment under a decentralized structure of an intergovernmental system. Here, because environmental policy-making takes place in a system with several tiers of government, the question of appropriate role of the various governmental levels in performing environmental related public functions becomes central.

The accounts of environmental phenomena such as tropical peatland and forest fires seem to suggest that these two seemingly separate issues – namely, a cross-spatial external effect and a decentralized intergovernmental system – appear to have a number of essential things in common. This holds particularly true in terms of the provision of public services. Measures related to, for instance, forest management, fire prevention, land rehabilitation, pollution control or biodiversity conservation are forms in which public service provision may occur. In such provisions, the relevant subnational or local jurisdiction – be it a province, municipality or district – delivers the public service.

In the setting of a decentralized multi-tiered governmental system, this notion of public service provision is of crucial importance. It becomes the logical precursor of investigation in relation to the appropriate governmental level and the assignment of responsibilities for the provision. In order for the intended provision to take place, the notion of public service provision raises the subsequent questions. Who bears the cost of the provision of such cross-jurisdictional public services? Which jurisdiction(s) is/are the beneficiaries of such a public provision? What appropriate level of government should be entrusted with the provision? This set of standard questions is often posed in the discourses on fiscal decentralization (e.g., Musgrave, 1959; Oates, 1972; Boadway and Shah, 2009).

This being said, the provision of ecological related public services will deal with the assignment of public services to different levels of government, the need for the

provision and the capacity to perform the provision.² In public finance, they relate to the concepts of expenditure need and revenue capacity. More precisely, the level of ecological public service provision would largely depend on the fiscal need and the fiscal capacity of a jurisdiction under inquiry.

Determining the fiscal need for ecological public services is not trivial. This is partly due to the complex and interdependent nature of most environmental problems which affect the extent and magnitude of expenditure need required to perform environmental related public service provision. To elaborate on the matter, it is useful to return to our example. Peatland and forest fires are not rare events in Indonesia, but occur every year. At present, Indonesia is the largest global emitter of CO₂ from land use change and forestry (PEACE, 2007). The causes of fires however, including the devastating fires of 1997, are manifold.³ They are to a large extent related to a broader context of deforestation and land degradation, involving an interaction of “causal factor synergies” (Geist and Lambin, 2002: 143). Such causal factor synergies in tropical deforestation, in the view of Geist and Lambin (2002), would in general involve a set of proximate causes and underlying forces.

The proximate causes refer to immediate land-use related human activities that directly impact forest cover. Examples of proximate causes include agricultural expansion, wood extraction or infrastructure development. Subsistence cultivation or permanent large-scale cultivation is parts of agricultural expansion, while wood extraction can take place for instance under state-run or commercial arrangements in addition to domestic use for fuelwood for example. Infrastructure development may take the form of rural and urban settlements or mining exploration for instance. The underlying forces refer to the fundamental social processes that underpin the aforementioned proximate causes. Whilst proximate causes largely operate at the local level, underlying causes operate at the local level and are influenced at the national or

² Since public service provision often encompasses the non-excludability and the non-rivalry of public goods, it is often referred to as public good provision.

³ The causes of the fires in 1997 were largely anthropogenically-induced, although droughts due to a climatological phenomenon from the so-called El Nino Southern Oscillation from the eastern Pacific appeared to have exacerbated the fires (e.g., Stole and Tomich, 1999: 23; Page *et al*, 2002: 61).

global level. Examples of underlying causes include social processes such as demographic, economic, technological, policy and institutional and cultural factors. From this range of causes and forces, triggers such as forest fires serve as a biophysical driver and count as a proximate cause (Geist and Lambin, 2002: 144). In terms of economic, policy and institutional factors, we can also add fiscal-related dimensions to the underlying forces of tropical deforestation. Brazil can be a representative example here. In this country, fiscal incentives (such as income tax policy which exempts agriculture sector) and land use allocation policy that induces shifting cultivation appear to have accelerated deforestation in the Amazon (e.g., Binswanger, 1991).

These causal factor synergies imply that there is a range of causes and underlying forces that interact with one another. Drawing on such causes and forces, one can anticipate the possible large extent in relation to fiscal needs that may be required in order to deliver the necessary public services. Referring back to our introductory examples, some direct and evident public activities which are required for sustainable land use and forest management may simply represent a number among several so-called ecological public functions that are undertaken by a jurisdiction. Certainly, these public activities are not limited solely to forest-related measures. Indeed, ecological public functions include a comprehensive range of various precautionary and aftercare public activities – from nature conservation to rehabilitation – that arise from dealing with diverse resource systems such as forest, soil, water or marine (Ring, 2002: 418).

So much for fiscal need. How might the picture look like when it comes to fiscal capacity? In the period shortly before decentralization took place in Indonesia, the content and magnitude of Indonesia's public environmental expenditure tended to lend some degree of support to the underlying forces for the country's declining capacity to perform its ecological public functions. The analysis of Vincent *et al* (2002) on public environmental spending in Indonesia over the period between the fiscal years 1994 and 1998 provides some relevant findings. For instance, they found that the level of environmental public expenditure during the economic crisis in 1997 and 1998 fell significantly – far below the level prior to the crisis, both in real terms and relative to total budget share and proportion of GDP. In comparison to other East Asian countries also struck by the economic crisis, relatively speaking Indonesia experienced a greater

decline in its environmental public expenditure during the time of the crisis. Before the crisis, the percentage of public expenditure for the environment compared to governmental expenditures and to GDP was already lower than that in other East Asian crisis countries. One important point regarding fiscal decentralization is that public expenditure on the environment declined more in the subnational budget than in the national budget (World Bank, 2001).

The following account provides a more specific and recent context. It illustrates the difficulties Indonesia encounters with respect to higher fiscal need and lower fiscal capacity. As is often the case in many developing countries, Indonesia is subjected to higher financial costs and deficits to carry out its ecological public functions. This proposition seems quite obvious in the case of managing and expanding the country's protected-area systems. Indonesia's protected areas are underfunded (e.g., Bruner *et al*, 2002). Such a gap ensuing from the higher need and the lower capacity related to financial resources is likely to "jeopardize the ability of protected areas to safeguard biodiversity and the benefits that intact nature provides to society" (Bruner *et al*, 2002: 1119).

Table 1.1 serves to demonstrate the financial shortfalls. It presents the annual budget and the optimal budget to fund protected areas in Indonesia in 2006.⁴ The total annual shortfall of funding amounts to 81.9 million dollars. The national budget of 38 million dollars was not sufficient to cover the optimal budget of circa 135.3 million dollars. There is insufficient funding for all types of protected areas, in which nature reserves and national parks make up the largest shortfalls relatively speaking. The dimension of lower fiscal capacity becomes a lot more obvious if international funding (approximately 15.3 million dollars) is excluded from the calculation. In this case, the annual shortfall would have totaled over 97.3 million dollars. The optimal budget in this calculation refers to the estimated optimal level of investment that is required for the national protected area system in Indonesia. The estimation is based on the size of

⁴ The study was initiated by a collaborative partnership between the Indonesian government and NGO partners which was established following the agreement adopted at the seventh Conference of the Parties (COP-7) meeting to the Convention on Biological Diversity (CBD). See KLH (2008).

protected area, staff requirement and biodiversity value involving a total of 73 cost types in reference to the current government policies and national prices.

Table 1.1. The annual funding for protected areas in Indonesia, by type in 2006.

Type of protected area	Total area, million ha	National budget, million US\$	Cost/ha, US\$	Optimal budget, million US\$	Cost/ha, US\$	Shortfall, million US\$
Nature reserve	4.549	6.031	1.33	40.721	8.95	30.890
Wildlife reserve	5.464	4.962	0.91	14.967	2.74	7.205
National park	16.447	15.958	0.97	45.930	2.79	26.872
Nature recreation park	1.124	3.592	3.19	15.550	13.83	8.857
Forest park	0.275	1.979	7.20	3.366	12.24	1.186
Hunting park	0.226	1.497	6.62	3.269	14.47	1.642
Marine protected areas	2.026	3.990	1.97	11.506	5.68	5.296
Total	30.111	38.009	-	135.309	-	81.948

Source: State Ministry of the Environment (KLH, 2008).

Note: The national budget represents the budget of both national and provincial governments.

Thus, from the preceding discussions there appears a gap between the need and capacity of a jurisdiction in order to maintain a certain level of ecological public service provision. In a decentralized setting where different levels of government and different jurisdictions are involved in fiscal relations, the intention for fiscal equalization is likely to justify the presence of intergovernmental fiscal transfers between different levels and among jurisdictions (e.g., Oates, 1972, 1999; Boadway and Shah, 2009). The extent of “ecological spillovers” accross jurisdictional borders in the provision of public services provides additional rationale for the required intergovernmental fiscal transfers (e.g., Zimmermann and Kahlenborn, 1994; Smith *et al*, 1999b). With this in mind, considering the fiscal need and fiscal capacity, as well as the potential “gap” between the two, to undertake ecological public functions implies the necessity for ecological considerations in intergovernmental fiscal transfers.

Theoretically, the notions of fiscal need, fiscal capacity and fiscal gap are particular subjects of fiscal federalism, which is a subfield of public finance. Fiscal federalism addresses the roles of different governmental levels in the public sector and how they are related through intergovernmental fiscal transfers (Oates, 1999: 1121). The acknowledgement of ecological aspects in intergovernmental fiscal transfers necessitates an inquiry that seeks to substantiate the interface between implementing sustainability concept, policies related to conservation and environment, and the economic theory of fiscal federalism. Ring (2002: 425) contends that research at this interface is relatively still new and there exists few studies investigating the potential of intergovernmental fiscal relations to consider ecological aspects in the financing and provision of public functions. There is still plenty to explore in this infant field.

1.2 Objectives and research questions

The aforementioned problems and knowledge gap drive the motivation of the study. The objective of the research is to investigate the possibilities and limits of ecological fiscal transfers in light of the existing intergovernmental fiscal transfer system and fiscal institution in Indonesia. The sub-objectives of the study are (1) to understand how far ecological issues have been considered in Indonesia by examining this dimension in the country's intergovernmental fiscal transfer system and its fiscal instruments for ecological public activities. Upon this basis, (2) the study then aims to propose options for ecological fiscal transfers and to look at the possibilities with reference to concrete policy applications.

In the investigations throughout this study, the following two broad questions are raised. *First*, what is the current state of intergovernmental fiscal transfers in Indonesia in terms of ecological purposes? The current state relates to the existing circumstances regarding the country's financing of its ecological public measures. Such a financing is through fiscal transfers in reference to the functioning system of fiscal relations between the national and the subnational (province and local) governments as well as among jurisdictions at the same governmental level. *Second*, based on theoretical reflections in public finance what might be conceivable options to introduce intergovernmental fiscal

transfers for ecological purposes? In addition to conceptual-theoretical reflections, the study has to take into account of existing international experiences and the proposals for ecological fiscal transfers in different fiscal settings, institutions and systems.

1.3 Structure of the study

The structure of this study mirrors the intention of answering the above research questions. It begins with *Chapter 2* which introduces the conceptual framework for the proposed ecological fiscal transfer. The chapter lays out the economic foundations of fiscal federalism by describing the division of fiscal functions in relation to allocation, distribution and stabilization. This chapter also identifies the assignment of responsibility among levels of government resulting from the division of these functions. It continues with the notion of intergovernmental fiscal transfers and describes the requirements in the design of the mechanism for fiscal transfers before proceeding further with the idea of fiscal transfer instruments and the typology of fiscal transfer programs. All these considerations are expected to open the possibility for the inclusion of ecological issues into fiscal federalism and fiscal transfer system. The international experience of existing ecological fiscal transfers as well as a number of proposed schemes in various fiscal settings and fiscal institutions will become the subject of discussion.

Chapter 3 sets the stage for the context of the study. It describes the Indonesian intergovernmental fiscal transfer system before and after the country embarks on decentralization. The main part of this chapter is devoted to the present fiscal transfer system after the country initiated a wide-ranging decentralization in 2001. The elements of general-purpose transfer, specific-purpose transfer and revenue-sharing arrangements are shed a light. In this chapter, particular emphasis is put on the general-purpose transfer which is elaborated at relatively greater length to provide sufficient basis for the empirical examination of the policy proposal in the forthcoming chapters. This chapter finally discusses the treatment of environmental aspects in the fiscal transfer system and the financing of ecological public functions in the period prior to decentralization, the transition and in the present system.

Apparently, to be of relevance, the proposal of policy options should comply with the existing institutional context of the specific setting as much as it builds on theoretical abstraction. *Chapter 4* is generally concerned with combining the discussions on the Indonesian context of an intergovernmental fiscal transfer and the discussions on the theoretical foundations for policy options. The context of Indonesia becomes the specific setting within which the policy options are to be implemented. Three concrete policy options are addressed in this chapter. The first option is to introduce an explicit ecological indicator, namely the indicator of a protected area, into the formula of fiscal need in the general-purpose transfer (DAU). The second option relates to the revenue-sharing arrangements (DBH), both from taxes and from natural resources for ecological purposes. The third option considers an extension of the existing specific-purpose transfer (DAK) to the environment. Finally, given the country's global significance this chapter discusses the discourse on global fiscal mobilization in relation to climate change.

Chapter 5 presents an empirical examination of the selected policy option. The focus lies on the first policy option through which the ecological indicator is explicitly incorporated into the calculation of fiscal need as part of a general-purpose transfer (DAU) allocation. The chapter discusses the present area-based approach and extends the approach by introducing protected area as an ecological indicator into the approximation of fiscal need in a general-purpose transfer. On the basis of simulations, some of the possibilities envisaged in the previous chapter are examined. The methodological undertakings refer to the similar method of fiscal transfer determination that is in use in the country being studied. Finally, this chapter examines the proposed ecological fiscal transfer at the provincial level and their fiscal equalization effects.

Chapter 6 encapsulates important discussion points of the study. It emphasizes again the possibilities regarding the incorporation of ecological issues into intergovernmental fiscal transfer system, the proposal of policy options and the empirical examinations of the option under the context of a specific country. A discussion on the limitations of this study and the perspectives for future research complete this chapter.

CHAPTER 2

The conceptual framework for ecological fiscal transfers

The analysis of public provision concerning ecological goods and services by different governmental units and levels in a decentralizing structure of decision-making is related to the notion of optimal division of functions, expenditures and revenues between the levels of government. In consequence, given the structure of multi-tiered governments, the justification for the imperative role of intergovernmental fiscal transfer as one instrument applied in fiscal federalism also rests on this concept of optimal division (Musgrave, 1959; Oates, 1972). With this in mind, we may conjecture that the same justifications for intergovernmental fiscal transfer can also be applied to analytical areas dealing with ecological issues. In consideration of ecological issues, however, a conceptual foundation is still required to connect the relationships between the role of intergovernmental fiscal transfers on the one hand and the ecological issues under consideration on the other hand. Ecological issues here relate to an array of wide-ranging issues, from nature conservation to resource management, which are of relevance for public provision. In the public finance literature, the study examining the relationship between intergovernmental fiscal transfers and ecological issues is more or less still in its infancy.

This chapter intends to provide the conceptual framework for ecological fiscal transfer. The latter constitutes an instrument of intergovernmental fiscal transfer which considers certain ecological issues in an explicit manner. Since optimal public provision is considered as economic inquiry, this chapter begins with Section 2.1, introducing the economic foundation of fiscal federalism. In light of the Musgravian division of fiscal functions (Musgrave, 1959), this section discusses the economic arguments of fiscal federalism on the basis of such fiscal functions. The assignments of public function to various governmental levels and the distribution of fiscal resources are then discussed. These discussions are expected to lay the basic arguments for intergovernmental fiscal transfers.

Section 2.2 is devoted to the elaboration of intergovernmental fiscal transfers. The design of intergovernmental fiscal transfers entails a number of criteria, from highly normative to practically operational aspects, which may help to ensure that intended fiscal transfers are established in an appropriate manner. Subsequently, this section discusses two important dimensions in intergovernmental fiscal transfers. One is concerned with the vertical dimension regarding to the instruments of general and specific-purpose transfers as well as revenue-sharing. The other dimension deals with the horizontal aspect of transfer in terms of fiscal need, fiscal capacity and the resulting fiscal gap in the provision of public services.

The final section of this chapter attempts to incorporate ecological issues into the discussions of fiscal federalism and intergovernmental fiscal transfers (Section 2.3). Having discussed environmental federalism, the field of most proximity for the possibility of such incorporation, this section presents existing international experiences in the implementation of ecological fiscal transfers. This section further examines a number of proposals involving the different contexts of countries. These proposals are expected to improve our understanding in the implementation of concrete and feasible policy in intergovernmental fiscal transfers that explicitly consider ecological issues.

2.1 Economic foundation of fiscal federalism

On which grounds is decentralization taking place? There are a number of reasons in the literature on fiscal federalism on why decentralization finds its rational. The conventional arguments suggest three concerns relating to functions of the efficiency of resource allocation, distribution of income and stabilization in the macroeconomy. First proposed by Musgrave (1959), this division of functions has instituted itself into the standard economic foundations for fiscal federalism. Definitely, there are other factors explaining the impetus of decentralization beyond these sheer economic arguments.⁵ For example, decentralization has emerged in part as the tools and

⁵ For reasons of expediency, the Musgravian branches of allocation-distribution-stabilization will serve here as a conceptual framework to help elaborate the economic foundation of fiscal federalism and the

strategies of an intergovernmental decentralized society to serve a number of political-economic functions. Bird and Ebel (2007) point out cases in which decentralization has served for instance as a corridor to national unity, a solution to civil war or a deflation to secessionist tendencies, a concession to member(s) of a nation in order not to depart from the republic, and as a co-optation of local support for central policies. However, while crucial in explaining why decentralization is occurring, these legitimate political-economic arguments will not be elaborated on here.

The discussion on the economic foundation of fiscal federalism is organized as follows. Section 2.1.1 presents the Musgravian division of fiscal functions. It introduces the arguments underlying the allocative, distributive and stability dimensions of fiscal federalism. This section elaborates the allocative dimension at a greater length given its wide treatment in the literature relative to other dimensions. The notion of public goods and externalities, preference heterogeneity and information asymmetry, fiscal equivalence and correspondence principle, interjurisdictional competition, as well as cost effectiveness, innovation and scale economies make up the discussions on allocative dimensions. Distributive and stability dimensions will be pointed out afterwards. Based on this elaboration, Section 2.1.2 presents the assignment of responsibility for public function. In this section, two aspects are pointed out. First, the distribution of public function and public expenditure into the appropriate governmental structure. Second, the distribution of public revenues.

ensuing assignments of responsibility. This framework has been under criticism. For instance, in its basic assumptions about the behavior of the government, which is not necessarily benevolent and social welfare-maximizing. A different critical view can be seen for example in the public choice approach by Brennan and Buchanan (1980) in which the government, consisting of politicians and bureaucrats, is assumed to maximize its own private objectives.

2.1.1 Division of fiscal functions

2.1.1.1 The allocative dimension

a. *Public goods and interjurisdictional externalities*

Mitigation of global climate change, maintenance of ecosystem resilience, or the preservation of endangered species and intact nature are but a few examples of public goods provision. In its pure form, a public good is typified by two salient characters: *nonrivalry* in consumption and *nonexcludability* of benefits.⁶ A good is said to be *nonrival* provided that “each individual’s consumption of such a good leads to no subtraction from any other individual’s consumption of that good,” as Samuelson asserts (1954: 387). It implies that the marginal social cost of providing a public good to an additional consumer is zero. Nonexcludability of benefits refers to the availability of a good to all potential users once it is provided. While withholding the benefits it provides is costless, any exclusion from the benefits can be costly and difficult, if not impossible, as one can well imagine the difficulties of exercising exclusion from the benefits of climate change mitigation, resilient ecosystems, species preservation or intact nature. Viewed in this manner, a pure private good is both fully rival and fully excludable.⁷

Public goods and externalities are two concepts of close linkage. Numerous cases of externalities share the character of public goods. A case in point is the emission of toxic gas into the air which affects all individuals equally and simultaneously. Cornes and Sandler (1986: 41-43) for instance model a pure public good, as explained above in the cases of an environmental good, as a special type of externality. In general, following Meade (1973), externality refers to an event which confers a considerable benefit (positive externality) or inflicts a considerable cost (negative externality) on some not fully approving third parties in reaching the decisions directly or indirectly

⁶ The original statement of public goods character is given in the classic works by Samuelson (1954) and Musgrave (1959). For a discussion on this subject see e.g., Tresch (1995).

⁷ Pure public goods and pure private goods are two extreme forms in the taxonomy of goods. Along the spectrum distinct types of goods exist, having a different degree of rivalness and excludability. See e.g. Ostrom (1993).

related to that event. The decisive point to make here is that the impact on third parties is not transformed via the market and price mechanism. Externalities have further more operational defining properties. Baumol and Oates (1975: 17) suggest that externalities are present if the utility or production relationship of the relevant parties – such as individuals or jurisdictions – include something real whose decisions are taken by others without paying attention to the effects of such decisions on the welfare of these parties. The one who decides on the externality-creating activity receives (or incurs) no compensation (Baumol and Oates, 1975: 17-18).

Another defining feature of a public good – and of close relationship to the notion of externality – is related to the size of a particular group that is impinged on by the benefit from the provision of a public good (Oates, 1972: 46-48; Corness and Sandler, 1986: 80-84). Take a measure for degraded land rehabilitation as an example. It is a local public good if the localized collective consumption of the benefits – the protection from degraded land – involves only the residents of that particular jurisdiction, such as prevented landslides in an upstream region. In this case, the benefit consumption is restricted to the boundaries of the producing jurisdiction. The sustained way of land use as mentioned, however, may also confer benefits to downstream jurisdictions, as is the case with an ensured supply of surface water or less nutrient dissolution into the river from upstream agriculture run-off. Likewise, it may confer to the global community the benefits from terrestrial carbon absorption for mitigating climate change. The potential beneficiaries can be a particular jurisdiction, different scales of governmental levels, or different jurisdictions and at different levels, simultaneously (see e.g., Young, 2002).

Interjurisdictional externalities become an allocative problem since they largely relate to the likelihood of whether public service provision is occurring or not. Two important notions are worth mentioning (Oates, 1972: 46). First, the external effects may become a problem if they are not internalized into the system of prices and decisions. For example, an upstream jurisdiction bears the provision costs incurred for water conservation, while the beneficiaries of water conservation include downstream jurisdictions. A non-correspondence between the costs and benefits from the provision thus arises, and is likely to lead to the sub-optimal provision of public service concerned

by the upstream jurisdictions. Second, jurisdictions interacting in a cross-spatial public service provision behave strategically given the incentive to engage in a free-riding behavior (see also Buchanan and Stubblebine, 1962). Under a public-good setting and under the assumptions that interacting jurisdictions are self-interested and utility-maximizing, and there is a unique equilibrium in that public good interaction (namely, no-cooperation is the dominant strategy), the jurisdiction will defect to cooperate for the provision.⁸ In consequence, the public service is likely to be under- or sub-optimally provided, which is socially inefficient (e.g., Olson, 1965).

The internalization of externalities therefore should consider the extension of the size of the jurisdiction relevant for such an internalization, given that the benefits or costs no longer correspond to the territories of the producing or consuming jurisdictions. Additionally, as mentioned, the public good nature of the matter raises the possibility of strategic behavior between jurisdictions with respect to provision cost and benefit consumption of cross-spatial public service provision. These imply that a structure above the jurisdictions affected by the externalities is required. The internalization of external effects suggests a larger jurisdiction for the provision due to the tendency of an inverse relation between the optimal size of the jurisdiction and the welfare level from the externalities (Oates, 1972: 47). For example, the smaller the jurisdiction, the lower the possibility that the external effects are to be internalized. The arguments of external effects thus justify a centralization of function to upper governmental levels.

b. Preference heterogeneity and information asymmetries

The heterogeneity of preferences would potentially be better guaranteed by decentralized levels of government in response to regional resident's various demands for different kinds and extents of public goods and services provision (Oates, 1999: 1123). The reason is that relative to the national level the local jurisdictions have better information about local preferences, needs and conditions, leading to a better decision-

⁸ A different assumption of behavior in collective action, namely that free-riding is but one possible behaviors, is discussed e.g., in Ostrom (1990) and Ledyard (1995). In public finance application the discussion can be found in Tresch (1995). In this assumption, self-interested motivation is not a unique behavioral predisposition as Olson (1965) and neoclassical economics hold. This assumption leads to the possibility of the presence of multiple equilibriums.

making provided that, as Hayek (1945) suggests, the utilization of knowledge takes place.⁹ Local governments may know better about the need related to, for example, local environmental standards or species conservation in remote archipelagoes than the national government does. Catering to different regional preferences would enhance efficiency in comparison to the centralized provision whose inherent tendency seems to be a uniformity of preference.¹⁰

Heterogeneous preferences are likely to lead to more decentralization. This, as empirical studies show, suggests an indication of preference matching. Strumpf and Oberholzer-Gee (2002) demonstrate in their study of liquor control in the United States that the states with a higher degree of heterogeneous preferences tend to decentralize the assignment of regulatory responsibility with respect to the control and decision-making of liquor control to the local government. Drawing on the case in Bolivia, Faguet (2004; 2006) provides the argument for a preference matching under decentralization. The study shows that local public expenditures in sectors related to human capital and social services correspond to the preferences of local population.¹¹

In addition to the possibility of becoming better acquainted with information that characterizes local preferences and needs brought about by decentralization, the notion of information emerges in another distinct and important dimension, one that is also relevant for decision-making in the provision of public services. Particularly, this holds for information associated with administering public functions, delivering public services and fiscal transfers targeted for particular purposes (Boadway, 2001: 100-101).

⁹ There are cases, however, where efficiency may be increased through less information. For example, limiting the authority on the side of the principal (hence, limited information) gives the agent incentives to take initiatives. See Qian and Weingast (1997) and the literature cited there. The principal-agent aspect will be discussed below.

¹⁰ Notice, however, that efficiency in this sense applies to the public goods and services provided to serve local communities. The presence of interjurisdictional externalities will set limits on this efficiency presumption (Breton, 1965; Boadway, 2001), as previously mentioned.

¹¹ For a survey of empirical works on preference matching under decentralization, see Ahmad *et al* (2008). In the case of developing countries, partly because of a large proportion of very poor population, there are reasons to expect less heterogeneity of individual preferences in comparison to a wide variety of tastes and preferences in wealthy industrialized countries. This may affect the nature of demand for local public goods in developing countries. See the discussion on this in e.g., Smoke (1989).

Given information asymmetry, agency problems may arise in which, for example, the behavior of local public agencies (the agent) delivering public services cannot be fully observed by the population (the principal) of the respective local jurisdictions, the tax payers to which the delivery is primarily intended. The true cost, actual effort level and the effectiveness of public service provision at a local level are difficult to monitor and verify when the provision is organized at a central level. As a result, the cost, effort and effectiveness of public service provision would not reflect their optimal levels than otherwise the case if monitoring and verification were possible. Moreover, since the required information for the provision of a public service are not fully revealed to the higher level of government,¹² in some public spheres lower level governments may have a comparative advantage and better tackle this information-based problem (Boadway, 2001: 100-101). The points mentioned are arguments for allocating functions to the lower governmental level.

c. Interjurisdictional competition

Building upon Tiebout's (1956) contribution, there is a large body of literature in favor of the expectation that competition among jurisdictions may lead to more efficiency. The logic is quite straightforward (see also Oates, 1972: 163). On a number of conditions, in the presence of competition, local governments are forced to keep the benefits of public services in line with the taxes paid by the population.¹³ As taxes and spending powers are decentralized to the local governments, jurisdictions at the same governmental level will compete with each other for mobile tax bases, such as from

¹² Public agencies, for instance, can not fully observe the differences in the characteristics of employment status, such as between voluntary or involuntary. In the absence of monitoring, a targeted redistributive measure to the poor implemented by the agencies is likely to be inefficient since transfer recipients do not voluntarily reveal their information. Thus, the recipients may be not those most in need (Boadway and Cuff, 1999). In the case of intergovernmental fiscal transfer, a central government has difficulties in determining the optimal level of transfer with respect to local changes in income, or demand for and cost of public goods. The fiscal transfer may thus induce oversupply or undersupply of public goods (Lockwood, 1999).

¹³ The competition here refers to a horizontal one, that is among jurisdictions at the same intergovernmental level. In addition to this, there is also a vertical competition which occurs between different level of government. See Breton (1998).

individuals and/or firms.¹⁴ Individuals and firms respond to incentives and decide upon expenditure-revenue packages by voting-with-the-feet. In Tiebout's world, governments are therefore forced by mobile individuals and/or firms to correspond to their demands. The incentives for jurisdictions are usually related to tax or expenditure offerings, but they can also include land concessions or land for business development, which would otherwise be assigned to nature conservation. In response to such incentives, the preferences of individuals or firms either entering or leaving jurisdictions would thus be revealed; they will leave a jurisdiction if it offers less attractive tax-expenditure packages, and enter it if more attractive offers are in place.

Empirical evidence on the allocative effects of competition among the decentralized level of governments appears to be inconclusive, however. On the one hand, as viewed by Wilson (1999), competition is expected to be welfare-enhancing and promote efficiency. Jurisdictions may produce public goods more efficiently. On the other hand, interjurisdiction competition may introduce allocative distortions (Oates, 1999: 1134). It may promote inefficiency and reduce welfare.¹⁵ Inefficiency arises given institutional factors, for instance because mobility and information are not without cost. Inefficiency may also arise from fiscal externalities, leading to the under-provision of public goods. Capital moving to low-taxed jurisdictions expands the tax bases of the jurisdictions and reduces the tax burden as local public goods can be jointly consumed. Jurisdictions, failing to acknowledge these fiscal externalities, set inefficient low taxes (cf. Zodrow and Mieszkowski, 1986). Sources of inefficiency also arise from competition in expenditure. In the belief that the relocation of mobile sources from neighbouring jurisdictions leads to additional own benefits, for instance, a jurisdiction might spend a large amount of expenditure to attract factors of production, inducing an inefficient beggar-thy-neighbour sort of competition (Boadway and Shah, 2009: 79). Competing jurisdictions may also prefer to reduce environmental standards in order to be competitive in attracting new firms (Cumberland, 1981; Oates and Schwab, 1988).

¹⁴ Whereas the Tiebout model is oriented toward citizens who choose the jurisdiction they want to live in, the expansion of the model to the context of firms was provided later. See, e.g., Postleyp (1993).

¹⁵ For a survey of contrasting empirical evidence on the mobility of resources and voting-with-the-feet, see e.g., Mueller (2003).

For instance, under tax competition a jurisdiction may have an incentive to undercut its tax level or to set a rather regressive tax to gain a competitive advantage, potentially leading to a reduction in public provision due to reduced tax revenue (see Oates and Schwab, 1988).

Given such inconclusiveness, the details of local setting that might affect local incentives should be taken into account in policy formulation. Wallace (2008: 222-224) mentions that the details of local setting at issue include pre-existing tax-related distortions, the relative size of the local economy, the public sector's capacity utilization, the mobility of production factors and the fiscal instruments that are available to local governments etc.

d. Fiscal equivalence and the correspondence principle

The beneficiary should also bear the cost. This simple formulation, from Eucken (1952: 279), might succinctly highlight the basic idea that underlies the notion of fiscal equivalence. The cost incurred for forest conservation, to mention an example, should be paid for by the beneficiaries of ecosystem services from that forest, irrespective of the jurisdictional border within which the beneficiaries reside. The decisions about both the extent of forest protection and the resources allocated for such protection have to be made by the beneficiaries. This is plausible, provided however that the political jurisdiction matches the benefit area. In a decentralized government structure, there are other dimensions that are to be taken into account in an attempt "to match" the benefit of public service provision and those who pay for the provision. Olson (1969) argues that if the condition of fiscal equivalence is fulfilled – i.e., the political jurisdiction resembles the boundary of benefit consumption, then the incentive for free-riding behavior as discussed above will tend to disappear, possibly leading to an optimal public service provision.¹⁶ In light of this, to achieve a fiscal equivalence – namely, a match between (1) the beneficiary of a public good provision, (2) the bearer of its cost, and (3) the decision-making entities – requires the redefinition of an optimal governmental unit in relation to the case of the public service under discussion. Olson proposes that fiscal

¹⁶ For an extensive survey on fiscal equivalence and public sector financing, see e.g., Hansjürgens (2001).

equivalence requires a single function government, i.e., a separate governmental institution for each public good with a unique boundary (Olson, 1969: 483).

In terms of boundaries, the concept of fiscal equivalence is closely related to the principle of *correspondence* put forward by Oates (1972). As elaborated above, the presence of inter-jurisdictional externalities implies a distorted economic allocation – there is a mismatch between the production side and the consumption side of public goods. The output of public goods provision (or externality-generating activity) does not correspond to having to bear its cost. The benefits of an inter-jurisdictional public good spilling over into other jurisdictions, which do not pay taxes or due compensation for its production, induce an under-supply; the costs borne by other jurisdictions outside of the producing jurisdiction induce an over-supply of the good concerned (Oates, 1972: 33-38; Eichenberger and Frey, 2006: 156). In order to overcome an imperfect correspondence of this kind, namely to induce efficient levels of the public activity on the part of all relevant economic units by sufficiently internalizing the externalities, Oates argues for a governmental structure that ensures a perfect correspondence in public good provision. Within such a structure, the jurisdiction that determines the level of provision of each public good should specifically include the set of individuals who consume the good (Oates, 1972: 34). The design of such governmental units according to their benefits area, was referred to as “perfect mapping” by Breton (1965: 180).

Eichenberger and Frey (2006: 154-161) evaluate the notions of fiscal equivalence and the correspondence principle and develop an extended concept. They believe that their ideal concept offers flexibility in decision-making processes and a more efficient and innovative provision of public services, while attempting to tackle major predicaments which are common in the federal constitution related to negative or uncompensated positive spillover effects, diseconomies of scale, coordination problems, and inequalities in income distribution. The proposed concept is the functional, overlapping and competing jurisdiction (FOCJ). In this concept, *functional* jurisdictions could be organized by referring to an extended political unit, which is defined by the tasks (i.e., public functions) to be fulfilled. In addition to different public tasks they perform, the governmental units are *overlapping* on the same geographical territories. *Competing* in FOCJ ensures the political rights of individuals or communities to express

their preferences in their choice of which governmental unit among competing jurisdictions they want to be integrated with. The units, namely the *jurisdictions*, are governmental in that they have enforcement power and tax-raising authority.

The concept of FOCJ seems likely to be complementary or alternative to the existing and more established governmental structures in the literature of federalism, i.e. those that are built upon the principles of subsidiarity and residuality. Under the subsidiarity principle, tax and spending assignments as well as regulatory functions are devolved and become the responsibilities of the lower level governments. The next level of government could legitimately exercise such responsibilities under the condition that they prove to be superior in meeting the objectives of the responsibility assignments relative to those of the lowest possible governmental level. Under the residuality principle, the opposite character to the subsidiarity principle holds. Functions and responsibilities are assigned to lower level governments since the central government is not inclined or capable of performing, as typical practices in a unitary state may suggest (Boadway and Shah, 2009; Zimmermann, 1999).

In the cases of providing environmental public goods or ecological public functions to preserve or enhance environmental resources, there appears to be limits to both of these two principles, especially the subsidiarity principle. The spatial distribution of natural assets that produce ecosystem services and the spatial interrelationship in environmental effects from economic activities are the sources of the limits, as contended by Smith *et al.* (1999b: 128-131). In this respect, one may imagine the limitations regarding the determination of an appropriate responsibility assignment under the subsidiary principle when it comes to terms with, for example, a single watershed system involving upstream forest cover and downstream marine estuaries, or with the global effects from a declining carbon sink or an increase in carbon dioxide released from burning tropical peatlands (e.g., Smith *et al.*, 1999b; Hansjürgens, 1996: 91-94).

In this section the discussions on fiscal equivalence and the correspondence principle place considerable importance on the decentralization structure in order to match the benefits of public service provision and the cost of its provision.

e. *Cost effectiveness, innovation and economies of scale*

The cost effectiveness of program designs and the program delivery of public services may be improved under a decentralized governmental structure (Boadway, 2001: 101). Cost effectiveness can take place by drawing a comparison with a relatively similar jurisdiction, such as a comparable neighboring jurisdiction. Inter-jurisdictional competition may facilitate such a comparison. The presence of competition among jurisdictions may induce cost effectiveness in which a sort of benchmark jurisdiction, that is a jurisdiction with a cost effective public service delivery, becomes the reference of the competing jurisdictions – perhaps more or less comparable to the yardstick competition among firms as described by in Shleifer (1985). It is expected that competition may potentially discipline a given jurisdiction to be cost effective (Boadway, 2001: 101). Certainly, as discussed earlier, there are a number of downsides from destructive competition, which may justify the presence of national state intervention.

Another form of interaction between jurisdictions associated with yardstick competition is related to copycat behaviors (e.g., Wallace, 2008: 222; Boadway, 2001: 101). Once innovation occurs, and the resulting improvement becomes obvious, other jurisdictions may imitate this for their own development. One good example of this is the value-added tax revenue-sharing arrangement on the basis of ecological indicators in Brazil. The expansion of this arrangement to other federal states in Brazil can be explained to a certain extent by the mimicking process of this innovative practice undertaken by other jurisdictions. While this could be seen as a certain type of inter-jurisdictional competition, the allocative gains from such an arrangement arise from the internalization of spatial positive spillovers and the consideration of foregone opportunity cost for conservation (see e.g., May *et al.*, 2002).

The scale of public service production also determines cost effectiveness. Public services associated with large fixed costs and ones that are not divisible require a certain degree of scale to be able to achieve cost efficiency (e.g., Blankart, 2008: 540-541). The collective public provision of local goods and services, involving a larger sized territorial group, may minimize the unit cost and introduce a consumer surplus because of production and managerial economies of scale at least over some scope of the

production function (Dafflon, 2006: 284). Such economies of scale in producing a public service are an argument for a higher level of government. Good examples of this are waste management or water purification facilities. Conversely, a diseconomies of scale may arise when the scale of public service production outweigh cost effectiveness. These are, for instance, the costs related to coordination or information dissemination in a large public administration (e.g., Hirsch, 1970: 183).

In the conventional public finance literature, the arguments related to the allocative dimensions that have been elaborated on in this entire section can be taken further for both centralization and decentralization. Economists tend to focus on decentralization due to its positive impacts on competition. As has been argued, decentralization also has the potential to provide an institutional mechanism to increase efficiency or to make the governmental level more responsive to local preferences. In subsequent sections we discuss the other two dimensions in the literature on fiscal federalism, namely distribution and stability. In contrast to the allocative dimension, these two dimensions basically take the virtues of centralization further.

2.1.1.2 The distributive dimension

In a market economy, the dimension of distribution in relation to income and wealth is of interest given the degree of equality or inequality which comes about from a number of factors related to, for instance, inheritance, talents, educational opportunities, social mobility and market structure (Musgrave, 1959: 17-18). While the definitions of (in)equality and the proper state of distribution are certainly disputable and opinions differ, “few will deny that some situations arise in a democratic society where an interference in the state of distribution is called for” (Musgrave, 1959: 18). In this respect one may consider for example the economic and social implications of abject poverty or extreme interjurisdictional discrepancies. Among the available instruments, taxes and the transfer system provide a mechanism in the public sector to adjust the state of distribution.

The case for a distributive function in the public sector is often made for a centralized responsibility assignment (Musgrave, 1959; Oates, 1972). The underlying logic is that the mobility of economic factors would prevent any particular local jurisdiction from effectively performing distributive measures, such as raising a negative income tax through which higher-income units pay taxes that are distributed to lower-income units. As such, it is to be expected that high-income tax payers will relocate to neighboring jurisdictions with a more favorable fiscal treatment and that these jurisdictions may in turn hold back a lower income population seeking social transfer. Conversely, these jurisdictions with progressive redistributive policies and a higher social transfer may attract a low-income population, leading to higher social public expenditures. Unless the mobility of economic factors – including the poor population – is relatively low and the preferences of the jurisdictions for distribution are relatively homogeneous, the distributive function in the public sector should be centralized (Oates, 1972: 8).

Nevertheless, the arguments for decentralizing the distributive function to the subnational government or local jurisdictions are also advanced, weakening to some degree the case for centralization. For instance, assuming that local jurisdictions have comparable fiscal capacities, they may undertake redistribution (Boadway, 2001: 111). Higher-income taxpayers may also take part in local income redistribution, as Pauly (1973) formally demonstrates, because their benefits are increased in doing so particularly for the redistributive measure that directly affects this income class. The positive effects of local redistribution policies on social welfare may be stronger than assumed thus far.

Despite the distributive purposes, the mechanism of intergovernmental fiscal transfers should not ascertain full egalitarian transfer. The differences of jurisdictions in their fiscal capacities and their needs to perform an acceptable level of public functions should be taken into account. The perceived need of jurisdictions would entail dimensions of socio-economic, demographic or spatial differences in order to allow marginal benefits of public goods provision to vary among them, simultaneously allowing differences in local preference and equality with respect to incentives. Further, to ensure that a nationally-agreed standard of minimum service level of public provision

is guaranteed, the resulting need-capacity gap will be filled by transfers (see the discussion on these issues by Lenk, 1993: 52-53).

The discussion on the distributive dimension of the fiscal function may also have to contemplate a separation between *interregional disparity* and *interpersonal disparity*, especially in the sense of fiscal equalization transfer, that is, for transfer available to governments at the same level (Bird and Tarasov, 2004). Bird and Tarasov (2004: 81-82) argue that on account of interregional equity is not interpersonal equity, transfer to poor jurisdictions may have ambiguous effect on poor people.

The main distributive objective of intergovernmental fiscal transfers is often confused with the intention to reduce disparities in per capita incomes in different regions. The concept of intergovernmental fiscal transfer design is concerned principally with fiscal equalization between government income and spending, including one that enables the poorest jurisdictions to generate an appropriate level of public service provision. An intended transfer should consider, for example, that a local government consisting of a population with a relatively higher income may not necessarily be a rich local jurisdiction; it can still be poor if it only has access to a very limited range of own source revenues, such as taxes and charges (Bird, 2002: footnote 29).

Reducing interpersonal disparity, for example per capita income differences, as a policy objective thus may seem to require different policy instruments. An example for this is an instrument specifically directed towards poverty reduction which is also of vital relevance in the case of developing countries. In some of these countries, according to Smoke (2006: 205-206), while the effect of decentralization on interpersonal and interregional disparities within local jurisdictions is unclear and in need of further research, a local jurisdiction can raise its own revenues from its well-off economic units in the form of property taxes, license fees and service charges. Redistribution takes place at the local level in that these revenues help to finance general public services, which may benefit the urban poor and rural peasants whose local tax paying capacity is very low or even non-existent. In addition to this possibility on the revenue side, measures of poverty alleviation in these countries also occur on the expenditure side such as pro-poor expenditures (Smoke, 2006: 206). In this way, interpersonal transfers undertaken through expenditure policies for poverty alleviation coexist with intergovernmental

fiscal transfers for distributive purposes (Rao and Das Gupta, 1995: 9). In developing countries, however, the capacity of local governments to undertake decentralized redistributive efforts for poverty alleviation is of concern. Bird and Rodriguez (1999: 305-308) discuss aspects of local limited capacity in developing countries to deliver poverty alleviation services such as regarding the size and skill level of local bureaucracy as well as the ratio of public employees in relation to poverty need. In the case of Indonesia, Olken (2006) shows for example the low level of transfer for anti-poverty programs in terms of subsidized rice for poor people and how corruption may impose a limitation on such programs.

Distributive dimensions are of relevance to environmental questions. Is poverty a cause of environmental degradation? Does environmental degradation hurt the poor? The broad answer to the first question is inconclusive. On the one hand, for example, the well-known Brundtland Report published in 1987 pointed out that poverty degrades the environment. Arguing on the grounds of a political-economy line of reasoning, Martinez-Alier (1991) comes up with a similar conclusion. On the other hand, drawing on an extensive review of empirical literature, Markandya (2006: 104-116) argues that there is neither clear evidence nor a convincing theoretical basis that the poor are more damaging to the environment than their rich counterpart. To some degree this is not in line with the “environmental Kuznets curve” hypothesis that links environmental degradation to per capita income, derived from Kuznets’ work (1955) on income distribution and economic growth. In this hypothesis, the relationship is U-shaped in that the quality of the environment initially deteriorates with an increase of GDP per capita before it improves when a particular critical point is reached.

The answer to the second question, i.e., whether environmental degradation hurts the poor or not, seems less disputable – the answer is positive. The implication of this for a poverty-based strategy, according to Markandya (2006: 121), is that environmental protection may imply pro-poor benefits. A poverty alleviation strategy may also be connected to benefit generation from ecosystem services or natural resources. In his overview of tropical forest, however, Wunder (2001) argues that synergies between forest conservation and poverty reduction do not necessarily succeed. The underlying reason is that reduced poverty has an ambiguous impact on forest conservation.

Especially at the micro level, poverty can cause either more or less deforestation (Wunder, 2001: 1822-1823).

Both interregional and interpersonal disparities are of relevance to environmental issues. Although these two sorts of disparity are in principle related to distributive problems, both disparities also entail an allocative dimension if one is willing to consider the provision of public goods or externality-generating public functions where a degree of inequality, for example in terms of wealth and income differences, is involved. Given the allocative character of public goods, the provision of ecosystem services or nature conservation would depend on cooperation between the relevant actors – individuals, jurisdictions, etc. – for provision. Olson (1965: 35), for example, conjectures in his theory of groups that inequality can encourage cooperation. In a group consisting of a few number of wealthy actors and a large number of poor actors, the likelihood for cooperation is increased if the few number of wealthy actors, induced by potentially enough benefits that they observe, contribute to the provision of public goods irrespective of the actions of poor actors who would chose to free-ride. However, empirical evidence shows a more dynamic picture than this conjecture. For instance, based on the case of rural communities extracting forest resources in Columbia, Cardenas *et al* (2002) show that poorer members of the community are willing to cooperate for common pool resources, and not free-ride. Certainly, as Baland *et al* (2007: 8) argue, the effect of inequality on environmental sustainability will particularly depend on the institutional setting, which structures the interaction among actors, and the technical nature of the environmental asset under discussion.¹⁷

2.1.1.3 The stability dimension

The dimension of stability differs from the previous two dimensions. In its basic formulation, Musgrave (1959) holds that the main concern of the stability function is related to maintaining a high level of resource allocation and monetary stability – in

¹⁷ For the effect of inequality in collective action and cooperation on environmental sustainability, see different cases and discussions in Baland *et al* (2007) and Basili *et al* (2006).

short, it serves macroeconomic purposes. In the division of functions among the levels of government, assignments surrounding tasks that aim to stabilize output and prices at a high level of employment are often designated to a centralized responsibility. In contrast to subnational or local governments, central government has more effective fiscal and monetary instruments to generate full employment with stable prices.

In a Keynesian sense, it is the central government for example that has control over the money supply, a larger fiscal multiplier, and a better capacity to deal with public debt issues. By contrast, a local community has no incentive to adopt a stabilization policy because although it would bear the full cost of this policy, the benefits would spread beyond this community, enabling free-riding behavior. In addition, given its small size, a single local community can not affect the stabilization policies. Its capacity to influence macrostability is negligible if other communities do not follow the same policies. Hence, central government is considerably better at dealing with cyclical economic downturn (see e.g., Oates, 1972: 4 ff.). However, there are arguments in favor of subnational governments adopting counter-cyclical policies for macroeconomic stability and subnational debt management. Such arguments might be justified provided that, for example, borrowing controls are imposed on this level of government to safeguard macroeconomic stability and preserve local public finance. Additionally, a hard budget constraint is applied to the local government's side in that the central government will not revise transfer allocation to bail-out local governments (Ahmad *et al.*, 2006: 413-415).

Stabilization policy in fiscal federalism shares little conceptual connection with environmental concerns. Accordingly, we can discard the dimension of stabilization from the discussions surrounding the assignment of environmental functions to government levels.

Having described the fiscal dimensions with respect to allocation, distribution and stability and their relationships with the institutional mechanism of (de)centralization, to quote Oates (1999: 1120), the next step then would be as follows "...we need to understand which functions and instruments are best centralized and which are best placed in the sphere of decentralized levels of government". The elements of this question have already been addressed, even if in a less elaborate way. The

imperative question is: how to assign responsibilities with respect to public functions, expenditures and revenues to the appropriate level of government? We now turn to answer this question.

2.1.2 Responsibility assignment of public function

Countries organize their public sector and public service provision in different ways. Such differences reflect invariabilities from country to country in terms of historical origin and development, geographical and spatial conditions, political contestation and balance and policy objectives among others (e.g., Bird and Vaillancourt, 1998; Bahl and Linn, 1992; see cases in Bardhan and Mookherjee, 2006). Notwithstanding these differences, countries that have more than one level of government will need to establish some kind of intergovernmental fiscal system.

A set of general issues arises when attempting to assess an intergovernmental fiscal system. Bird and Vaillancourt (1998: 15) argue that the following four questions are of vital importance in any intergovernmental fiscal system of a multi-tiered government. The first question relates to *expenditure assignment*: Who does what? The second question is about *revenue assignment*: Who levies which taxes? At a further level are the questions of equalizing imbalances; the third question relates to a *vertical imbalance*: How is the imbalance between the revenues and expenditures of subnational governments? Finally, the question of *horizontal imbalance*: To what extent should differences in needs and capacities among different governmental units at the same governmental level be adjusted? Obviously, these questions are linked to one another in understanding an intergovernmental fiscal system.

In the succeeding discussions, the first two questions regarding expenditure and revenue assignments will be further highlighted. It has to be noted that the fiscal question is directly related to the above discussion on fiscal federalism. To help elaborate these assignments, two plausible categories of passive and active fiscal transfers are utilized here. “Passive” fiscal transfer is concerned with the concept of distributing public function and public expenditure into the appropriate competence

structure (Section 2.1.2.1). “Active” fiscal transfer deals with the distribution of public revenues (Section 2.1.2.2).¹⁸

2.1.2.1 Passive fiscal transfer

In passive fiscal transfers, the following three partial yet related problems should be taken into account and settled (Hansmeyer and Kops, 1984: 127; Kops, 1989: 16-19). First, the necessary delineation related to public function to distinguish it from private function. The second problem is related to setting up the appropriate public institution for the execution of a given public function. The third problem concerns the distribution of public function assignment to this public institution.

A delineation of assigned public functions is essential given that the fiscal need of a jurisdiction depends to a large degree on this. Therefore, it is necessary to decide the quantity, quality and structure in assigning public function to a governmental level or to a non-state entity. This decision is expected to be made by taking the preferences of relevant actors into consideration, as well as the additional benefit of public function compared to its additional cost at the margin vis-à-vis those provided by a non-state sector. In establishing the appropriate structure to assign a public function, the optimal public provision becomes the reference. This undertaking may involve weighting the level of both decentralization and centralization to which the optimal provision of a particular public function can be assigned (Kops, 1989: 17-18). In what follows are the competence or responsibility assignments of public function into the appropriate public structure.

Decision responsibility

Decision competence constitutes a set of rights or obligations to undertake the subsequent tasks: planning the function related to quantity (i.e. intensity of use) and

¹⁸ The elaboration of responsibility assignments in this section draws largely on Koops (1989), unless otherwise stated. The discussion on these assignments is also provided in Lenk (1993: 58-67). On the notion of passive fiscal transfer, see also Hansmeyer and Kops (1984: 128-135).

quality as well as operationalizing this task in terms of legal and administrative requirements; taking the consequence of implementing this in an appropriate way, if it is relevant to the function; and, establishing a system of control and sanction in cases of violations in the implementation of this function (Kops, 1989: 19).

The division of decision competences refers to attempts to internalize external effects, match preference heterogeneity and consider the implementation of the function. In general, decision competences are assigned to the governmental level whose responsibility area is considered the most optimal to the function of concern. Ideally, a responsibility area of a public function should correspond to the area in which the impact from measures and the performances of the function can be observed. In practice, sub-optimality may occur in the presence of external effects and systematic mistaken decision-making. Such sub-optimality is due to a divergence between the responsibility area from the distribution of function, on the one hand, and the responsibility border related to the impact and performance as a result of undertaking the function, on the other (Kops, 1984: 29-30; Lenk, 1993: 61). In the presence of such sub-optimality in the division of decision responsibility, other structures of competence to perform public functions may present themselves. For instance, by changing and adjusting the existing decision competence or by establishing a new functional competence that serves only a particular public function. Another option would be to establish a collective structure between the relevant jurisdictions in view for example of spatial externalities from public service provision. See Kops (1984: 29) or Lenk (1993: 61) on this discussion. The creation of a regional competence consisting of local upstream and downstream jurisdictions in a defined watershed area for the purpose of internalizing the cross-jurisdictional benefits from water conservation is a case in point.

Sub-optimality regarding the division of decision responsibility also arises due to systematic mistakes in decision-making on the side of the decision competence itself. The causes for such a mistake can be in the form of lacking or insufficient information, the lack of objectivity and neutrality from political interests in decision-making, competition and a prestige-driven attitude among the relevant jurisdictions, a compartmentalized way of thinking in that other public functions are not considered as an integrated whole within the larger context, and neglect with respect to cross-

jurisdictional and macroeconomic imperatives such as in the cases of regional investments (Lenk, 1993: 62; Kops, 1984: 30). Along with the presence of externalities, the aforementioned causes make the assignment of decision responsibility suboptimal if it is only assigned to one competence structure.

Implementation responsibility

Implementation responsibility constitutes a set of rights or obligations to undertake a public function; these rights and obligations are exercised within the regulatory framework, without giving the structure in charge of the implementation the possibility of greatly influencing the intensity and quality related to the implementation of the public function concerned (Kops, 1989: 17). The distribution of implementation competence principally depends on economies of scale of the public function. Given this production-related dimension, the higher the governmental level the more efficient it would be concerning the implementation of public function. The distribution of decision and implementation competences should not necessarily be in the same public institution; both competencies can be distributed incongruently. For example, a public function can be determined by a national government while the implementation of this function can be devolved to subnational governments. It is conceivable that the opposite would also apply in cases where there are diseconomies of scale. Certainly, any incongruence like this has its disadvantages. For instance, the complexity arising from assignments of implementation responsibility to different competences implies that more regulatory and administrative requirements are involved, in addition to increased transaction costs in the decision-making process (see Kops, 1989: 21; Lenk, 1993: 62-63).

Financing responsibility

Financing responsibility is a set of rights or obligations to incur the expenditures given the implementation of a certain function. In this competence, a reference is the so-called connectivity principle, according to which the distribution of expenditure follows the distribution of function (Lenk, 1993: 63). As such, a jurisdiction that has been assigned the responsibility of a public function should bear the associated cost of its provision (Blankart, 2008: 548, footnote 5). There are a number of combinations in

assigning financing competence (see e.g., Hansmeyer and Kops, 1984: 132-135), in which the most relevant ones include the following.

According to Lenk (1993), in cases where there is congruency between decision and implementation competence, and the connectivity principle holds, financing competence can be explicitly assigned in order to make clear the incentive effects of the financing decision on the budget of the jurisdictions or governmental levels under discussion. By contrast, in cases where the connectivity does not hold, the financing competence should be in the hands of the institution that decides on the function since the institution that implements it exercises no influences on the design of the function or on the magnitude of its expenditure. Moreover, in cases where decision competences are shared, i.e. between different governmental levels, the financing responsibility should reflect the relationship between decision competences given the burden-sharing. If decision competences are exclusive, that is not shared, the financing competence should be assigned to the one making the decision (see Lenk, 1993: 64-65).

2.1.2.2 Active fiscal transfer

Financing public services necessitates public revenues. The latter can be derived from various forms of revenues, such as taxes, levies, fees, or other sources. Taxes are of special importance in this respect due to the relatively large proportion they make up of the revenue structure. These public revenues are normally directed towards covering the fiscal need of a given jurisdiction in performing its public functions. In a decentralized governmental system, after the types of public revenue and the magnitude of their respective revenues have been identified, a distribution of the collected public revenues to the assigned governmental level follows. This distribution of public revenues should refer to the assignment of public function. In the long run, to ensure a sustained operation of public function, responsibility assignments should be built on the considerations as well as on the specific characters associated with each revenue type. These include for example the extent and the productivity of the revenue type, its impact on economic stability and growth, its effects on the performance of public function, and

so forth (Kops, 1989). Three responsibility assignments related to decision, implementation and financing, are called for. Each of these are discussed in turn in the following.

Decision responsibility

Decision responsibility entails a set of rights or obligations to determine the quality and quantity of public revenue. Part of decision competence is about the choice of the tax object and the tax base, as well as the operationalization of tax obligation and the tax rate (Kops, 1989: 32). The composition of individual taxes make up the tax system. The design of the tax system is one of the most important decisions of fiscal constitution in a decentralized system. As such, there is a need to balance the extent of maintaining the autonomy of a given (local) jurisdiction over decision competence and the unity of a tax system in the entire state (Lenk, 1993: 69).

The distribution of decision competence is contingent on the notion of externalities, preference matching and fiscal equivalence. In general, under the institution to which decision competence related to tax sources is assigned (and therefore its associated tax burden), the public expenditure and the public service provision of this institution ought to reflect the fiscal equivalence between the service beneficiary and the tax paid for the provision, referring to Olson's fiscal equivalence discussed in Section 2.1.1.1(d) above. Under this objective, Kops (1989: 33-34) suggests that the following taxes are assigned to a centralized institution: (a) taxes with less local extractability and/or less spatial economic impacts; (b) taxes serving distributive purposes; (c) taxes that are sensitive to macroeconomic instability, in order to limit the impacts of a contractionary budget on a decentralized institution. In these cases a centralization of the decision competence, from the view of Lenk (1993: 70), is likely to ensure an integrated framework for public finance and tax policies in achieving socio-economic objectives. By contrast, taxes which are extractable for regional public provision in the sense of fiscal equivalence or that serve preference heterogeneity should be assigned to a decentralized institution.

The assignment of decision competences as mentioned above could however lead to contradictory results. For instance, there are areas where taxes, which are of local

extractability (that should therefore be decentralized), may serve distributive purposes and should therefore be centralized, such as the income tax. In this case, dividing the decision competences between different levels may be conceivable, although higher transaction costs and relatively lower transparency are to be anticipated (Kops, 1989: 34; Boadway and Shah, 2009: 170-171). Additionally, particularly in the case of developing countries, a centralized supervision may still be required as local capacity is inadequate and corruption tends to be pervasive (Smoke, 1989: 14; cases in Bardhan and Mookherjee, 2006).

Implementation responsibility

Implementation responsibility can be defined as a set of rights or obligations to raise public revenues. In this competence, the aspects related to administration and economies of scale are essential in order to have the lowest administrative and production cost in the provision of public services. Given various regulations, yet still required to comply with more or less a similar practice of revenue raising, there is a need for a unified standard measurement and allocation system to ensure a rational fiscal transfer between jurisdictions (Lenk, 1993: 71).

The assignment of implementation competences is expected to be centralized in cases of uniformly regulated taxes, which create less impact on taxpayers and are not extractable locally. If otherwise the case, then a rather decentralized implementation competence should be advocated. This assignment is partly driven by considerations regarding economies of scale (Kops, 1989: 34-35). Moreover, under a shared competence between different governmental levels, raised revenue (after being deducted by the collection fee) should be assigned to the governmental level which raises the revenue before being shared to other levels (Lenk, 1993: 71).

Revenue responsibility

Revenue responsibility refers to the right to decide on the financial amount to be raised from a revenue source. To a certain degree, this competence reflects autonomy with respect to revenue-raising and design. The general principle behind this competence appears to be similar to that of decision competence. Financing the public budget for a centralized function applies to the revenues from taxes which are relevant for

macroeconomic stability¹⁹, locally unextractable, and distributive driven; the opposite characters are for decentralized institutions that perform public functions, including taxes which better serve the equivalence principle (Kops, 1989: 35-36). Nevertheless, contradictory objectives may arise from the assignment of these revenues. A subnational or local government, for instance, may have insufficient revenues from shared taxes, to which it is entitled, to cover its fiscal needs given the lack of tax sources. The national government, in this particular case, should share part of its tax revenue without a need, however, to share its decision competence due to redistributive or macroeconomic stability reasoning (Lenk, 1993: 71-72).

2.2 Intergovernmental fiscal transfers

It has been pointed out that a set of general issues emerges in assessing an intergovernmental fiscal system (Bird and Vaillancourt, 1998: 15). Two of these issues, concerning the assignment of expenditures and revenues, belong to discussions in the afore-mentioned sections. In the section that follows, we discuss the other two issues, namely, the issues of vertical and horizontal imbalances and the fiscal instruments to tackle them. Vertical imbalance is related to the discrepancy between the revenues and expenditures of regional governments compared to upper governmental levels. Horizontal imbalance deals with the differences in fiscal needs and capacities among different governmental units at the same governmental level.

The organization of this section is as follows. We begin with the elaboration of the mechanism, which is required in order to design a fiscal transfer (Section 2.2.1). In the discussion of vertical fiscal transfer (Section 2.2.2), the instruments of general-purpose transfer, specific-purpose transfer and revenue-sharing are highlighted in addition to the taxonomy of intergovernmental fiscal transfer programs. In the discussion on horizontal fiscal transfer (Section 2.2.3), first the normative concept for justifying a

¹⁹ There are also arguments, however, that revenue autonomy at the subnational level may improve the fiscal position of subnational governments in terms of macrostability. In addition, the reliance on transfers from central to local governments is likely to deteriorate their fiscal position. See the discussion and empirical evidence in Ebel and Yilmaz (2003).

fiscal transfer is presented before going into the approaches used in practice to determine the level of fiscal transfer.

2.2.1 The mechanism for fiscal transfer design

Policy options for fiscal transfer necessitate a set of analytical criteria. The latter become a necessity should a rational fiscal transfer be the policy objective. In order to achieve the objective requirements need to be met that both regulate and improve intergovernmental fiscal transfers. Lenk (1993: 220-239) puts forward a number of such requirements.²⁰ Table 2.1 presents the requirements which are categorized in levels and each level entails different types of criteria.

The levels are in chronological order; from the highest level of normative requirement to the lowest level of requirements for the mechanism of fiscal transfer. The first two requirements are based on legal-related dimensions, whereas the last two requirements concern the implementation and mechanism of fiscal transfer. Each level of requirement embraces criteria for a rational fiscal transfer. Moreover, with respect to the character of each criterion, Lenk (1993: 221) makes a distinction between *indispensable* and *desirable* characteristics. A condition is said to be indispensable if the criterion of concern is necessary and essential for the regulation of fiscal transfer, whereas a condition is said to be desirable if it is worth having in order to improve the design of the fiscal transfer, although the criterion could be dispensed with.

The exposition in this section, unless otherwise indicated, largely draws on the systematics of fiscal transfer requirements as structured, typified and elaborated in Lenk (1993: 220-239), with a number of imperative adjustments. This system has been chosen since it provides a comprehensive and integrated account of both the science of public

²⁰ For a detailed discussion on the requirements for fiscal transfer as well as an alternative categorization of the mechanism, see Buhl and Pfingsten (1986, 1991), Fuest and Lichtblau (1991) and Michalk (1989). Boadway and Shah (2009: 351-353) identify a list of criteria for designing intergovernmental fiscal transfers, most of which are included in the systematics described in this section. The criteria of Boadway and Shah provide guidelines which are more or less similar to the requirements elaborated in Lenk (1993), especially at the axiomatic, technical and operational levels. Boadway and Shah, however, seem to overlook the importance of requirements at the normative level.

finance, on the one hand, and the policy and institutional relevance of fiscal transfer mechanism, on the other. We consider these requirements and criteria in turn.

Table 2.1. Requirements and criteria for intergovernmental fiscal transfer

Levels	Category	Criteria	Character of criteria
Level I	Normative	• Constitutionality	Indispensable
		• Compatibility	Desirable
Level II	Axiomatic	• Completeness	Indispensable
		• Contradiction-free	Indispensable
		• Independency	Desirable
Level III	Technical	• Suitability	Indispensable
		• Incentive compatibility	Indispensable
		• Practicability	Indispensable
		• Transparency	Desirable
		• Efficiency of instrument and institution	Desirable
		• Cost effectiveness	Desirable
Level IV	Operational	• (Strong) monotonicity	Indispensable
		• Consistency	Indispensable
		• Low sensitivity	Indispensable
		• Equalization between grants and contribution	Indispensable
		• Time period independency	Desirable
		• Possibility for fiscal policy (re)design	Desirable

Source: Own table, based on and amended from Lenk (1993, 1998).

2.2.1.1 Normative requirements

At the first level, an arrangement of fiscal transfer would indicate a sort of structure, which pertains to providing a set of directives, rules, or particular (yet collectively shared) norms. Such an arrangement, from which the normative criteria derives, would refer to the arrangement of fiscal transfer as it is stipulated in the existing law that both determines the fundamental principle of the government and enforces these directives, rules or norms on the whole process of governance. In a governing structure that shares the character of economic federalism, the decision about the arrangement would be “subject to the constitutional constraint” (Inman and Rubinfeld, 1997). The principal reference of such an arrangement is certainly the law provision of intergovernmental fiscal transfer. It follows that law provision is the primacy of the specifically derived principles of fiscal affairs, which is enacted by legislature undertakings. This normativity defines the generally accepted foundation of constitutional, legal and administrative framework in a particular country.²¹

Another dimension of normativity in relation to a rational fiscal transfer arrangement may also imply a kind of compatibility with the legal system or legal order in that the derived principles would not contradict both the principal reference (that is, the basic law of intergovernmental fiscal transfer) and the regulation of lower judicial level. Eventually, a dimension of social norms seems to be the reason of concomitant normativity requirement. In cases where contradictions between legislated law and social norms occur, a resolution may be achieved, according to Lenk (1993: 224), provided that the possibility that the effectiveness of sanctions from the former is higher than the latter.

Normative requirements under this level comprise the criteria of constitutionality and compatibility. Constitutionality is an indispensable criterion, while compatibility is a desirable one.

²¹ In a particular case of local revenue system in developing countries, a reference to normativity, conventional wisdom and experience of fiscal federalism, is provided in e.g. Smoke (2008).

Constitutionality

The determination of fiscal transfer arrangement must not conflict with the constitution that is a fundamental concept of nation. A fiscal equalization program, for instance, “must be established with reference to the constitutional mandate” (Clark, 1997b: 81). The determination of fiscal transfer arrangement should satisfy general principles as well as special principles required for the arrangement. In many federal or decentralized countries, for example, numerous programs of intergovernmental fiscal transfer incorporate explicit considerations of the expenditure need of a jurisdiction as well as its fiscal capacity to meet that need. These considerations are obviously stated in the articles of the country’s basic law or constitution, which embody the “philosophy of intergovernmental grants” (Oates, 1972: 86).

In the context of Indonesia, the general standard and requirement would entail a statement that the autonomy given to subnational and local governments, including fiscal decentralization, is under the framework of the unitary state of the Republic of Indonesia.²² Further, as stated by the constitution, the relationship between public finance, public service provision, as well as the productive use of natural and other resources between central and regional governments requires a “fair and harmonious” relationship.²³ In order to support regional autonomy and its ensuing process, the revenue-sharing between different levels of government should refer to a fiscal system based on the sharing of authority, task and responsibility. These make up the general principles of fiscal arrangement.

In terms of special principles determining a fiscal arrangement, the requirement would entail, *inter alia*, the elements and definition of balancing funds – that is, related to revenue-sharing (DBH), the general purpose fund (DAU) and the specific-purpose fund (DAK) – as well as, in the case of a general-purpose transfer, the foundation and the determination of fiscal capacity and fiscal need of a jurisdiction, and the mechanism under which fiscal gap-based transfers are to be administered. In addition, it may also

²² See the items of consideration in Law number 33 Year 2002 on fiscal balance between central and regional governments.

²³ The 1945 Constitution of The Republic of Indonesia, Art. 18A, Paragraph 2.

entail other specifications for instance in terms of fiscal gap-filling. The regulation of fiscal requirements and its rules should also affirm for instance, the right to fiscal transfer, its extent, as well as the obligations of each fiscal jurisdiction to contribute to the transfer.

Compatibility

The design of fiscal transfer requires compatibility with the existing regulation and should be in accordance with the objectives of that regulation. Such compatibility should, if possible, be congruent with the regulations and the norms they share with both upper and lower levels of government. Compatibility also assumes that regulations made by a jurisdiction attune to economic development as a whole. The latter includes the considerations of general economic policy as well as structural and spatial policies at the regional level, for instance policies targeted at jurisdictions of weak fiscal capacity or with a higher unemployment level (Lenk, 1993: 228).

Besides, the compatibility condition is dependent on the state form. For instance, a competitive federalism may correspond to different sets of social norms compared to a cooperative federalism (e.g., Inman and Rubinfeld, 1997; Bardhan, 2002). In the case of Indonesia, a revenue-sharing arrangement shares the normative character of distributive norms, because the arrangement aims at horizontal equalization at the same time. The degree of centralization or decentralization is another example of how the state form might shape the normative requirements on compatibility. For a unitary state exercising fiscal decentralization, such as Indonesia, the fulfillment of the compatibility condition appears to be less problematic compared to the circumstances that are common in a federal structure. By definition, the regulations at a lower governmental level, namely for decentralized subnational and local governments, necessarily reflect the regulation at the upper level. The practical experience after Indonesia's "big bang" decentralization in the period from 1998 to 2002, however, showed that a number of regulations at the lower level seem to contradict the purpose of upper level regulation (see Alm *et al.*, 2005).

Compatibility of regulation may grow in complexity when there is a supra state which shares (or should share) a devolved structure compared to a regulation that is

common in a conventional national state. Law provisions of fiscal transfer regulation in some European countries, for example, should be compatible with the norms of law and the contracts of the European Union (Walther, 1996: 91-95; Lenk, 1993: 225-226). In the member states, for example, the design of intergovernmental fiscal transfers for ecological purposes should comply with the European Directives on bird conservation and nature conservation areas.

2.2.1.2 Requirements in compliance with a fiscal axiomatic system

The system of fiscal transfer regulation is the essence that can be attributed to all criteria within the requirements of this level. Such a system entails logical propositions to which the formulation process of a general concept of law will make a reference. Conceived in this way, all laws turn out to be adhering to a particular logical system of axioms. In order to bring intergovernmental fiscal transfers into conformity with the system of regulation, three legal axioms are to be discussed here: completeness, contradiction-free and independency. The first two criteria (axioms) are indispensable, whereas the last one, independency, is desirable.

Completeness

As for the condition of completeness, it calls for a differentiation between the horizontal and vertical kind of completeness. The former refers to the legal boundary – a line, which determines the sphere of a particular regulation (Lenk, 1993: 228), whereas the latter – vertical completeness – touches on the notion of making the state of affairs, and legal consequences that follow from those affairs, sufficiently concrete. A concretization is reflected for example in (1) an elaborated and clear definition in relation to fiscal capacity or fiscal need, (2) the consequences they have in terms of fiscal transfer both for the contributing and recipient jurisdictions, as well as (3) the extent of the transfer. A concrete definition also applies to the degree of performance that a jurisdiction should accomplish (consider for example certain amounts of compulsory own source financing to accompany public activities financed by central government's specific-purpose transfer). Additionally, as Lenk (1993: 228) contends, a clearly defined regulation of intergovernmental fiscal transfers in light of possible fiscal

constellations, especially with regards to fiscal capacity and ensuing fiscal performance of the jurisdiction is imperative. In specifying a precise definition of the regulation, vertical completeness is expected to ensure that no legal loopholes have been left undefined by the legislator.

Contradiction-free

A contradiction is present when in a particular situation the implementation of part of a regulation contradicts (at least one part of) another regulation (see Lenk, 1993: 229; Taube, 1990: 374). The criterion of contradiction-free only refers to the situation in which the regulation of fiscal transfer is assessed by its overall effects in relation to the result of a decision on the basis of the regulation itself. For example, the effect ensuing from a particular stage of fiscal transfer mechanism should not contradict the intended result of the mechanism (Lenk, 1998: 48). In view of this criterion, plausible inconsistencies that may arise from differences in norms of fiscal transfers do not become the subject of consideration (for instance, in terms of conflicts with upper, lower or similar level of governments and their consequences). Inconsistencies of that kind come under the discussion about the compatibility criterion (see Lenk, 1993: 229). At the same time, circumventing the contradictions that may occur from those inconsistencies is part of the technical requirements, which are to be discussed later.

Independency

Compared to the previous two indispensable requirements, independency is a desirable criterion. In a nutshell, independency in a regulation qualifies if the explanation of that very regulation can by no means be derived from another regulation; otherwise a redundancy of regulation will be encountered (Lenk, 1993: 229). Although desirable, it is dispensable since in practice there are cases of redundancy, which are common and sometimes intended. However, as Lenk asserts, this independency also appears to be problematic, particularly in the absence of a concrete formulation of the regulation, as it allows room for interpretation maneuver, not to mention for contradiction between the content of one regulation and another.

2.2.1.3 Requirements for technical implementation

At Level III, the requirements for the technical implementation of fiscal transfers are presented. The requirements serve as criteria for an assessment of the regulation and implementation of fiscal transfers. They ensure that the implementation of fiscal transfers corresponds to the predetermined normative objectives of the country, in ways that are more concrete than the rather more abstract criterion of axiomatic requirements that we have encountered in the above section. The requirement for technical implementation entails the indispensable criteria of suitability, incentive compatibility, and practicability of fiscal transfer regulation. Moreover, the requirement at this level also entails a number of desirable criteria related to transparency, efficiency in terms of instrument and institution of fiscal transfer, as well as cost effectiveness. These indispensable and desirable criterion will be addressed in turn.

Suitability

The compliance of the law provision with the predetermined normative objective is the core of the suitability criterion (Lenk, 1993: 230; 1998: 47). This criterion requires that any existing regulations of fiscal transfer mechanism and law provisions made for such regulations should correspond to the norms embodied in the normative objectives.²⁴ The foundations of such objectives are provided in the constitution. However, they serve merely as a framework, requiring further operational regulations, which await the political decision-making process. The regulations seeking to meet various objectives can be primary and secondary (Lenk, 1993: 230-231). The operational realization of a decentralized system and regional autonomy under the legal framework of a unitary state, in which intergovernmental fiscal transfers become the instrument for this realization, is a case of primary objective. A secondary objective may include special regulations which are in line with the general norms underlying the fiscal transfer regulation and yet intended to meet specific conditions such as for jurisdictions with a special autonomy status or particular spatial considerations (Lenk, 1993: 231), for instance cross-border, archipelagic jurisdiction, remote islands, and so forth.

²⁴ A similar description of the suitability criterion can also be found in Taube (1990: 372, 375).

Incentive compatibility

This criterion of incentive compatibility chiefly concerns incentive creation in relation to fiscal-gap filling. This criterion requires that a transfer mechanism should ensure that an increased fiscal capacity of both recipient and contributing jurisdictions is promoted (Lenk, 1998: 47). Excessive measures of leveling-out are to be avoided or minimalized so that a fiscal measure does not induce disincentive behavior. In concrete, this criterion ensures that in order to be compatible with incentives a jurisdiction may not receive a lower transfer nor contribute a relatively higher amount in the case where its fiscal capacity is increased (Lenk, 1998: 47-48). In this way, filling a fiscal gap can potentially encourage positive incentives.

In light of distributive and allocative functions, the criterion of incentive compatibility may proceed in adverse directions.²⁵ In fulfilling the distributive function, a transfer mechanism may increase the fiscal capacity of a given jurisdiction or a group of jurisdictions (for example, provinces that fall below the national average of fiscal capacity) in the presence of a fiscal transfer. However, a transfer mechanism may not simultaneously comply with the allocative objective if the system of transfer mechanism provides no incentive for a jurisdiction to improve its own per capita fiscal capacity, given the presence of that fiscal transfer. To diffuse or at least dilute such a conflict between distributive and allocative functions, Lenk (1998: 51) suggests applying a strict monotonicity criterion, which will be discussed below at the operational level of the fiscal transfer mechanism.

Practicability

The practicability criterion requires that a regulation of a fiscal transfer mechanism can be implemented in terms of judicial applications. Both the execution and

²⁵ For example, in view of the incentive incompatibility criterion, a fiscal transfer reform is difficult largely because the reform deals with a pure zero-sum distribution problem in which a gain for one jurisdiction means a loss for the other, and vice versa (see Blankart, 2008: 607). Finding the least common denominator which is acceptable to all jurisdictions is a way out, according to Blankart. To this end, and in addition to other criteria such as transparency, Blankart proposes a (conceptual) distinction between distributive and allocative functions in order for fiscal transfers to be incentive compatible, i.e., related to strengthening one's own fiscal capacity, in spite of the presence of transfer. For an allocative description of this proposal, see Section 2.2.3.5 on bridging the fiscal gap.

the result of implementing a regulation should be suitable for assessment. Some important principles presuppose this criterion. In the description by Lenk (1993), they involve the requirement that all necessary input information for the fiscal transfer mechanism can be judicially constituted into regulation. This allows all the relevant parties in the judicial process to assess the regulation and take the decisions that are necessary. Further, the regulation should include existing and designated resources, that is the resources available at the time, which are required for the implementation and evaluation of fiscal transfer regulation. Finally, it should be made possible that the evaluation of execution and the result of the regulation is comprehensible and sufficiently documented.

Transparency

The principal idea behind the transparency criterion is a general comprehensibility and clarity in the formulation of fiscal transfer regulation so that the regulation can be quickly scrutinized (Taube, 1990: 374). A promotion of the transparency criterion offers a number of inherent advantages (Lenk, 1993: 232). Transparency, for instance, involves practicability in that the feasibility is increased for the relevant parties involved in the technical implementation process of educating and learning about, evaluating, and coping with fiscal regulation. Transparency may also improve acceptance through all parties having stakes in the fiscal transfer regulation, particularly because transparency enables more anticipated opinion building and technical exchanges. Additionally, in terms of putting fiscal transfer law into practice, the transparency requirement simplifies the instruction to the subjects implementing the regulation and facilitates control as to whether the implementation of the fiscal transfer conforms to the objectives.

Efficiency of the instrument and the institution

This criterion ensures that the normative objectives should be achieved by the most appropriate instruments and institutional requirements (Lenk, 1993: 232-233). As such, once that the multiple choice of instrument is in place, the appropriateness in relation to intended objectives becomes the primary reference. To name a few examples, a multiplicity of instruments involves the choice of the fiscal transfer mechanism, the

indicators of fiscal need, or the treatment of adjustment funds. At the same time, the institutional design for fiscal transfer regulation should not be considered in isolation of the existing fiscal institutions. This efficiency of instrument and institution criterion to some degree is a derivation of the afore-mentioned criteria of suitability and practicability.²⁶

Cost effectiveness

The cost effectiveness requirement refers to the idea that the regulation of the fiscal transfer mechanism is formulated in such a way so that the resulting costs are the least costs possible (Lenk, 1993: 233). A regulation is said to be cost effective if the intended effect (e.g., of introducing a fiscal measure and allocating funds for a certain public spending) or a predetermined objective are achieved with the least cost. Equivalently, this criterion also requires that for a particular level of public spending, the highest possible amount of public services is to be produced, thus implying a careful and productive utilization of resources by subnational or local governments (Schroeder and Smoke, 2002: 23).

2.2.1.4 Requirements for the fiscal transfer mechanism

So far the discussion and its semantics appear to be mainly of a legal character. In the following discussion on the level of requirements for the fiscal transfer mechanism, the formulation of the fiscal transfer regulation touches on some expressions originating from mathematics (Lenk, 1993: 234). The expressions applied here consult the application in public finance in order to describe further requirements and criteria that are relevant for the fiscal transfer. The following requirements are expected to concretize the implementation of the fiscal transfer mechanism, which is derived from the legal framework and objectives, discussed in the previous sections.

²⁶ There is a definite difference between suitability and efficiency criteria. According to Lenk (1993: 233), the difference is that the suitability requirement concerns the achievement of normative objectives and does not address the question of the instrument that is used to achieve the objectives, whereas the efficiency requirement refers to the extent of how the instrument and institution in use is most applicable.

The subsequent requirements for the fiscal transfer mechanism discuss the criteria of strong monotonicity, consistency, low sensitivity and the harmonization between grants and contribution. In addition to these indispensable criteria, other desirable criteria of time period independency and the possibility for fiscal transfer (re)design are discussed.

Strong monotonicity

Fiscal transfer, both vertically and horizontally, should not change the relative position of a jurisdiction's fiscal capacity before and after it is exposed to the transfer. A rational fiscal transfer refers to "incentive preservation" in that the transfer should not reverse the relative fiscal capacity ranks in order to keep the incentive for jurisdictions to seek a higher fiscal capacity (Fei, 1981: 869). In this respect, for example as Fuest and Lichtblau (1991: 13) suggest, a jurisdiction with the highest fiscal capacity must stay as it is after the transfer and vice-versa for a jurisdiction with the lowest fiscal capacity. In particular, this should be taken to mean that the actual surplus above the weighted average fiscal capacity of a jurisdiction should not be entirely drawn off. Only in this way, as Fuest and Lichtblau contend, would a so-called over levelling-out (*Übernivellierung*) be circumvented – the implication of which creates a disincentive effect for a jurisdiction to improve its own fiscal capacity.²⁷

Lenk (1993: 235) further distinguishes between simple and strict monotonicity requirements. Simple monotonicity suggests that a jurisdiction with a relative position of lower (higher) fiscal capacity before the transfer takes place can not be in a worse (better) position afterwards. It should be at least (at most) equal. Simple monotonicity implies that a levelling-out is not entirely impossible. A strict monotonicity suggests that the rank position of a jurisdiction is stable and unchanged after fiscal transfer. One important implication of the strict monotonicity condition relates to the principle of

²⁷ Satisfying the monotonicity requirement can be ensured for instance by the weighting factor, as Fuest and Lichtblau (1991: 13) suggest. First, a weight is given to a jurisdiction upon the basis of its actual-average relation of fiscal capacity, which is undertaken after carrying out a fiscal capacity comparison between the positions before and after the fiscal transfer. Second, a weight is assigned by considering the fiscal need components. Notice that the monotonicity requirement by Fuest and Lichtblau reflects a strict monotonicity.

incentive prevention. Strict monotonicity becomes an indispensable condition if it is confirmed that the jurisdiction has no incentive to increase its own fiscal capacity.²⁸

Consistency

The consistency condition is especially concerned with the relationship between fiscal capacity and the level of fiscal transfer with regard to fiscal capacity. A function of fiscal transfer is said to be consistent given that an increase (decrease) in fiscal capacity should increase (decrease) the transfer obligation in a consistent, not leaping, magnitude. Consider for instance the relationship between functions of fiscal capacity. A change in the function of fiscal capacity *before* the fiscal transfer should result in the same change in the function of the fiscal capacity *after* the fiscal transfer.

Low sensitivity

The requirement of low sensitivity relates to the final allocation of transfer considering the effect from changes in the so-called input variable, which is employed in the calculation of fiscal transfer (Lenk, 1993: 235-236). In the conventional practice of intergovernmental fiscal transfer, the input variable itself relates to the variable of fiscal capacity of a jurisdiction concerning fiscal particularities (e.g. population) or the variable of the average per capita fiscal capacity of the entire jurisdiction. By and large, these variables serve the purpose of determining the fiscal gap of a given jurisdiction and the magnitude of transfer it deserves to obtain.

As to the effect of certain changes in the size of the variable, a number of properties are necessary, which are drawn from Buhl and Pfingsten (1986, 1990, 1991).²⁹ If the amount of funds available for fiscal transfer for all jurisdictions changes

²⁸ Under the condition of simple monotonicity, Lenk (1993: 235) argues that a jurisdiction with a higher than average fiscal capacity might possibly encounter a disincentive to increase its fiscal capacity since that position (i.e. higher than average fiscal capacity) would adversely affect the extent of the fiscal transfer that it would receive.

²⁹ With an analytical emphasis on fiscal capacity, Buhl and Pfingsten (1990, 1991) propose a set of criteria for a rational fiscal transfer and the distribution of public funds (see also Fei, 1981). Let T_i be the tax revenue of jurisdiction i and S_i denote the contribution of jurisdiction i . In this case, if equalized fiscal capacity after partial equalization through fiscal transfer is the purpose, a subnational jurisdiction i should

by an equal magnitude, then after the fiscal transfer the rank of the jurisdiction may not alter due to the change, *ceteris paribus*. An additional feature is that if the size of one variable – of at least two jurisdictions – changes, *ceteris paribus*, without changing the whole sum of that particular input variable, the fiscal volume of a jurisdiction unrelated to that change should remain unchanged after fiscal transfer. Further, if the amount of funds available for fiscal transfer of a given jurisdiction increases, then the size of the funds may not fall below the size before the increase occurs. At the same time, if such an amount of funds decreases, then it shall not increase above its size before the decrease.

The next properties relate to the requirements about how the funds should depend on the population distribution. If the number of the population in all jurisdictions alters by an equal magnitude, then the relative proportion of the jurisdiction from the available fund after fiscal transfer should remain the same, *ceteris paribus*. Here, the intention of the requirement is to isolate a given jurisdiction's fund from the effect of population changes. Further, if the number of the population in a single jurisdiction increases, *ceteris paribus*, then after fiscal transfer occurs the available fund for fiscal transfer from that jurisdiction may not fall below the size before the increase takes place. Conversely it requires that if the number of the population of that jurisdiction decreases, then the available fund for the jurisdiction after fiscal transfer may not increase above the level before the decrease. (See the elaboration of low sensitivity criterion in Lenk, 1993: 235-236).

contribute S_i , which means that the fiscal capacity of a given jurisdiction is low if $T_i < S_i$, and high if $T_i > S_i$. Buhl and Pfingsten formalize these characteristics by requiring what follows.

(1) *Monotonicity with respect to tax revenue*. If the tax revenue of a jurisdiction increases, *ceteris paribus*, and given that the contribution of that jurisdiction stays constant, then the fund of that jurisdiction after fiscal transfer should at least not decrease. Hence,

$$f(T + x, S) \geq f(T, S), \forall x \geq 0.$$

(2) *Monotonicity with respect to vertical transfer from an upper level jurisdiction*. If the tax revenue of a jurisdiction increases, *ceteris paribus*, then such an increase should not reduce the fund of other jurisdictions. The increase in tax revenue also simultaneously enlarges the contribution of that jurisdiction. Formally,

$$f(T, S + x) \geq f(T, S), \forall x \geq 0.$$

Equalization between receipt and contribution

The general idea of this requirement is that, by taking all jurisdictions into account, the receipt from fiscal transfer should be equal to the contribution for fiscal transfer. This equalization ensures that a sufficient volume of fund is available for fiscal transfer through which jurisdictions with above average fiscal capacity contribute to those with below average fiscal capacity. Furthermore, this requirement enables the aforementioned condition of completeness to be fulfilled.³⁰

Independency of time period

This requirement intends to ensure that the distribution of funds does not depend upon the length of the selected time period (Buhl and Pfingsten, 1990: 366). In practice, it is desirable that a change in the length of the fiscal period – e.g., the month, quarter, or year, etc. – does not matter for the distribution. For instance, the total amount of transfer for two fiscal years is similar to an addition of transfers from two separate fiscal years. The result of fiscal equalization should thus depend on the input reference and not on the function of the time frame of its calculation (Lenk, 1993: 237).

Possibility for changes in fiscal policy

Within the existing legal framework of the fiscal transfer mechanism, this requirement provides the possibility that the redistribution measure may still vary over time (Lenk, 1993: 237). As such, there is a certain degree of freedom in which fiscal policy is subject to changes. Lenk contends that in principal there are two arguments through which such possibilities are relevant in practice. The first argument is by way of a variation in the redistribution measure by allowing a varying degree of levelling-out. The second argument relates to the flexibility in the regulation of fiscal transfer, which enables a different intensity of intended effects – from the initiated policy changes – to occur. These arguments are in close relationship to the policy-making process.

³⁰ Such a full divisibility of the total distribution of a fund is due to Buhl and Pfingsten (1990). The overall fund available for transfer should be fully distributed afterwards. In other terms, harmonization implies that the total fund before and after equalization needs to be equal. Using the notations in the earlier footnote, formally $\sum^n f(T_i, S_i) = \sum^n T_i$.

The first argument requires, in an idealized circumstance, that there is a political agreement on the extent of levelling-out. This agreement leads to a change in the fiscal system which requires a certain degree of flexibility. The second argument ensures greater stability for a longer time of the fiscal transfer regulation because the decision made for the regulation is not situation-driven. Although relatively restrained in its extent, a swift response to required changes – political, economic or social changes – is also possible under this degree of freedom. Lenk suggests however, that both arguments, in the absence of political agreement, should refer to the previous agreement on the variables of redistribution measure (Lenk, 1993: 237).

2.2.2 Vertical fiscal transfers

2.2.2.1 The instruments

After having presented the mechanisms of fiscal transfer design and its underlying mechanism, we now discuss the forms of intergovernmental fiscal transfer. Using a broad classification, they constitute the three elements of general-purpose transfers, specific-purpose transfers, and revenue-sharing arrangements. Some authors (e.g. Boadway and Shah, 2009: 291 ff.; Oates, 1999: 1126-1130) prefer to distinguish between general and specific-purpose transfers, on the one hand, from revenue-sharing, on the other. Intergovernmental transfers would thus only refer to general and specific-purpose transfers.

In the discussion presented here, we choose instead to combine all these instruments under the general rubric of intergovernmental fiscal transfers, given the following two motivations. First, both transfers and revenue-sharing systems have similarities and the difference between the two is simply a conceptual one, as Boadway and Shah (2009: 293) acknowledge, although revenue-sharing relates to a particular way of distributing transfers from national to subnational governments. Second, the reason for not separating them is driven by a practical consideration with respect to the context of this study. While in the Indonesian case there is a conceptual differentiation between transfers and revenue-sharing, in practice these two instruments may merge. For

instance, the determination of fiscal capacity – which is an element of the general-purpose transfer – is in part built upon “transfers” under the revenue-sharing arrangement (see Figure 3.2 in Chapter 3). In what follows we discuss intergovernmental fiscal transfers in a rather general notion. More specific elaborations, including the types of transfer programs, will be dealt with in the later sections.

General-purpose transfers

As its name implies, a general-purpose transfer is a transfer provided for a general budget support without any conditionalities attached to the transfer (see Boadway and Shah, 2009: 307). The recipient lower-tier governments, such as subnational or local jurisdictions can spend the fund received at their discretion. Given that no string is attached to this transfer by the central or national government and that its fund utilization depends merely on the decision of lower level government, this instrument is also referred to as an unconditional transfer.

This transfer instrument encourages local autonomy. Subnational or local jurisdictions are given the autonomy to manage the fund, to which they are entitled from a general-purpose transfer, and to exercise a decision on the financing of public service provision. The transfer finances public expenditures for public functions at this level of government such as for education, health or infrastructure. This instrument also enhances inter-jurisdictional equity. The determination of a general-purpose fund is often formula-based which attempts to equalize the fiscal capacity and the fiscal need of a jurisdiction. This typically provides the case for a general-purpose transfer as the appropriate instrument for purposes of fiscal equalization (Oates, 1972; 1999).

A general-purpose transfer tends to induce income effects. In the presence of this transfer and assuming that public goods have a positive income elasticity, the budget constraint of the recipient jurisdiction will expand at an equal magnitude, allowing spending possibilities on (and the consumption of) public services (Gramlich, 1977;

Boadway and Shah, 2009: 308).³¹ The relative price of public services are assumed to be unaffected by this kind of grant.

Specific-purpose transfer

In a specific-purpose transfer, the grantor defines the purposes of as well as the restrictions on the fund utilization. The purpose includes specific public programs or activities. The restrictions relate to the types of public expenditures or to certain outcomes of public services. In view of these, a specific-purpose transfer is often referred to as conditional grant. The conditionalities in a specific-purpose transfer may be input-based or output-based (see Boadway and Shah, 2009). According to Boadway and Shah (2009: 309), input-based conditionalities relate to the specification of types of expenditure that are entitled to specific-purpose funds, whereas output-based conditionalities specify and require an attainment of particular outcomes of grant-financed public service.

A specific-purpose transfer may induce both an income effect and a price (or substitution) effect, especially in its matching form, where transfer recipient jurisdictions have to finance a part of the expenditure. The income effect occurs as the transfer alters the available income because the recipient jurisdiction obtains more financial resources. The price effect takes place due to a reduction in the relative price of delivering a public service. Altogether, both effects stimulate a higher spending on public services. The income effect may also affect the consumption of other public services. Although the relative price increases given the substitution effect, the consumption of such public services may increase, provided that the income effect is sufficiently large (see e.g., Boadway and Shah, 2009: 309-314; Gramlich, 1977).

³¹ The prediction that an increase in the general-purpose transfer will increase local public goods at the same magnitude as its income elasticity (and the remaining part of the block transfer will flow to, say, private consumption), has not necessarily been confirmed empirically. The portion of public spending from general purpose grants tends to increase more than was predicted. This gives rise to a phenomenon called the *flypaper effect*. There have been volumes of empirical literature on this; for recent surveys see e.g. Hines and Thaler (1995) and Bailey and Connolly (1998).

Revenue-sharing arrangement

A revenue-sharing arrangement in its common form, deals with an arrangement in which the upper level government allocates a share of its tax revenues to lower level governments. In this arrangement, the lower governmental level is considered to have a claim on those collected revenues. The allocation mechanism entails which tax revenue and what proportion of the revenue is to be shared, both to the lower-tier jurisdictions as a whole or among the jurisdictions. The source of revenues to be shared can be a single tax, such as the income tax. The source may also be from a set of taxes such as taxes related to natural resource extraction. The discussions on revenue-sharing arrangements can be found in e.g., Boadway and Shah (2009), Bahl and Wallace (2007), and Searle (2007).

With respect to the allocation of shared revenues, there are different mechanisms (see the elaboration of the allocation mechanism in Boadway and Shah, 2009: 294-295). The principle of derivation is the most common of all – here collected revenues are allocated to recipient jurisdictions on the basis of the revenue origin, namely where the revenue is raised. The allocation of revenue by derivation may be in a simple per capita measure or through a formula-based equalization. Regarding the mechanism on the type of revenues to be shared, in some countries it is regulated under the fiscal constitution, or based on the recommendation of an external independent authority, while in other countries with federal structures the federal state itself determines the allocation mechanism. At a conceptual level, a revenue-sharing scheme attempts to tackle vertical fiscal imbalance, namely the gap between expenditure need and revenue raising capacity, as subnational and local governments have more access to revenue sources such as broad-based and income-elastic taxes (see e.g., Bahl and Wallace, 2007: 214). In practice, there are cases where a revenue-sharing scheme is also intended to equalize horizontal fiscal imbalance between jurisdictions.

2.2.2.2 A taxonomy of intergovernmental fiscal transfer programs

Intergovernmental fiscal transfers have different forms of transfer instruments. In grant policy, transfer programs (or grant programs) are contingent on the type of transfers and the intended effect they seek to gain. Gramlich and Galper (1973: 17-20) suggest three broad classifications of intergovernmental fiscal transfers. Such classifications, the elaboration of which follows below, refer largely to developed federal systems such as in the United States.

(1) The first kind is an *open-end matching grant*. The central government pays a fraction of the cost to match a given public expenditure incurred by subnational governments. It constitutes a partial reimbursement of the funds whereby the national government level provides a portion of the reimbursable expenditures while the remainder is the responsibility of the subnational authority. A partial cost reimbursement, or a matching grant, encourages subnational governments to mobilize their own source revenues as their contributions are required to pay the portion of the total costs of undertaking a public function (see Schroeder and Smoke, 2002: 30). Under this arrangement, the lower level government decides on the extent of the grant that it intends to spend on its public expenditure at this cost relation. (A matching grant is often referred to as a cost-sharing program). Theoretically, as Gramlich and Galper (1973) hold, such a decision will rest on the price elasticity of demand for goods and services related to the public expenditure of concern.³² For example, if demand is elastic, lower government will increase total expenditure to an extent that is larger than the grant it receives. In contrast, if demand is inelastic, lower government will increase its expenditures so that the latter is lower than the grant it receives. Examples of public expenditures financed under open-end matching grants are social welfare-related or assistance expenditures.

(2) A *closed-end lump-sum transfer* is the second kind of transfer under which the central government provides a fixed and predetermined amount of transfer to

³² Typically, the justification for an open-end matching transfer is benefit spillovers. The transfer consequently serves as a Pigovian price-reduction instrument, resulting in a decline in the price of public expenditure that a subnational or local jurisdiction pays (Gramlich, 1977: 220).

subnational governments.³³ It is a total fund reimbursement from the national government. As its name implies, this lump sum and fixed amount of transfer is not attached to any effective restrictions on its use or change due to changes in relative prices of public expenditures. With this type of grant, both the degree of reimbursement and the number of projects approved may vary each year depending on the total available funding. According to Gramlich and Galper (1973), the propensity of lower-tier government to spend budgetary resources, rather than motivations related to tax reduction or budget surplus, determines the response to this kind of grant. The authors suggest that in cases where the demand for public goods increases as income increases, lump sum transfer will to some extent induce an increase in public expenditure and a decrease in tax revenue. Grants of this kind, in comparison to the aforementioned open-ended matching grants, will also stimulate less expenditure per monetary unit provided that demand for expenditure is price elastic. Examples of close-end lump sum transfer include general revenue-sharing schemes.

(3) The third kind of transfer constitutes a *closed-end categorical grant*. It is a specific-purpose transfer through which a central government provides a limited amount of transfer for specified public expenditure. Under the classification system of Gramlich and Galper (1973), this kind of grant is a sort of hybrid between the two foregoing types.³⁴ Generally speaking, the expenditure effect of this kind of grant lies somewhere between the effects of the two afore-mentioned grants. As the amount of this transfer is principally limited and results in a decreasing impact of any price reduction, the expenditure effect is below an open-end matching grant. At the same time, its

³³ An unconditional, close-end lump sum transfer to lower level governments can also be justified in light of Musgravian distribution and stabilization functions (Gramlich, 1977: 221). Gramlich suggests that there is an innate limit to which local governments can impose a progressive income tax. A case in point are the benefits from public expenditure that accrue proportionally to all income brackets and disproportionately to low income groups. A local tax can thus be regressive. On the cost side, the distribution of public good provision cost is disproportionate with different income level. Higher income tax payers also tend to prefer jurisdictions offering a lower tax. With regard to the stabilization function, assuming that services offered by the public sector are more stable than that of the private one, Gramlich holds that the central government budget can be used to stabilize local public spending and unemployment.

³⁴ Gramlich (1977) holds that this grant affects both the relative prices and incomes facing lower levels of governments. Break (1980: 75) notes that this type of grant blends income and price effects, “in ways that are difficult to disentangle.”

expenditure effect is greater than that of a lump-sum transfer given price reduction in specified public expenditures. Numerous grant programs, beyond those described previously, take the form of a close-end categorical grant.

Break (1980: 73-76) proposes another form of grants, which are commonly in use and are likely to be complementary to those of Gramlich and Galper. In addition to the above open-end matching grant and closed-end categorical grant, Break adds another two kinds of grants: unconditional general grants allocated on a formula basis and project grants under competitive application. *Unconditional formula-based general grants* are allocated to subnational governments on the basis of a computable fiscal formula. Theoretically, income effects are expected in that they increase the available funds from transfer and yet make no changes to the price of goods and services in public expenditures. Examples of this kind of grant are comparable to formula-based revenue-sharing schemes. Under a *project grant by competitive application*, a subnational government applies to the central government and competes for the available fund. The decision about grant eligibility will depend on the submission of detailed plans on the use of funds, including the relative priority level of the proposal, among other plausible considerations.

The taxonomy of intergovernmental fiscal transfer programs proposed by Gramlich and Galper (1973), as it has been briefly pointed out, refers to – and thus is of limited relevance to – the developed or advanced federal systems. The concern of this taxonomy, as Bahl and Linn (1992) contend, is merely on the distribution between jurisdictions, or interstate.³⁵ It may follow from this contention that a taxonomy of this kind “would not apply in developing countries” (Bahl and Linn, 1992: 432). Alternatively, subscribing to an extensive review and cases in developing countries, Bahl and Linn set out and advocate an alternative form of taxonomy. Their proposed taxonomy takes into account the dimensions of the size of the divisible pool of funds available for grants as well as the mechanisms behind its allocation. In addition to being able to separately focus on these two dimensions, this alternative taxonomy may offer a

³⁵ Gramlich and Galper (1973: 18 ff.) acknowledge the difficulties concerning the practical application of such a grant taxonomy. For example, when various types of expenditures are combined into functional categories for the purpose of empirical studies.

better understanding on the importance of grant design so as to meet the objectives of a grant system.

As for determining the size of the funds, or the divisible pool, for all jurisdictions in a given fiscal year, in practice three common approaches are often suggested. The first approach is in the form of a specified share of tax revenue collected at the national or state/provincial level. The second approach is by way of ad hoc decisions such as those that are appropriated through the parliamentary process. This occurs annually within the regular budgetary process and the decisions are often driven by political considerations and contestations. The third approach is the reimbursement of approved public expenditures. The next mechanism, after having the divisible pool of funds determined, is the allocation among lower level governments. The allocation typically takes the following routes: by derivation principle in which the tax revenues are returned to the jurisdictions of tax origin; by certain formula; by cost reimbursement; and by ad hoc decision.

A broad taxonomy of grant relying on Bahl and Linn's (1992) classification is shown in Table 2.2. Schroeder and Smoke (2002: 27-31) provides an extended description of this classification. In this table, of all possible combinations, there are eight grant types, A to H, which have apparently become common practice in grant design in developing countries. Consider Type A to Type D, for example. In these grant programs, a specified and fixed share of the divisible pool is allocated on the basis of the origin of tax collection (Type A), fiscal formula (Type B), the cost reimbursement basis (Type C), whereas an ad hoc decision for grant allocation is made for Type D.

Some grant types are categorical in that they are designated for specific purposes or projects, which typically should be on the approval of the central government. Type C, F, and H grants belong to this description. Some other grants are rather for general purposes, such as virtually all of the remaining grant types. A characterization of grant is also to be seen whether it is open-ended or closed-ended.

Table 2.2. Forms of intergovernmental grant programs

Method of allocating the divisible fund pool	Method of determining the total divisible fund pool		
	Specified share	Ad hoc	Approved expenditures
By derivation	Type A Revenue-sharing arrangement based on the origin of tax. Not earmarked. Usually general purpose and closed-end.		
Formula-based	Type B Formula-based grant, closed-ended. General purpose or sectoral block.	Type E Formula-based grant, close-end. Decided ad hoc through a political decision. General purpose or sectoral block.	
Cost reimbursement (total or partial)	Type C Specified amount to projects, distributed on cost basis. Grant is categorical, usually closed-end. Sectoral block or specific purpose.	Type F Grant is categorical, usually closed-end. Sectoral block or specific purpose.	Type H Grant is categorical, can be open-end. Sectoral block or specific purpose.
Ad hoc	Type D Closed-end. General purpose, sectoral block or specific purpose.	Type G Closed-end. Purely ad hoc. General purpose, sectoral block or specific purpose.	

Source: Adapted from Bahl and Linn (1992: 432), Table 13-2, and Schroeder and Smoke (2002: 28), Table 1.

Furthermore, a grant is defined as a sectoral block if its allocation is intended to give recipient governments space for their own decisions on the use of the fund – even if the scope in which the fund can be used is merely for a particular sector. Another characterization arises in terms of whether a grant is earmarked for a particular public service or whether a grant is for purposes that a lower level government decides upon itself. Type A grant, for instance, is not earmarked.

2.2.3 Horizontal fiscal transfer

2.2.3.1 The normative concept of fiscal transfer

One could say that the core objective of intergovernmental fiscal transfer is the internalization of inter-jurisdictional benefit spillover in public goods provision (e.g. Oates, 1972; Boadway and Shah, 2008). As discussed in the foregoing sections, the internalization process can be justified due to the presence of various divisions of assignment at different governmental levels (i.e. vertical consideration) and jurisdictional boundaries (i.e. horizontal consideration).

Given benefit spillover, the presence of these vertical and horizontal considerations gives birth to the notion of correspondence between public goods provision on the one hand and the beneficiary from the provision in a defined jurisdiction, on the other. In terms of public goods provision, as Oates (1972: 34) formulates, a perfect correspondence constitutes a government structure in which a government unit providing public goods has a jurisdiction that corresponds exactly with the group whose welfare depends on the output provided by this government unit. Imperfect correspondence occurs when the outputs of public goods no longer coincide with the groups of beneficiaries. The existence of imperfect correspondence implies an anticipation of inter-jurisdictional externalities – the effects of which may lead to inefficiencies in resource allocation.

We can use the degree of correspondence as a normative point of departure to analyze the first and second best policy environments in terms of the social welfare optimum (e.g., Atkinson and Stiglitz, 1980; Tresch, 1995). In a first-best decentralized

system of government where a perfect correspondence of resource allocation is assumed to be present, the conventional formulation suggests that social welfare maximization is an affair that is best taken care of by the national government, whereas subnational governments are concerned with efficiency. Intergovernmental fiscal transfers have no reason to be in place here. A resource allocation (and the correction of resource misallocation) would take place between individual actors in interaction with national and subnational governments in their respective jurisdictions. Interpersonal equity conditions would theoretically be satisfied with a sort of lump-sum tax and transfer among individual participants, ensuring Pareto-optimal requirements (Tresch, 1995).

Conceptually, intergovernmental fiscal transfers become imperative as imperfect correspondence emerges. In a second-best policy environment where public activities generating externalities come to the fore, the aforementioned conditions of efficiency will no longer hold. Consequently, there is a need to define the appropriate level required transfer. Consider a hypothetical case with two jurisdictions, a and b .³⁶ Jurisdiction a , which consists of i individuals ($i=1,...,n$), provides a pure Samuelsonian (1954) public good at the quantity of G . Residents of the jurisdiction directly consume this public good. X denotes the private good. Meanwhile, the other jurisdiction, b , has a population of j ($j=1,...,m$).

Following the efficiency criteria in utility maximization of the individual jurisdiction, the Pareto-optimal allocation takes place when:

$$\sum_{i=1}^n MRS_{GX_i}^a + \sum_{j=1, j \neq i}^m MRS_{GX_j}^b = MRT_{GX} \quad (2.1)$$

This condition says that the marginal rate of transformation (MRT) of the public for the private good must be equal to the marginal rate of substitution (MRS) of both jurisdictions a and b . In this world, there is no need for fiscal transfer.

³⁶ Derived from Tresch (1995: 894 ff.) on the discussions surrounding an efficient level of transfer in light of imperfect correspondence due to the presence of externalities. Similar examples can be found in Oates (1972: 99-102). For an elaboration of the decision rules and their derivations, see e.g., Mueller (2003), Dasgupta and Heal (1979), and certainly the original paper of Samuelson (1954).

Now, imagine another scenario in which jurisdiction b indirectly consumes cross-jurisdictional benefits of public goods that exist, or are produced, in jurisdiction a . As such, public goods (G) in the above formula will be misallocated. The non-excludable public good spills over beyond the producing jurisdiction a . The production and consumption of G that jurisdiction a provides no longer correspond to the jurisdictional boundaries of jurisdiction a , resulting in a less than efficient level of aggregate consumption of public goods. If the extent of positive externality is denoted α , then formally:

$$\sum_{i=1}^n MRS_{GX_i}^a + \alpha \sum_{j=1, j \neq i}^m MRS_{GX_j}^b = MRT_{GX} \quad (2.2)$$

In order to internalize such a positive externality and achieve Pareto-efficiency in public goods provision, a government at a higher level than jurisdictions a and b could provide (in a Pigouvian spirit) a matching per capita fiscal transfer T to jurisdiction a , through a number of possibilities. The transfer should be equal to the aggregate marginal gain resulting from the externality, namely:

$$T = \alpha \sum_{j=1, j \neq i}^m MRS_{GX_j}^b . \quad (2.3)$$

Another plausible normative guideline may be introduced by examining fiscal inefficiency in terms of the benefits of public services provision. An inevitable feature of a decentralized structure of decision-making is that differences will exist in terms of the needs for public services and tax capacities to finance the provision of these services. Given such differences, fiscal decentralization will lead to fiscal disparities (Boadway, 2001). Fiscal inefficiency arises when in two different regions the same individual receives a different value of benefit from public services. In the terms of Buchanan (1950), this is the “fiscal residuum”, which basically represents the balance between the tax paid by an individual and the value of public services that an individual receives.

In this case, a fiscal structure is said to satisfy the equity criterion only if the fiscal residua of that same person are equivalent in different regions. Fiscal treatment should be equal for individuals in equal positions, irrespective of the jurisdiction in which they reside. The role of an equalization transfer is thus to even out the differential

in the net fiscal benefit between the two jurisdictions in terms of per capita tax revenues. Equalizing the net fiscal benefit means an equalization between the value of public services delivered and their tax cost (Boadway and Shah, 2008: 46-47). If an equalization transfer is not in place, then the difference in net fiscal benefit will induce economic actors (households, firms, individuals) to locate in regions with a higher net fiscal benefit, leading to inefficiency as resources will not be allocated to their most optimal uses (see e.g., Boadway and Flatters, 1982).

An alternative normative view seeks to apply a fiscal capacity equalization in the concept of interjurisdictional equity (Mieszkowski and Musgrave, 1999). In a very general sense, lower tier jurisdictions with a high per capita income and a low per capita need provide transfers to those jurisdictions with opposing characteristics. This perspective, as viewed by Mieszkowski and Musgrave, treats fiscal federalism as a contract and understands that a severe inequality of member jurisdictions to render public service is unjust. Interjurisdictional transfers are thus called for to reduce inequality (see Mieszkowski and Musgrave, 1999: 258-259).

2.2.3.2 Practical approaches in determining fiscal transfer

A general model for equalization transfer would involve an assessment of relative revenue capacities (or fiscal capacity) and relative expenditure needs (or fiscal need).³⁷ The general model for equalization transfers, G , can be expressed as:

$$G = E_i - R_i, \quad (2.4)$$

where E_i denotes the relative expenditure needs of jurisdiction i and R_i for own source revenue raising capacities relative to a standard revenue (a yardstick). The capacities for own source revenues in this model are evaluated in relation to an equalization standard, such as the average expenditure level across jurisdictions. As the explanation below

³⁷ The model of equalisation transfers and the elaborations that follow draw from Ahmad and Thomas (1997: 363-369) and Ahmad and Searle (2006). See also Dafflon (2007: 368-380). The earlier work of Musgrave (1961) discusses various fiscal equalization plans in a somewhat similar vein.

emphasizes, such a general formulation indicates that the capacity equalization transfer rests on the magnitude of (net) variations from the standard per capita expenditures and revenues. The variations will adopt a positive value should there be a shortfall in revenue-raising capacity, or in other words, if jurisdictions would cope with a higher per capita cost in the provision of standard public services. A formula-based equalization transfer allows expenditure needs for equalization purposes to be attributed to evident differences in cost, and to other relevant factors, for public service provision.

A decentralization of the expenditure assignment and tax base to subnational and local governments, as discussed in earlier sections, justifies the existence of a comprehensive equalization program, which attempts to bridge both vertical and horizontal fiscal gaps. Ahmad and Thomas (1997) provide the extension of the general equalization model just elaborated and establish a model structure in more detailed compartments of expenditure and revenues.³⁸ The structure of the model seeks to highlight the consideration of vertical and horizontal gaps. In this way, the general equalization model will be an estimatable function of standardized expenditure need (E_i) and standardized revenue capacity (R_i). In the formulation of Ahmad and Thomas (1997: 363), standardized revenue constitutes a measure of desired potential revenue of a jurisdiction given its tax bases. Standardized expenditure on the other hand reflects the desired level³⁹ of per capita consumption in each public expenditure category, such as public functions related to infrastructure, health, education, or the environment.

³⁸ The motivation to utilize the Ahmad and Thomas' model is driven by two reasons. First, it can be a useful structure to help shed light on the analysis of different equalisation programs in terms of expenditure need, revenue capacity, and the resulting gap. Second, the structure facilitates further investigations of different approaches to intergovernmental fiscal transfer programs which have been in practice in a number of countries on the basis of expenditure and revenue analysis.

³⁹ Ahmad and Thomas acknowledge that determining the desired level of both expenditures and revenues may not be trivial for a number of reasons. To them, the determination will rest on how the role of the state is perceived in the provision of public services; how a normative standard (for equalisation) is of relevance and defined; and the way different interests of subnational and national governments are taken into account in the process of determining the desired levels. These dimensions appear to, more or less, relate to the general considerations highlighted in Boadway and Shah (2008) on designing fiscal constitutions, as well as in Lenk (1993) on the mechanism for fiscal transfer, in particular with regards to normative and axiomatic requirements (cf. Section 2.2.1.1).

In a more concrete expression of the equalization transfer model, jurisdiction i will receive a grant,

$$G_i = \underbrace{P_i \sum_{k=1}^K \vec{n}_{ik} \vec{c}_{ik} C_k Q_k}_{\text{Expenditure need, } E_i} - \underbrace{P_i \sum_{j=1}^J \hat{t}_{ij} B_{ij}}_{\text{Revenue capacity, } R_i} \quad (2.5)$$

where the population is denoted as P . For each expenditure category k , the estimation of expenditure need for a given jurisdiction consists of a vector of need factors (\vec{n}), a vector of cost factors (\vec{c}), unit cost (C), and a level of per capita consumption (Q). In the second term of the equation on the right, for each tax base j , the estimation of expected revenue capacity utilization involves a desired tax rate (\hat{t}), and per capita tax base (B).

Now, we consider that the population within a country may have different preferences for the types and magnitude of public services. Let us assume for the sake of example that budget deficits are absent and negative grants (i.e., tax bases are equitably shared among jurisdictions) are allowed. The consideration of different preferences can be translated into a function in which the per capita *actual* expenditure of a particular subnational government differs from the national government's *desired* per capita expenditures. In notational terms, $C_k Q_{ik}$ will differ from $C_k Q_k$ and the difference, which is written as $C_k S_{ik}$, can be either positive or negative.

Actual expenditure (AE) accommodating the desired level on the one hand and the deviation due to differences in preference on the other can thus be rewritten as:

$$\begin{aligned} AE_i &= P_i \sum_{k=1}^K \vec{n}_{ik} \vec{c}_{ik} C_{ik} Q_{ik} \\ &= \underbrace{P_i \sum_{k=1}^K \vec{n}_{ik} \vec{c}_{ik} C_k Q_k}_{\text{Expected expenditure}} + \underbrace{P_i \sum_{k=1}^K \vec{n}_{ik} \vec{c}_{ik} C_i S_{ik}}_{\text{The difference}} \end{aligned} \quad (2.6)$$

Whereas on the revenue side, the potential revenue base will generally differ from actual revenue,

$$AR_i = P_i \sum_{j=1}^J t_{ij} B_{ij} = \underbrace{P_i \sum_{j=1}^J \hat{t}_{ij} B_{ij}}_{\text{Expected revenue}} + \underbrace{P_i \sum_{j=1}^J T_{ij} B_{ij}}_{\text{The difference}}, \quad (2.7)$$

in which the state tax rate on tax base j , that is t_{ij} , differs from the desired tax rate \hat{t}_{ij} . The magnitude of the difference between potential revenue (R_{ij}) and actual revenue (AR_{ij}) is captured in $T_{ij} B_{ij}$ such that $T_{ij} B_{ij} = (t_{ij} - \hat{t}_{ij}) B_{ij}$. With regards to the tax base j , according to Ahmad and Thomas (1997: 366), this equation shows that the potential-actual difference will be negative for jurisdictions performing a lower than desired fiscal effort.

We now turn to possible approaches, which refer to the above mechanics of expenditure and revenue analysis. Ahmad and Thomas (1997: 366 ff.) propose three basic forms of approach in terms of transfer design. First, an equalization based on a revenue capacity basis. Second, an equalization of expenditure need. Third, equalization based on the gap between the actual expenditure and revenues. See Table 2.3. Note that the final choice among these equalization approaches, as Musgrave emphasized (1961: 98), would seem to be a matter of normative preference of the country concerned – a matter of political philosophy rather than economics (cf. Section 2.2.1.1). Before considering these respective approaches in turn, we discussed the benchmark of all the approaches, namely a balanced budget criterion. Define a balanced budget as actual expenditures equal to actual own source revenues including unconditional transfers such that

$$AE_i - (AR_i + G_i) = 0. \quad (2.8)$$

Following this criterion and taking account of differences in both revenue capacities (Eq. 2.6) and expenditure needs (Eq. 2.7) as well as the grant (Eq. 2.5), a balanced budget would imply that

$$P_i \sum_{k=1}^K \bar{n}_{ik} \bar{c}_{ik} C_{ik} Q_{ik} - P_i \sum_{j=1}^J T_{ij} B_{ij} = 0. \quad (2.9)$$

This balanced budget requirement considers efficiency and equity criteria at the same time. On the one hand, it suggests that if a public expenditure is above the

(normative) desired level, additional fiscal effort is then required to finance the extent of “excess” expenditure above that level. On the other hand, this requirement reflects the preference of a jurisdiction for public service level. For instance, a low fiscal effort in a jurisdiction would result in a lower level of public services provision in that jurisdiction.

Table 2.3. Approaches for equalization transfers

Equalization approaches	Transfer level (G)	Balanced budget requirement
<ul style="list-style-type: none"> Equalizing revenue capacity 	$G_i^R = P_i \sum_{k=1}^K C_k Q_k - P_i \sum_{j=1}^J \hat{t}_{ij} B_{ij}$	$P_i \sum_{k=1}^K \bar{n}_{ik} \bar{c}_{ik} C_k S_{ik} - P_i \sum_{j=1}^J T_{ij} B_{ij}$ $= P_i \sum_{k=1}^K C_k Q_k - P_i \sum_{k=1}^K \bar{n}_{ik} \bar{c}_{ik} C_k Q_k$
<ul style="list-style-type: none"> Equalizing expenditure need 	$G_i^E = P_i \sum_{k=1}^K \bar{n}_{ik} \bar{c}_{ik} C_k Q_k - P_i \sum_{j=1}^J t_{ij} B_{ij}$	$P_i \sum_{k=1}^K \bar{n}_{ik} \bar{c}_{ik} (C_k S_k - C_k S_{ik}) = 0$
<ul style="list-style-type: none"> Bridging the expenditure-revenue gap 	$G_i = P_i \sum_{k=1}^K \bar{n}_{ik} \bar{c}_{ik} C_k Q_k - P_i \sum_{j=1}^J t_{ij} B_{ij}$	No requirement

Source: Own table, based on Ahmad and Thomas (1997).

A revenue capacity equalization approach

This approach only aims at equalizing the revenue capacities of the jurisdictions. In terms of the balanced budget requirement, this system of transfer would benefit jurisdictions with a lower cost per unit of public goods provision, and vice versa. As revenue capacities will exclusively define the transfer level, equalization will accordingly depend upon standard and actual revenue bases. This formulation is efficient yet possibly not equitable, according to Ahmad and Thomas (1997: 367). It is efficient as the equalization grant is determined only on the basis of taxes and tax bases irrespective of policy interventions from subnational or local governments. It may be

inequitable, however, because only subnational or local jurisdictions whose tax efforts are higher than the desired level are able to meet the required revenue standard.

Expenditure need equalization approach

A design of equalization transfers may also be based on expenditure needs. Under this kind of transfer system, expenditure needs will solely define the level of transfers. In the most extreme case of only expenditure need equalization, although relatively less common in practice, there may be no own source revenues raised by subnational or local jurisdictions. A general interpretation of this requirement suggests that in the absence of fiscal capacity, the actual expenditures of subnational or local governments will be kept exactly equal to the central government's desired aggregate expenditures. As such, it is conceivable that an expenditure-based equalization seems more likely to find proponents in unitary rather than in federal states (Bird and Vaillancourt, 2007: 285). This requirement, however, has unfavorable negative incentive effects. Under this requirement, a central government tends to reward careless jurisdictions at a lower level, while discouraging those jurisdictions practising responsible management in terms of expenditures or revenue effort. Increasing expenditure and lower tax effort are thus plausible consequences of this requirement (see Ahmad and Thomas, 1997: 368).

An expenditure-revenue gap filling approach

The third conceptual approach ignores the equalizations both in expenditure needs and in revenue capacities in the design of fiscal transfer. Rather, a transfer design in this approach is built upon the projected mismatch (or "gap") between the actual expenditures and actual revenues of subnational or local governments (see Ahmad and Thomas, 1997: 369). Unlike the other two approaches, this approach does not specify a balanced budget requirement and perhaps the least advocated. As a plausible result, increasing fiscal deficits by subnational or local governments may drag a national government to continually inject additional transfers (Ahmad and Thomas, 1997: 369; Boadway and Shah, 2008: 387). These predicaments are likely to result in part from a low monitoring capacity over expenditures on behalf of lower level governments (Ahmad and Thomas, 1997: 369). Other consequences may be related to the problem of

soft budget constraint in which the central state sets negative incentives by bailing out or continuing failed or inefficient public projects (see e.g. Qian and Weingast, 1997: 84-85).

By bridging the need-capacity gap completely, it seems likely that incentives would be induced erroneously. In order to avoid this as well as to maintain both equity and efficiency objectives, a parameter may be introduced, say k , in the transfer equation by which a central government equalizes only a fraction of the gap and not a full (100 percent) equalization of the differences in fiscal capacity across jurisdictions. A transfer level in Eq. (2.5) thus becomes:

$$G_i = k \bullet P_i \left(\sum_{k=1}^K \bar{n}_{ik} \bar{c}_{ik} C_k Q_k - P_i \sum_{j=1}^J \hat{t}_{ij} B_{ij} \right). \quad (2.10)$$

The first term inside the bracket of Eq. (2.10) represents expenditure need, whereas the second term represents revenue capacity.

Bridging the gap between expenditure need and revenue capacity requires three operational steps. This will be elaborated in the following sections: determining fiscal capacity (Section 2.2.3.3), determining fiscal need (Section 2.2.3.4) and filling the fiscal gap (2.2.3.5).

2.2.3.3 The determination of fiscal capacity

Fiscal capacity in its general meaning constitutes the ability of governmental units such as states, provinces, or municipalities to raise revenues from their own sources within their jurisdictions (Boadway and Shah, 2008: 358-360). Own source revenues here often relate to potential tax bases from which the jurisdiction could raise its maximum amount of revenue given the specified tax burden on incomes and the use of tax rate (e.g., Ferguson and Ladd, 1986: 143).

In a theoretical manner, as Barro (1986: 54-55) maintains, the assessment of fiscal capacity should be built on the following propositions. The attribute of fiscal capacity should refer to an area and not to a unit of government. Fiscal capacity should

only be concerned with own-source revenues; transfers from external sources should therefore not be included. It should be relative in that it pertains not to a certain absolute upper limit, but instead to certain relative per capita revenues. Fiscal capacity should also refer to nominal rather than real purchasing power. In addition to these propositions, Barro also holds that fiscal capacity should pertain to a specific point in time and that fiscal capacity should be independent of fiscal and economic choices.

In a more practical manner, although it may be intricate both at conceptual as well as empirical levels, there are two basic approaches to measure fiscal capacity (e.g., Boadway and Shah, 2008: 359; Wilson, 2007: 345-348; Clark, 1997a: 19-20). The first approach is called a *macro* approach. The second one is a *micro* approach, which is also referred to as representative tax approach. In the macro approach, measures that are commonly used in practice as indicators to derive estimated fiscal capacity include gross domestic regional product and/or with the jurisdiction's income factors (Boadway and Shah, 2008: 358; Wilson, 2007; Clark, 1997a). Gross regional product (GRP) represents the total value of a documented production of goods and services from a certain region. Macro indicators for income factors encompass all income such as those from source-based taxes and from residence-based taxes. The former kind of tax includes property tax and tax from natural resources, whereas for instance the personal income tax and business tax belong to the latter.

The micro approach (or the representative tax base approach) measures fiscal capacity by focusing on the actual tax system of all jurisdictions nationwide from which the revenue that can be potentially raised from a particular jurisdiction is compared to the national "average intensity of use" (Boadway and Shah, 2009: 359). With this approach, a relative tax-raising capacity is derived for each jurisdiction by commonly applying the subsequent procedure (Aten, 1986: 93). First of all, fiscal capacity is calculated by identifying and measuring the bases for important taxes at the national and subnational levels. For each of these taxes, an average national rate is calculated on the basis of the national tax base. These national rates then serve as the basis of the tax concerned in each jurisdiction to estimate the per capita potential tax collection given the tax's rate at the national average level. Finally, the resulting estimates are aggregated across all taxes and compared across jurisdictions. The micro-oriented approach of

measuring fiscal capacity is often used in federal countries with a significantly equalizing fiscal transfer system such as Canada, Germany, and Australia (see Schroeder and Smoke, 2002: 40).

The simplest method to determine fiscal capacity is perhaps on the basis of the current or past fiscal period's revenue collections. This method creates serious problems, however, because it ignores factors such as fiscal effort, tax compliance and actual revenues in assessing the potential ability of a jurisdiction to raise revenue (see Bird and Vailancourt, 2007: 263).

2.2.3.4 The determination of fiscal need

In general, the determination of fiscal needs of a jurisdiction can be categorized in two broad approaches. First, the determination of fiscal needs based on quantitative methods, namely by way of estimated costs and expenditures; second, the non-quantitative methods to determine fiscal need. In what follows we discuss these two approaches.⁴⁰

Quantitative estimation of costs and expenditures

A cost function of expenditure needs is a statistical relationship between measures and factors that affect the spending of a given public service provided by a jurisdiction and the level of public service provision (Reschovsky, 2007: 404). In this approach, it is assumed that the costs of each public service can be estimated statistically. With econometrics analysis, a public service of a certain jurisdiction is estimated along those of the vectors related to public good inputs (for the production of public services), input prices and, other relevant factors that are considered likely to influence the relationship between input and output. In turn, all of these costs are

⁴⁰ An evaluation on the virtues and limitations of these two approaches can be seen in e.g., Reschovsky (2007: 404-410), Boadway and Shah (2009: 362-368), and the various contributions are discussed in Reeves (1986).

aggregated as a sum across all public services to provide an approximation of the expenditure needs of the jurisdiction concerned.

The derivation of cost functions is problematic, according to Reschovsky (2007: 405-406), given data requirements and complex statistical estimation techniques. Alternatively, expenditure equations are used to determine the expenditure needs of jurisdictions. Its methodological undertaking is similar to the statistical estimation of cost functions as described above except that – in the estimation of the expenditure equation – its independent variables do not include public sector output (Reschovsky, 2007: 407).

The estimation based on cost functions has been used quite extensively. It is commonly applied to determine fiscal needs for public services in education. Duncombe and Yinger (2000) develop a cost function for educational expenditure need and then incorporate it into the fiscal allocation formula. The cost function involves a number of factors related to the input prices of public provision in education, aspects affecting the spending (such as a student's background), and characteristics of the jurisdiction concerned. In contrast, the estimation based on the expenditure equation is implemented, for example, in Bradbury *et al* (1984) and Shah (1996), with reference to cases in the United States and Canada, respectively. In the study of Bradbury *et al*, fiscal transfers to compensate fiscal disadvantages are allocated to local jurisdictions based on estimated cost disparities, which serve as an index for fiscal need (see also Le Grand, 1975). On the basis of the estimated expenditure function, Shah suggests an equalization transfer in which the entitlement to such a transfer of the jurisdiction concerned is developed by considering potential expenditure and need factors (both relative to national standards) on the one hand, and fiscal national average fiscal capacity, on the other. Among the pioneering works on the application of quantitative approaches for expenditure need estimation, we have Feldstein (1975) who applied it to local public expenditures. Feldstein estimated price and income elasticities of educational expenditures and used these to determine the required fiscal transfers.

A non-quantitative determination of fiscal need

In addition to the above approaches, there are other methods of estimating fiscal needs, which rely less or not primarily upon quantitative approaches. For example, it is not uncommon for political decisions to determine the fiscal need of jurisdictions. With such decisions, the cost factors or weights assigned to these factors in the fiscal need allocation formula which are derived from quantitative statistical estimations are, replaced. In France for instance, Gilbert and Guengant (2003) demonstrate that the weight of cost factors assigned to the actual allocation formula is two times higher than that of econometric estimates. Political decisions of this kind may be driven by a legislator's vote-maximizing behavior as discussed in the literature of public choice. Underlying normative values may also explain part of the choice of simple measures of expenditure needs in general-purpose transfers. Such simple measures, which are often referred to as an ad hoc determination of expenditure needs, include a needs indicator of population size and population density adjustment in Germany, the number of public employees in China, or the level of backwardness in India (Boadway and Shah, 2009: 361). The operationalization of fiscal need can also be determined through an ex-ante, normative catalogue consisting of public functions of a given jurisdiction (Kops, 1989: 108-109).

Political decisions may take other forms as well. They may become complementary to a formula-based fiscal need decision during the budgetary process. For example, a formula-based allocation of fiscal needs (i.e. an economic process) recommended by the Ministry of Finance may be adjusted by the parliament (i.e. a political process) before it is fixed into a final equalization transfer. In several cases, expert judgment may also become part of the fiscal need decision, notably when data on the public sector output are not sufficiently available (Reschovsky, 2007: 409-410). In this way, the determination of fiscal need of jurisdictions (e.g. the average cost estimate) to provide a certain level of public service relies on expert assessment, usually by a panel of experts.

2.2.3.5 Fiscal gap

A fiscal gap can be defined as the revenue insufficiency arising from the difference between the revenue-raising capacity and the perceived expenditure needs. The mismatch between revenue and expenditure occurs at a lower tier of government, which is why the fiscal gap is often referred to as a vertical fiscal gap. The elaboration of this matter can be found in e.g., Boadway and Shah (2007: 353 ff.) and Bird and Tarasov (2004). According to Boadway and Shah (2007: 355), the gap largely stems from the following causes: inappropriate assignment of responsibilities, centralized taxing powers, inefficient tax competition (i.e., driven by beggar-thy-neighbor tax policies of subnational governments), and a lack of tax space for subnational governments due to tax burdens imposed by the national government. In the presence of a fiscal gap, the capacity of a given jurisdiction to deliver public services can be limited, therefore measures such as fiscal transfers or the reassignment of revenue-raising responsibilities may be justified.

Following the general model of equalization transfer in Eq. (2.4), the level of fiscal transfer (G) to bridge the expenditure-revenue gap for jurisdiction i may be defined as

$$G_i = \sum_i (E_i - R_i), \quad (2.11)$$

where the required expenditure is denoted E . Local government revenue is represented by R , which includes own-sources and other revenues.

In practice, however, the transfer level intended to bridge the fiscal gap does not automatically represent a full gap-filling transfer. In this case, Eq. (2.11) can be redefined as

$$G_i = k \left[\delta \left(\sum_i E_i \right) - \sum_i R_i \right]. \quad (2.12)$$

The actual transfer based on the fiscal gap becomes subject to the annual available pool of fund allocated by the national government, the proportion of which is represented by k . This parameter is quite similar to the need-capacity gap parameter proposed by Bahl

and Wallace (2007: 206), which is prespecified by the central government. The expenditure need for jurisdiction i is also likely to be subject to a certain norm of need equalization, which is represented here by δ . Such a norm may refer to indicators such as the average expenditures across all jurisdictions or certain expenditure values of reference jurisdictions. Additionally, the final fiscal gap equalization is sometimes raised to a kind of normative standard, such as a minimum national standard.

Choosing not to fully equalize the fiscal gap is not without intention. In the first place a full equalization of the fiscal gap is by no means compatible with the principles of a decentralized system (see e.g., Lenk, 1993). Choosing not to fully equalize the fiscal gap is also driven by an incentive-preserving motivation (e.g., Bird and Tasarov, 2004: 81; Boadway and Shah, 2007). A full equalization is likely to be a disincentive for subnational or local governments to maximize their own source revenue raising capacities.

The foundations of fiscal transfers have been presented in the preceding sections. To assess the analytical link between these foundations and ecological concerns, we now turn to the inclusion of ecological issues in fiscal federalism and fiscal transfer schemes.

2.3 The inclusion of ecological issues in fiscal federalism and fiscal transfer

The subsequent sections are devoted to discussions on the inclusion of ecological issues in fiscal federalism and intergovernmental fiscal transfers. The sections are structured as follows. Section 2.3.1 discusses the concept of environmental federalism, which embodies the nexus between environmental-related issues and decentralization in a multi-tiered governance structure. Section 2.3.2 clarifies terminologies used in the discussion throughout this study. Section 2.3.3 highlights the empirical works with respect to ecological fiscal transfers.

2.3.1 Environmental federalism

Environmental federalism encompasses “a complicated set of issues” (Oates, 1997: 1321). Nevertheless, in essence environmental federalism seems to define the nexus between nature conservation and environmental policy on the one hand and the economic literature on federalism on the other, especially regarding the theory of decentralization. More concretely, a common rallying point between the approaches of the economic theory of federalism and environmental federalism, from the point of Zimmermann and Kahlenborn (1994), centers on the question of institutions. Namely, the central tenet of environmental federalism relates to the question of appropriate institutions regarding the level of government that a function should be best assigned to in order to perform a particular public function (Zimmermann and Kahlenborn, 1994: 47-48).⁴¹ The preceding sections have pointed out the allocative dimensions in fiscal federalism which affect the public provision of goods and services. The discussion on environmental federalism closely involves these dimensions especially in relation to the notions of public goods and interjurisdictional externalities, catering for preference heterogeneity and preference matching, fiscal equivalence as well as economies of scale. In environmental federalism, however, ecological complexity is also involved. Some of these dimensions are highlighted again in the following expositions.

Defining the boundaries of externality is not a trivial undertaking. Difficulties of this kind may affect the way in which the discussion is approached with respect to the appropriate level of government performing the ecological public function. At the same time, difficulties of this kind suggest that what constitutes an appropriate level may not fully correspond to the centralized-decentralized dichotomy that a standard treatment in the literature of fiscal federalism seems to maintain.

⁴¹ In the formulation of Zimmermann and Kahlenborn (1994: 47): “Der gemeinsame Anknüpfungspunkt der ökonomischen Theorie des Föderalismus und der Theorie des Umwelt-Föderalismus ist *prinzipiell die Frage nach den Institutionen*. Die Frage, welche(r) Träger optimalerweise *die Erfüllung einer spezifischen öffentlichen Aufgabe* übernehmen sollte(n), steht im Mittelpunkt beider Ansätze, und das heißt, daß es auch in der Theorie des Umwelt-Föderalismus um *die Dichotomie von zentraler und dezentraler Lösung* geht.” (Italics added).

The attempt to analytically establish an optimal institutionalization of environmental policy making and implementation – i.e., to decentralize or to centralize – which is imperative in the discussion of environmental federalism, will inevitably come to terms with the associated complexities. Besides the inherent complexity arising from the existence of various layers of governmental systems which are involved in the process, the nature of ecological systems adds to that complexity. Dalmazzone (2006: 460) observes that

“(…) the complexity of ecological systems implies that economic decisions concerning a specific natural resource generally affect more than one ecological component, although the impact is often lagged and difficult to predict. In multilevel governmental systems, the interdependence between environmental impacts caused by economic activities that take place at different points in space and time poses problems that have a bearing on the assignment of environmental powers.”

In spite of such complexities, a theoretical basis for ecological equivalence in public finance can be proposed by drawing an analogy to Olson’s fiscal equivalence provided that spatial externalities are in order (Huckestein, 1993: 331-335). The general proposal is as follows. Measures related to environmental policy are to be both decided and financed by those who are affected by the positive or negative effects of the measures. The prerequisite to establish such an ecological equivalence implies that the definition – and therefore the demarcation – of boundaries of externality are complete; so are the definitions of relevant participants. If these prerequisites are satisfied, a further plausible step can be taken as proposed by Döring and Fromm’s (1997: 569-570) two-stage approach. At the first stage, all relevant jurisdictions are brought together to make decisions on the financing of public functions. At the second stage, under a framework of modified fiscal equivalence, decision-making on financing the ecological public function in pursuit of optimal internalization of environmental externalities is likely to be reached on the basis of the Pigouvian polluter-pays-principle (Döring and Fromm, 1997: 570).

We may find it helpful for the purpose of illustration to consider one instance to be able to visualize how the assignment of responsibility to different levels of

governments is established.⁴² In this vein, the specific natures of ecological system complexity as well as their level of publicness can be taken into account. Consider for example setting pollution standards to ensure a certain level of environmental quality. In an application to assigning responsibility in the public area of pollution standard setting, Oates (2002: 2-5) identifies what he calls “benchmark cases” for his analytical purposes. There are three cases: pure public goods, local public goods and local spillovers (see Table 2.4).

A pure public good case, as the emissions of greenhouse gases or ozone-depleting substances appear to confirm, will have an impact on all jurisdictions. Although the intensity of the impacts may vary on a location basis, the country as a whole suffers from the emissions. In terms of the effect on the environmental quality, a pure public good has the same effect on the environmental quality no matter where the point of emission takes place. The assignment of responsibility to set an environmental quality standard calls for a centralized responsibility because of this cross-jurisdictional emission. In case of global warming, a centralized responsibility assignment at the upper governmental level is often advocated.

In contrast, the second case concerns environmental quality on a regional scale which is a purely local public good. The impacts of pollutants emitted from a particular local jurisdiction are restricted to the jurisdiction under discussion. Examples of local public goods are usually non-uniformly mixing pollutants such as particulate emissions from diesel engines or water and ground pollutions. On account of the local nature of these pollutants, the responsibility to set pollution standards should be assigned to the decentralized local government. Oates (2002: 4) maintains that this prototypical case of local public goods best suits the subsidiarity principle.

The last case is local spillovers, which are assumed to affect both local and other neighboring jurisdictions. This case represents the most common in practice as one can see from pollutants of regional, non-uniformly mixing characters. For instance,

⁴² Hansjürgens (1996: 90-95) provides a range of examples of responsibility assignments for different environmental cases in the context of the European Union. At the country level, Andersen (2007: 443-448) for instance reports the case of Denmark in which different forms of responsibility in environmental governance are assigned to the international, national, regional and local levels.

substances emitted from power plants or industrial manufacturers, unburned hydrocarbons from vehicles, or nitrogen from agricultural runoffs spread beyond the local scale.

Table 2.4. Responsibility assignments in the case of emissions control

	Pure public goods	Local public goods	Local spillovers
The impacts	All jurisdictions nationwide (with different intensity of impact)	Within a given local jurisdiction	Local and other (usually neighboring) jurisdictions
Examples *	Global or uniformly mixing pollutants. For example, greenhouse gases (e.g., CO ₂ , methane, water vapour, nitrous oxide) and ozone-depleting substances (e.g., CFCs, etc).	Local or non-uniformly mixing pollutants. For example, particulate emissions from diesel engines, trace metal emissions, ozone accumulation in the lower atmosphere, or water and ground pollutions.	Regional, non-uniformly mixing pollutants. For example, sulphur oxides from power and industrial plants, unburned hydrocarbons and nitrogenous air pollutants from vehicle, agricultural emissions of nitrogen species (can be both airborne and waterborne).
Responsibility assignment	Centralized	Decentralized	Different levels of assignment across jurisdictions

Source: Own table, based on Oates (2002).

Note: * Taken from Oates (2002: 2-5) and Dalmazzone (2006: 460-462).

While from these benchmarks one may observe a clear case for responsibility assignments for both a centralized (i.e., for pure public goods) and decentralized (i.e., for local public goods), a pure dichotomy as in Zimmermann and Kahlenborn's choice between centralization or decentralization might not necessarily be the only option. The case of local spillovers, for instance, seems to better fit the notion of functional and overlapping jurisdictions as proposed by Eichenberger and Frey (2006), and discussed earlier.

The choice of the pollution case may help to clarify the general argument. This, however, does not include the whole environmental issues in the assignment of

responsibility among the levels of government. Pollution control relates chiefly to internalizing negative externalities. Nonetheless, positive externalities that are not internalized also lead to a decline in social welfare. Consider biodiversity conservation as an example of a positive externality-generating public measure. The creation of various types of nature resources, such as national parks, wilderness areas or biosphere reserves, implies cost creation to the jurisdictions of concern (Ring, 2008c). Nature conservation usually leads to land use restrictions, putting local jurisdiction in an unfavorable position because their choice for raising fiscal sources from alternative land use options, such as for economic development, becomes constrained. The benefits of conservation (i.e. positive externalities) spread beyond the territorial border of the producing jurisdictions, whereas the costs accrued remain within them. A compensation scheme thus appears to be expected.

The assignment of responsibility in biodiversity conservation should consider the spatial distribution of conservation benefits (Ring, 2008c: 111-113). Responsibility that tangents the benefits of direct use values, such as values related to production, consumption and symbolic values, can be assigned at the local level. On the contrary non-use values, such as the existence values of biodiversity, can be assigned at the centralized level – the national, supranational or global level. These assignments are not necessarily mechanic, however, since there are cases where local biodiversity conservation measures may have regional and global impacts simultaneously. Examples are local reforestation and land rehabilitation which mitigate global climate change.

In the literature on environmental federalism, it is mostly issues of environmental negative externalities that are addressed with fiscal instruments such as taxes, licenses, etc. (e.g., Peszko, 2002; Zimmermann and Kahlenborn, 1994). The issues of environmental positive externalities are very rarely addressed. The internalization of positive externalities can be achieved through instruments of ecological fiscal transfer or direct compensation payments such as payments for ecosystem services (Ring, 2008b). Its potential and wide application notwithstanding, the instrument of ecological fiscal transfer has yet to receive more attention in policy and scientific research.

2.3.2 A note on terminology

2.3.2.1 The adjectives “environmental” and “ecological”

Ecological fiscal transfer is the all-embracing instrument under discussion throughout this study of intergovernmental fiscal relations. It is a broad instrument in that it involves transfers of general and specific-purpose as well as fiscal transfers built on arrangements of revenue-sharing. It is ecological since the very idea of the instrument is to allocate fiscal resources to relevant jurisdictions for the realization of ecological public purposes at this particular level of government.

To characterize the instrument, the adjective “ecological” is introduced in place of “environmental”. It is a deliberate semantic choice, the intention of which is to encompass a more comprehensive notion of the subject-matter of the study. Following Ring (2002: 418), “comprehensive” in this context is taken to mean that the instrument of intergovernmental fiscal transfers is one that considers the three dimensions of the sustainability concept, namely explicit considerations of ecological, economic and social dimensions.

The theory of public finance advocates such considerations. At a conceptual level, public finance tolerates the integration of dimensions relevant to sustainability under an economic perspective. The foregoing discussions, for example, are grounded on a general framework of the Musgravian fiscal functions. Along with the allocative and stability functions, the distributive function is an integrated part of that framework, which might attest to one of the possibilities for incorporating social dimensions. In terms of the sustainability concept, the expression *sustainability* is often used interchangeably with *sustainable development*. In the economics literature, however, sustainable development may be perceived as principally emphasizing equity rather than efficiency aspect.⁴³ This study chooses not to go down this binary path. The former expression – sustainability – will be used in the course of this study and simultaneously presumes no thin edge distinction between efficiency and equity in the discussion on

⁴³ For discussions on the economics of sustainability and sustainable development, see e.g. Hanley *et al.* (1997), Pearce (1998), or van Kooten and Bulte (2000).

intergovernmental fiscal transfers. In this way, while some degree of trade-offs or discrete choices may be involved, the application of the sustainability concept in this study presumes, and pursues, complementarity between the two aspects.

Thus understood, an exploration of fiscal transfers as an instrument to address ecological issues may not necessarily assume polar opposites. In essence, ecological fiscal transfers encompass a set of instruments serving different fiscal functions, including allocative (cf. efficiency) and distributive (cf. equity) functions. Discussions in previous sections have elaborated on this essence. For instance, a general-purpose transfer is aimed at tackling imbalances between the fiscal need of a jurisdiction and its capacity to fulfill that need. To some degree, a revenue-sharing scheme may also serve an equalization function between relatively poor regions – yet of ecological importance, such as having a large share of nature reserve areas – and their richer counterparts. Efficiency requirements have been underlying much of the rationale behind specific-purpose transfer. In the fiscal policy arena these instruments are often in use at the same time so that the *overall* effects of allocative and distributive functions may turn out to be overarching rather than discrete or substituting.

2.3.2.2 The “public” and the ecological public function

In reality, an accomplishment of sustainability is also a matter of financing. To quote Ring (2002: 418), “the realisation of the concept of sustainability calls for the consideration and appropriate financing at any governmental level.” In the contexts of both intergovernmental fiscal relations and the appropriate mechanisms for financing environmentally-related public expenditure, the translation of the sustainability concept into fiscal practice may take the form of an ecological public function.⁴⁴

⁴⁴ Ring (2002) coined the expression *ecological public function* which comes from the German expression of *ökologische öffentliche Aufgaben* (Ring, 2001). In the German-speaking literature on federalism and intergovernmental fiscal relations, for instance in Matzer (1977) and Kops (1989), the notion of *öffentliche Aufgabe* (public function) has been quite established and extensive in use. Nonetheless, the character of existing public functions are mostly socio-economic and non-ecological.

The adjective “public” in ecological public functions deliberately connotes a number of particular references, and in this way its definition is subject to the following scope of applications. Firstly, public function here refers to functions, activities or measures that are provided by state-based public institutions, including agencies.⁴⁵ Here there is a slight yet crucial difference between the intended meaning of the *provision* and *production* of public function. Although these two roles can be embodied in one public body, this is not necessarily the case. A provision of public function is to be undertaken by the state at a given jurisdiction or governmental level, but its production may also be carried out by private actors or by a community, for instance. Consider the case of water regulation systems. The state may provide an irrigation system in terms of arranging the required financing and design, however the state might make arrangements with the farmers regarding its production and maintenance (see Ostrom, 1990: 31).⁴⁶ In a decentralized structure, the arrangement of such a public institution may occur at a particular level of government – be it a central state, a provincial/federal state, or a local government such as a municipality or a district – or at different levels simultaneously.

Secondly, the source of fund for these public functions is from public financing whose derivation and distribution take the mechanism of existing fiscal institutions. The source of financing can be derived from own source revenues as well as from intergovernmental fiscal transfers such as grants and revenue-sharing. In addition, by virtue of its public nature, the use of funds for public expenditures, that is state expenditures to perform ecological public functions, is held accountable to the democratic process in that jurisdiction or, in cases of overlapping areas and levels, to the relevant jurisdictions. The determination of public expenditures refers to budgetary undertakings in a properly functioning democratic and open society.

Concrete ecological public functions may be subsets of (a) functions with regard to the protection and sustainable use of natural resources, living organisms, ecosystems

⁴⁵ This is crucial to emphasize so as to approach a federal or decentralized structure of government in the theory of public finance since, as Oates (1972: 66) notes, “the issues of government grants not to individual, private economic units, but to other levels of government.”

⁴⁶ For discussions on different plausible arrangements in the production of public functions see e.g. Zimmerman (2009, Ch. 1).

and landscapes, as well as (b) functions with regard to the regulation of environmental effects of human activities (Ring, 2001). The first sort of functions relate in general to *preventive* functions, whereas the second ones refer to *aftercare* functions (Ring, 2002: 418).

Preventive functions may apply to conservation, protection or preservation in areas such as soil, water, marine, nature and landscapes. Some examples of ecological public functions in these areas include activities for soil retention and maintaining land productivity, filtering and storing fresh water as well as watershed protection, and maintaining coastal area vegetation or reef protection. Other examples would include activities to ensure proper living space for flora and fauna, habitat for nursery and reproduction, protecting biosphere reserves, or maintaining ecosystem integrity. Preventive functions may also include public functions for cognitive purposes such as the aesthetic enjoyment of the landscape and the recreational use of natural ecosystems, besides public functions to maintain ecosystems as sources of cultural, artistic, historic and spiritual information, and for science and education (see e.g., De Groot *et al.*, 2002). Preventive functions also embrace ecological public functions which are seemingly not directly related to conservation and yet of high importance. Examples of such are socio-economic measures such as the provision of income-generating activities as an exit-option (from forest-degrading activities) for farmers and communities living close to a forest resource system.

Aftercare functions chiefly address the negative effects of human activities on the environment. They include environmental pollution – such as emissions, waste and contaminated sites – and impaired or destroyed landscapes (Ring, 2002: 418). Ecological public functions of these aftercare measures may include sewage and waste management of both urban and industrial disposal. Rehabilitation measures are also included in this function such as those for contaminated sites and landscapes, or the rehabilitation of degraded forests, land and marine areas.

2.3.3 Empirical works on the proposal of ecological fiscal transfer

The literature that connects the economic theory of decentralized structures of government, the concept of sustainability implementation, and conservation or environmental policies, is not extensive. This observation especially refers to studies on the potential role of intergovernmental fiscal relations in the financing of state-based ecological public functions. More or less the inquiry of such subject-matter is still in its infancy (Ring, 2002: 425).

A relatively small number of empirical studies have sought to investigate the possibility of ecological fiscal transfers. In addition to the existing ecological fiscal transfers in Brazil and Portugal, the following cases in India, Switzerland, Germany and Australia will be described to provide a sense of how ecological fiscal transfers have been proposed as a policy instrument for conservation and sustainability, as they are documented in the literature. In these cases, the proposals have been verified by concrete empirical studies, mostly by way of simulations. In one way or another, the subsequent discussions intend to shed some light on the following three aspects: first, the underlying background which seems to have been underlying and therefore justified the proposal of ecological fiscal transfers (EFT); second, the mechanics of the proposal especially with respect to its ecological indicator and weighting system; third, the potential results from the proposed EFT if they were implemented.

2.3.3.1 Ecological fiscal transfer in praxis: Revenue-sharing arrangement in Brazil and general-purpose transfer in Portugal

Brazil

Brazil belongs to the very few countries with a functioning ecological fiscal transfer system in place. Its intergovernmental fiscal structure has featured an explicit acknowledgement of ecological dimensions and purposes.⁴⁷ The Brazilian federal

⁴⁷ In no way could this fiscal innovation materialize within a contextual vacuum. The country's allotment of fiscal resources to individual municipalities, for example, was perceived to have overlooked a due consideration of fiscal needs for nature conservation and thereby the extent of potential economic

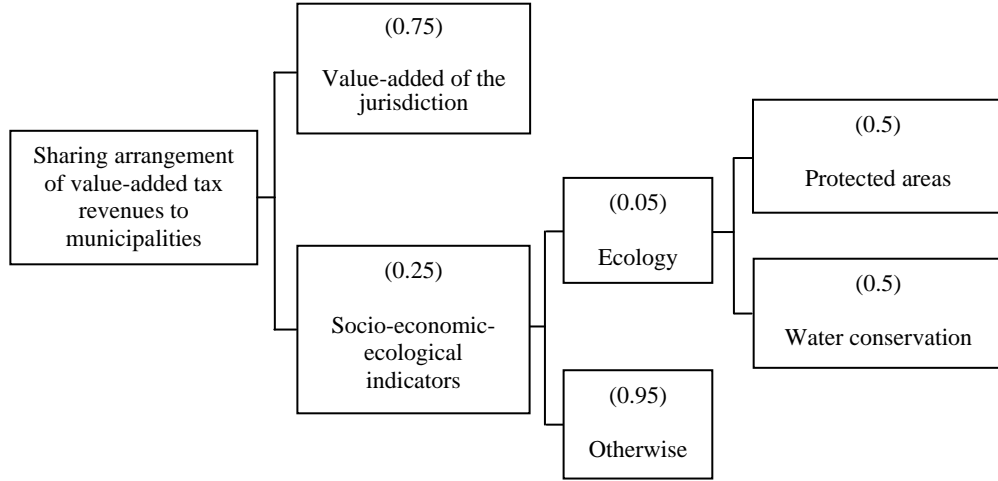
system constitutes an intergovernmental revenue-sharing arrangement among the federal government, subnational governments and municipalities. One of the shared-revenues is the revenue from ICMS (Imposto sobre Circulação de Mercadorias e Serviços), a value-added tax based on the sales of goods and services. It is a state tax and it is the main tax revenue for subnational governments and municipalities in addition to income tax.⁴⁸ Initiated in the early 1990s, environmental criteria have been incorporated into the distribution of ICMS revenue-sharing. Henceforth, this instrument is referred to as ICMS-Ecológico or “Green ICMS” (Bernardes, 1999).

The federal constitution requires that 25 percent of ICMS revenues have to be allocated from the subnational to the municipal government. Of this proportion, 75 percent is distributed by derivation of tax origin on the basis of the value-added creation that a municipality contributes to the state (Ter-Minassian, 1997). The distribution of the remaining 25 percent is built on a number of indicators, among which the ecological indicator can be included. The ecological indicators and their assigned weight may therefore differ from one federal state to another (Grieg-Gran, 2000: 2-4). Protected areas, watershed protection, or waste disposal and sanitation are selected examples of these criteria. Figure 2.1 illustrates the ICMS-E distribution in the state of Parana in which protected area and water conservation have been employed as ecological criteria.

opportunity loss (May *et al.*, 2002; Grieg-Gran, 2000; Bernardes, 1999; Ring, 2008a). Some macroeconomic backdrops are provided by Young (2005), against which one can glimpse at both the lack of fiscal resources and the disincentives for nature conservation in Brazil. They include the drive for fiscal policy of surplus budget (leading among others to sizable reductions in environmental public spending), high interest monetary policy intended to control inflation (inducing a biased expectation of high short-term gains from detrimental land use, such as crops and cattle ranching, and of low long-term gains from forest conservation), and a growth-oriented economy based on natural resources.

⁴⁸ The expenditure function and revenue assignment under Brazilian federalism is discussed in e.g., Alfonso and de Mello (2002). Prud’homme (1998) provides an analysis of local public finance in Parana, the first federal state introducing the ICMS-Ecológico.

Figure 2.1. Revenue-sharing of ICMS in the state of Parana, Brazil



Source: Own figure, based on May *et al.* (2002).

Having defined the relevant ecological criteria, the next undertaking is to develop the distribution mechanism of shared-revenues on the basis of the ecological index of a municipality. In the following, the formula applied by the State of Minas Gerais is presented.⁴⁹ Given a_i^T denotes the total area of a jurisdiction and a_{ij}^T denotes the area cover (or conservation unit) of conservation management category j for jurisdiction i , define the ecological index E for jurisdiction i ($1, \dots, n$):

$$E_i = \frac{\frac{1}{a_i^T} \sum_j a_{ij}^E c_{ij} q_j}{\sum_i \left(\frac{1}{a_i^T} \sum_j a_{ij}^E c_{ij} q_j \right)}$$

⁴⁹ The formula is based on the interpretation of Brazilian Law 12.040/1995 that regulates the revenue-sharing of ICMS in Minas Gerais. The law can be seen in Bernardes (1999, Annex 4). The original version in Portuguese can be accessed at <http://www.icmsecológico.org.br/images/legislacao/leg013.pdf>.

whereby a fixed weight c_{ij} is assigned to management category j for jurisdiction i .⁵⁰ Examples of the management category include biological reserves, national forests, and environmental protection. The higher the weight attached to a management category, the higher the conservation value of the relevant area and the land-use restrictions associated with it (Grieg-Gran, 2000: 5). Further, q_j represents the parameter for the quality of conservation in conservation category j , where $0.1 < q < 1$. The parameter takes account of dimensions, for instance, of conservation management plans, infrastructure, or the structure of protection and inspection. The State Council for Environmental Policy (COPAM) decides upon these parameter values. In this equation of an ecological index, the nominator represents a sort of municipal conservation factor, while the denominator represents a state conservation factor.

ICMS-Ecológico has two main objectives (Grieg-Gran, 2000: 1). First, it seeks to compensate for municipalities with protected areas; second, it sets incentives for the designation and extension of protected areas. These two objectives seem to have been achieved. As a result of the introduction of the new distribution regime, the areas set aside for conservation purposes have grown significantly. In the states of Parana and Minas Gerais, protected area increased respectively by 165 and 62 percent over the initial five years after the new regime had been initiated in 1992 (May *et al.*, 2002).

What possible incentive effects can be expected from this revenue-sharing scheme? In general, the incentive effects for conservation could be observed by the rise in fiscal transfers from ICMS given an increase in the registered protected areas. However, observing the expected incentive effects from the designation and extension of protected area may be more convoluted for a firm inference (Grieg-Gran, 2000: 27-28; May *et al.*, 2002). The subsequent issues could complicate such an observation. The first issue concerns the distribution of benefits. Given that the nature of revenue distribution is zero sum, not all municipalities will be equally better off as a result of ICMS-Ecológico. And some will even lose out. The second issue is due to the complex revenue-sharing system of value-added tax. In the assessment of fiscal effects from ICMS-Ecológico on the municipality, such a complex revenue-sharing system may lead

⁵⁰ c represents a predetermined weight of a management category, $c = \{0.025, 0.1, 0.5, 0.7, 0.9, 1\}$.

to a biased perception about the funds. For instance, since municipalities can hardly distinguish between the funds resulting from an allocation based on ecological criteria from those resulting from non-ecological criteria, the effects of ICMS-Ecológico may not be appropriately observed (see Grieg-Gran, 2000: 27). The third issue is related to incentive dilution. Over time not all “gaining”, or “would-be gaining” municipalities experience the same margin of revenue increase since the proportion of available ICMS-Ecológico is constant (given an increasing number of registered protected areas). In any case, this should definitely not be the only possibility. Particularly in the potential case where (1) the *aggregate nominal* fund available for ICMS increases and (2) the rate of that increase is at least equal to or higher than the increase rate of the registered protected area. If these conditions are met, then the level of distributed fund per jurisdiction will not diminish in spite of the constant *proportion* of the available fund.⁵¹

Another incentive issue is related to the distributive aspect. The allocation mechanism of the ICMS-Ecológico – which relies on indicators of *inter alia* (a) the size of a protected area and (b) the weight assigned to the category of area – tends to be in favor of larger landowners. It is probable, especially under so-called RPPN – private-based natural heritage reserves, that these will be assigned relatively higher conservation values and weights. This raises distributive concerns especially in relation to the positions of smaller landowners and poor landless peasants (see May *et al.*, 2002: 193).

Portugal

From Brazil we now turn to Portugal which only recently started to implement ecological fiscal transfers in 2007. Compared to the relatively well-documented Brazilian experience, however, the literature on the recent experience in Portugal is still not extensive.

The Portuguese new fiscal transfer law on local finance involves the promotion of local sustainability alongside socio-economic related objectives (see Santos *et al.*, 2009). In such a fiscal constitution, explicit ecological considerations are introduced into

⁵¹ The issue of incentive dilution will be reiterated in Section 4.2.1 of Chapter 4 on the policy options of assigning shared-revenues from taxes for ecological purposes.

the intergovernmental fiscal transfer system from the central state to local jurisdictions by way of a lump-sum general-purpose transfer, especially the municipal general fund, FGM (*Fundo Geral Municipal*). In Portugal, nature conservation is assigned largely to the responsibility of the central government, including Natura 2000 initiated by the European Union. Central and local governments share the responsibility for national ecological reserves (REN) and national agriculture reserves.

The Portuguese system has three instruments. First, the Municipal General Fund (FGM) which largely intends to ensure that municipalities have sufficient funds to perform their basic public services; second, the Municipal Cohesion Fund (FCM) that seeks to tackle horizontal fiscal imbalances arising from disparities between jurisdictions; and third, the Municipal Base Fund (FBM), which was introduced later on to complement FGM and FCM, and provides an equal share of funds to all municipalities. The distribution of funds for all these three instruments is weighted (see Pinho and Vega, 2010). An important source of fund, FGM makes up approximately 22 percent of the revenue structure of municipalities of mainland Portugal (Prates and de Melo, 2007: 4, Table 1).

Under the new FGM scheme, municipalities annually receive an amount of transfer contingent on its socio-economic and ecological characteristics. The ecological indicator is the protected area which includes nature parks and reserves as well as the Natura 2000 areas. Expressed as a percentage, the new criteria for entitlement to FGM are as follows: population (65), total land area (20 to 25), protected area (5 to 10), and equal share to all municipalities (5). See the discussion by Santos *et al.* (2010). The previous FGM scheme includes the criteria of population, area, and the number of municipalities within each group, i.e., mainland or autonomous regions (Fortuna *et al.*, 2005).

Having illustrated the existing ecological fiscal transfers as they are applied in Brazil and Portugal, we now review a number of other instruments of ecological fiscal transfers in the literature as they are proposed in India, Australia, Switzerland, and Germany.

2.3.3.2 Proposals of ecological fiscal transfers

India

In India, concerns with divergences between the costs and benefits from the conservation of natural resources have been raised by subnational jurisdictions (Kumar and Managi, 2009). Benefits – spilling over across jurisdictions – from public goods provision related to a score of measures in the management of ecology, environment, and climate change, as well as fostering sustainable development, seem not to be accompanied by an appropriate compensation, potentially leading to sub-optimal provisions. In this light, Kumar and Managi (2009) argue for the plausibility of ecological fiscal transfers as a mechanism to compensate local governments for their provision of ecological services in India.⁵²

In the view of Kumar and Managi, the existing Indian general-purpose transfer for the environment is considered to be less-optimal to tackle the externality problem. Ecological public functions are not directly considered in this transfer, which is an earmarked grants-in-aid,⁵³ except for forest maintenance measures. Moreover, support for an end-of-pipe type solution to environmental problems such as the emphasis on infrastructure, as well as a limited scope of functions for the existing ecologically earmarked transfer, are the main tendency of this transfer. Kumar and Managi, as a result, put forward a sort of revenue-sharing based transfer.

⁵² In their discussion of intergovernmental fiscal transfers for ecological purposes, Kumar and Managi (2009) apply the conceptual notion of compensation for environmental services (CES) and payments for ecosystem service (PES) interchangeably. This, as well as in Pagiola *et al.* (2002), is likely to be both incorrect and misleading. It is incorrect because while the state-based ecological fiscal transfer (EFT) appears to fit as an element – and to share the theoretical properties – of the CES, it is not necessarily similar to the market-based PES. It is misleading since PES and EFT start from a different rationale and thus advocate a distinct form of policy recommendations, even if both seem to deal with the enterprise of compensating environmental service. In their contribution, Kumar and Managi seem also to confuse “environmental services” with “ecological public functions”. While the former can be produced or provided by different institutions (such as state, private sector, or a defined community), the latter is a state-based provision.

⁵³ These grants-in-aids, according to Srivastava (2002: 109), constitute “general-purpose unconditional grants”. Their determination is contingent on “the difference between the assessed expenditures on the nonplan account of each state and the sum of projected own-source revenues and shares in central taxes.” Srivastava goes on to talk about the crux of every general-purpose transfer: “Thus, these grants are meant to fill a gap.”

A pool of shared-revenue funds is to be funneled into the local government contingent upon a set of weighted indicators. In addition to the standard socio-economic indicators such as income, population, area, and fiscal effort, which are directed to reduce horizontal and vertical fiscal imbalances (see Srivastava, 2002), Kumar and Kamagi (2009: 3056) advocate the incorporation of forest cover indicators into the allocation structure of the general purpose grant. The coverage of actual forest, tree and mangrove areas determine the indicator. In order to assign a weight to the introduced ecological indicator it is necessary to reduce or rearrange the weights of other indicators. In the proposal, the authors introduce forest cover indicators and assign a 7.5 per cent weight to it. They choose to reduce the weight of the population indicator and increase that of the area indicator (Table 2.5).⁵⁴

Table 2.5. Criteria and weights of revenue-sharing determination in India

Criteria	Relative weight (percentage)		Notes
	Status quo	Kumar and Managi (2009)	
Income distance	50	50	Unchanged
Population	25	15	Reduced (10%)
Area	10	12.5	Increased (2.5%)
Tax effort	7.5	7.5	Unchanged
Fiscal discipline	7.5	7.5	Unchanged
Forest cover	--	7.5	New weight
Total	100	100	

Source: Own table, based on Kumar and Managi (2009).

Note: The status quo refers to weights adopted by the 12th Finance Commission.

⁵⁴ The evolutionary character of the Indian intergovernmental fiscal transfer system, in particular its tax devolution, includes frequent changes to the weight determination of the revenue-sharing scheme by the Finance Commission (see Srivastava, 2002; Rao, 2002). This may lend the idea of changing the weight and introducing ecological indicators some sense of plausibility as a policy proposal.

The positive results of the proposed transfer regime become visible in terms of forest conservation and distributive fiscal functions. By and large, jurisdictions with a relatively extensive cover of forests are beneficiaries of the transfer, as are jurisdictions with a population below the poverty line. By contrast, jurisdictions that receive a lower transfer have a relatively disadvantageous position with respect to the proportion of the indicator in the transfer determination vis-à-vis the changes introduced to the weight of the indicator.

Australia

The interesting case of Australia refers to natural resource management in general (Hajkowicz, 2007). Managing natural resources is not an inexpensive enterprise, especially if it is devolved from the Commonwealth Government to the lower jurisdictions, such as state and territory, whose fiscal capacity to perform necessary ecological public functions are limited in relation to their own source revenues. Ecological public activities in the Australian case relate to natural heritage and water quality control in the state of Queensland. There are some reasons, therefore, for an “equalization” between fiscal capacity and fiscal need in their jurisdictions.

In the proposal of Hajkowicz (2007), the allocation of funds for fiscal transfers depends upon a “needs index” for natural resource management. A jurisdiction will receive a certain amount of transfers on the basis of its ecological needs, which are derived from an indexed measure of its relative environmental need. This will constitute an indicative transfer allocation for the forthcoming fiscal year. The precise actual transfers may differ from the indicative allocation, however, since the national government decides upon the actual transfer also depending on the quality of public functions proposed in the plan. The author develops a method to define the needs of a jurisdiction by way of multicriteria analysis. In this analysis, decisions on for instance the criteria of environmental need, the index value, or the weighting of criteria, are made in a series of processes involving relevant participants – i.e. representatives of environmental public agencies and regional group collectives. The needs index are

aggregated from a set of very specific indicators.⁵⁵ Thus, alongside those commonly used general fiscal need indicators of terrestrial and ocean areas, or population and gross agricultural products, there are also indicators of, for example, threatened plant and animal species, vegetation clearance rates, phosphorous and nitrogen output dissolved in water, or reef status and weed density.

This interesting case warrants some further remarks. From a closer perspective of public finance theory, equalization aims primarily at tackling horizontal fiscal imbalance, that is to say among jurisdictions at the same governmental level. By contrast, the fiscal gap approach (i.e. “closing” the fiscal gap between the needs and capacity of a jurisdiction) aims at vertical fiscal imbalance. As discussed in Section 2.2.2, a general-purpose transfer is usually advocated for vertical fiscal imbalance problems. The merit of Hajkowicz’s proposal lies in its innovative approach and participatory method.

However, this proposal may clash with some “conventional wisdoms” in public finance theory and practice. The first problem relates to the fact that the instrument of fiscal transfer is not defined in the proposal. It is not clear whether it is a type of general-purpose transfer, a specific-purpose one, or a revenue-sharing arrangement. The intention to close the fiscal gap suggests that the proposal meets the properties of a general-purpose transfer,⁵⁶ and hence it is not intended to meet the policy objective of “equalization”. This being the case, then it sets the stage for the second problem. A general-purpose transfer maintains simplicity in its allocation, in part to ensure a degree of autonomy in fiscal decisions of the lower jurisdictions. Indicators of fiscal need should therefore represent general proxies of need, such as those of the population,

⁵⁵ The indicators involve dimensions of geographic extent, ecosystem threats, use of reserves, water use and quality, cultural values, landscape state, as well as socio-economic conditions both in general and related to agriculture.

⁵⁶ See e.g. Rye and Searle (1997) for the discussion on the fiscal transfer system in Australia and its general-purpose transfer. Rye and Searle, however, consider a general-purpose transfer to be an instrument geared towards tackling vertical fiscal imbalance.

economic potential, or area cover.⁵⁷ A more detailed and specified indicator is usually employed by a specific-purpose transfer. In addition, the determination of a specific-purpose transfer allocation is, by definition, independent of the fiscal capacity of a jurisdiction (cf. Section 4.3). Moreover, as just mentioned, a general-purpose transfer intends to close the need-capacity gap. As a matter of fact, such a transfer mechanism depends solely on the general fiscal capacity and the general fiscal need of the jurisdiction concerned.

Cognizant of these considerations, the dissolution level of phosphorous (P) and nitrogen (N) in water, to mention a case in point, should conceptually belong to indicator of the fund distribution mechanism of a *specific-purpose transfer for environment*.⁵⁸ Another more plausible option for the inclusion of Hajkowicz's proposal in a concrete fiscal transfer scheme would be through a revenue-sharing scheme. Subsequently, a divisible pool of shared-revenue funds available for Queensland would be disbursed by relying on socio-economic and ecological indices developed by multicriteria analysis.⁵⁹

⁵⁷ It is also worth mentioning that a tendency to try to meet many objectives with a single transfer instrument and to add many indicators into the formula may confuse the overall effects which are expected from the formula-based instrument (Schroeder and Smoke, 2002: 26).

⁵⁸ See, however, the discussions in Section 5.1.1 on the arguments in favor of incorporating ecological indicators into the structure of the fiscal need calculation of a *general-purpose transfer*. A eutrophication problem for example, as long as it creates non-excludable negative externalities to other jurisdictions, may fit well into the rationale of a general-purpose transfer. Nonetheless, it is still open to discussion as to whether the calculation of "ecological fiscal need" should take place under a general indicator related to ecology (such as protected areas) *or* under a specific indicator of the eutrophication level. The critical limit between what is considered to be "general" on the one hand and "specific" on the other, has yet to be theoretically argued. This differentiation will depend largely on the extent and magnitude of the externality under discussion, or the scope of the externality (i.e. the number of beneficiaries or disadvantaged jurisdictions), among others. In practice, it is not uncommon that the decision of such a general-specific differentiation in the determination of a fiscal transfer mechanism will be a product of political consensus.

⁵⁹ This may be comfortably analogous to the Brazilian ICMS-Ecológico, whose weight, indicator and ecological index to distribute a (constitutionally binding) assigned portion of VAT revenue are upon the decision of the individual federal states. The Brazilian ecological index seems to correspond to the complexity level of the ecological index generated by multicriteria analysis in Hajkowicz's proposal. Besides, a revenue-sharing scheme is likely to be superior to an ad hoc grant (see Section 2.2.2.1). Unless the proposal in Hajkowicz (2007) is incorporated into the conventional structure of intergovernmental fiscal transfers, it is likely to be prone to ad hoc decisions of the transfer mechanism or ad hoc estimations of forthcoming budgets for environmental public expenditures.

In general, it is worth recalling that the Australian case in the first place is not concerned with the investigation of the effect or extent from introducing ecological indicators into the intergovernmental fiscal transfer; it is rather on figuring out and setting out a new allocation mechanism for the ecological fiscal transfer.

The proposed transfer mechanism appears to find policy accommodation in the actual decisions of regional budget allocation. The state of Queensland and the Commonwealth Government ministers agreed in the fiscal years of 2004/5 to 2006/7 on allocating funds to local regions in Queensland which is in part contingent on the proposed transfer mechanism.

Switzerland

Switzerland has a relatively high pressure on biodiversity compared to other industrialized countries, where its dense population and tourism-related factors seem to have played a major role (Köllner *et al.*, 2002: 382). In view of these considerations, Köllner *et al.* (2002) propose a reform of the intergovernmental fiscal transfer system in order to consider and finance biodiversity conservation more.⁶⁰ The proposal is to integrate biodiversity into the mechanism of intergovernmental fiscal transfers. The integration is founded on a computable function of the biodiversity index, with emphasis on the level of species diversity and species abundance for habitats in a certain jurisdiction. The resulting index is then used as a benchmark.

The authors propose to integrate three scenarios to incorporate biodiversity benchmarking into the structure of fiscal transfers, particularly into the federal tax reimbursement schemes.⁶¹ Only two of the scenarios will be elaborated here, namely the

⁶⁰ The prevailing system has considered ecological-related criteria such as forest cover and river length (cf. Table 2.6). These criteria are mainly intended for public functions in terms of forest maintenance or protection against natural disasters and floods (Köllner *et al.*, 2002: 386). In this study, the authors confine their analysis and proposal to biodiversity. On the method to derive biodiversity index used in this Swiss case study and how biodiversity is related to land use and fiscal transfer, see Schelske (2000: 263-273).

⁶¹ Switzerland has autonomous subnational cantonal governments. Its intergovernmental fiscal transfers take place in the form of unconditional federal tax reimbursements, tax sharing and conditional specific-purpose grants. Tax reimbursements are on a formula-basis whose indicators include *inter alia* the length of road or the relative tax effort regarding the motor vehicle tax and per capita expenditures on roads. See the discussion in Spahn (1997).

scenarios of low integration and high integration.⁶² Both of these are incorporated into the prevailing structure of fiscal transfers together with geographical and topographical criteria of population density, road length, forest and river length. Table 2.6 summarizes these criteria and their respective assigned weights. As for the source of funds to finance ecological fiscal transfers, the authors propose to replace the funds that are currently allocated to compensate cantons of weak economic structure. Additional funds are to be derived from part of the petroleum tax.

Table 2.6. Criteria and weights of revenue-sharing in Switzerland

Criteria	Official proposal	Köllner <i>et al.</i> (2002)	
		High integration	Low integration
Population density	50	25	45
Road length	25	12.5	22.5
Forest	20	10	18
River length	5	2.5	4.5
Biodiversity	--	50	10
Total	100	100	100

Source: Own table, based on and ammended from Köllner *et al.* (2002), Table 2.

Notes : (1) The revenue-sharing here is part of the sharing-arrangement which is unconditional.

(2) Except for the biodiversity criterion, other criteria are measured in per capita.

(3) The official proposal refers to the proposal being discussed at the time for fiscal reform in Switzerland which would be voted on in a national referendum in 2003.

Köllner *et al.* (2002) found that under the high integration scenario, 7 cantons (out of 26) in Switzerland would gain from the introduction of the proposed fiscal

⁶² The third scenario, that is, a full scenario of assuming 100 per cent integration of biodiversity criteria, is not discussed further. Although it is an interesting reference construct, the likelihood that this proposal would merit due consideration in the practice of fiscal policy making is conceivably low.

regime. As expected, these cantons have a relatively higher biodiversity index in common, and their biodiversity index is higher than the overall index which includes other geographical and topographical indicators along with the biodiversity indicator.

Only three of these cantons with a high biodiversity index experience a higher transfer payment above the level at which the transfer allocation combines the official formula with the biodiversity-based formula. Under the low integration scenario, one more canton would be among the “winners”. From all of these winning cantons, four of which are more advantaged than under the high integration scenario; two others would receive a reduced transfer. However, under this low integration scenario, only two cantons would receive a higher transfer than with the combined allocation mechanism of official and biodiversity formulas.

Germany

Biodiversity conservation efforts as well as land use restriction for protected areas incur costs to local jurisdictions. The benefits, however, spill over to other non-producing jurisdictions or to other higher governmental levels. These considerations seem to constitute the main point of departure to suggest ecological fiscal transfers in the case of Saxony, Germany (Ring, 2008b). Compensation for protected areas to local jurisdictions in the proposal by Ring would take two channels: a lump-sum transfer and an unconditional ecological fiscal transfer. In determining the general fiscal need of a jurisdiction, both instruments would comply with the existing fiscal mechanism in Germany.

The lump sum transfer under discussion involves the introduction of an ecological indicator in the distribution of general purpose funds, taking account of the fiscal needs of a jurisdiction. Such an ecological indicator is an index of a conservation unit. As a weighted indicator, it will co-determine the total funds for recipient jurisdictions, along with population and school pupil indicators. The other instrument – unconditional transfers for ecological purposes – involves assigning a predetermined and specified proportion of available funds, drawing on the inspiration of the Brazilian experience with revenue-sharing arrangements. This fund is distributed in a way that is more or less similar to the previous instrument, that is, through the conservation unit index of a jurisdiction.

The conservation unit in these two instruments takes account of designated protected areas within municipal boundaries. It is aggregated from a protected area indicator with reference to different management categories such as national parks, biosphere reserves or areas under the European Union Directives for habitats and birds. A predetermined weight is assigned to each of these categories. A jurisdiction then receives ecological fiscal transfers based on its coverage of protected areas.

Ring (2008: 148-148) found that around half (51 percent) of all 537 municipalities in Saxony would gain from the new lump-sum transfer. Most of the winning jurisdictions would gain by an increase of up to 25 percent compared to what they received without the ecological indicator. As expected, the jurisdictions benefiting the most belong to municipalities located in biosphere reserves, national parks and nature reserves in Saxony. In addition, the simulation under the second instrument, i.e., the unconditional transfer for ecological purposes, leads to even more winning municipalities (37 more), although the amount of transfer that some of the winning municipalities would receive decreases.

Another case in Germany investigates the problem of establishing a suitable compensation for nature conservation within the framework of the fiscal transfer mechanism. In the literature on ecological fiscal transfers, this case presumably represents one of the most rigorous empirical applications from the public finance perspective. In this case, Perner and Thöne (2005) explore two approaches to allocate intergovernmental fiscal transfers as compensation for a jurisdiction providing ecological services at a local level. The first approach is the landscape planning approach (*Landschaftsplan-Ansatz*) as compensation for ecological services based on the nature conservation values of areas. The second approach is the nature points approach (*Naturpunkte-Ansatz*) through which ecological services are compensated on the basis of ecological measures undertaken by a jurisdiction.

The motivation to develop these two approaches is driven largely by the observed inherent lack of an appropriate incentive structure in the prevailing fiscal transfer system to compensate ecological services provided by jurisdictions of ecological importance. The objective of the proposal is twofold (Perner and Thöne, 2005: 225ff.). The first objective intends to move the supply-side condition of the jurisdiction, which is

suboptimal due to distortions related to cross-spatial externalities, to a new equilibrium that will appropriately reflect the demand-side of ecological public good provisions. The second objective relates to reinforcing the incentives for engaging a local jurisdiction in nature conservation by ensuring more decentralized autonomy in fiscal-related decisions for (or against) the consumption of ecological services.

In principle, both approaches involve the same common structure and system of existing intergovernmental fiscal transfers as they operate within the structure of the federal system of Germany.⁶³ The determination of the basic pool of required funds – that is, the overall approximation of fiscal needs – is based on a population approach.⁶⁴ Meanwhile, the determination of fiscal capacity refers to the existing calculation of tax capacity. The same structure and system also hold for the determination of the aggregate volume for general-purpose transfers (*Schlüsselzuweisungen*). The source of funds for both approaches is an unconditional transfer for ecological purposes.

The two approaches differ in their mechanism of transfer allocation for the local jurisdiction. In the landscape-planning approach, a jurisdiction will receive a fiscal transfer contingent on a set of landscape-related indicators, the values of which technically correspond to nature conservation. More precisely, the so-called ecological service indicator is a general indicator that entails an additive system of weighted individual nature conservation value. It is developed by considering the nature conservation values of an area which involves one or more dimensions related to diversity and biotope type, land, water, air and climate, landscape scenery, and suitability for restoration. Further, these considerations are aggregated by different value scales indicating a level of proximity to the nature conservation value. On that scale, landscape areas for housing settlements and transport represent the lowest value level, whilst areas for nature and biosphere reserves, for example, represent the highest level. Finally, different rates are then applied to assess the level for the purpose of determining fiscal transfers in monetary units.

⁶³ The simulations on the effect of transfers to local governments are undertaken in a number of selected jurisdictions in the federal states of Bavaria, North Rhine-Westphalia, Lower Saxony, and Saxony-Anhalt.

⁶⁴ In Germany, the number of inhabitants constitutes an “abstract need criterion” for fiscal needs and for horizontal equalization (Spahn and Franz, 2002: 129).

The landscape-planning approach is oriented towards compensating the existing state of nature conservation. In contrast, the nature points approach is geared towards measure-based compensation. A jurisdiction receives a (one time) transfer given the measure on nature conservation that it plans to undertake, or has undertaken, which is reflected in a unit of point values, that is a measure value per hectare. The jurisdiction decides freely on the exact measure(s) of nature conservation. These measures correspond to a reference system of landscape planning in that they are ordered so that the measures reflect the spatial significance, such as measures for the protection, maintenance, use, or development for nature and the landscape. In the end, a kind of catalogue of nature conservation measures is compiled, containing the types of concrete measures relative to the total reference area and the (de)value of such measures. At a conceptual level regarding the transfer mechanism and the grant system, the nature points approach reflects to some degree a project grant by competitive application (Break, 1980; Section 2.2.2.2).

The simulation results show that theoretically the first approach – landscape planning – meets the first objective as a fiscal instrument to internalize positive ecological externalities. Practically, however, this approach cannot holistically provide incentive effects. The effect of changes in the value of a certain landscape type (which indicates the consumption for nature conservation) on the fiscal transfer is relatively small, implying a small fiscal incentive effect for improving nature. By comparison, the nature points approach is of practical suitability in terms of the fiscal incentive effect, and yet it is conceptually inferior since it is not capable of internalizing all observable positive externalities, such as preventing deterioration to the state of nature and landscapes.

General observations of the EFT proposals

Most of the cases reviewed here have to do with specific country or subnational government structures. It is quite possible that the cases considered are atypical and that a repetition of such model transfers for general application might prove to be impossible. The cases described above report on a wide range of possibilities. Such variety is understandable due to inherent differences as much as the countries of concern differ from one another. For example, the country within which the case is constructed has

different forms of state – embodying a different degree of decentralized structures – including differences in intergovernmental fiscal systems. Besides which, the cases investigated show different transfer instruments and propose different sources of funds for fiscal transfer. Furthermore, the point of departure for the proposal of fiscal transfers emphasizes the ecological problem differently. The technical characteristics of each proposal for ecological fiscal transfers are summarized in Table 2.7. In spite of such differences, however, one may observe a number of general trends which appear to emerge from this study of the proposals for ecological fiscal transfers.

The *first* trend is probably the fact that most proposals of ecological fiscal transfers, to varying degrees, are founded on the existing fiscal transfer mechanism. If these proposals are viewed as recommendations for alternative fiscal transfer policy, the analysis of these recommendations are embedded in the functioning *status quo* fiscal institution of the respective countries, as Hansjürgens (2000: 102) suggests. Imagined possibilities with respect to questions surrounding the choice of fiscal transfer instruments, decisions about which sources of funds to use, or the determination of parameter values for ecological indicators, take into account how intergovernmental fiscal systems have historically been in place in the country of concern. Far from being an abstract proposal, the introduction of such potential options takes place in the existing fiscal system. In view of this general trend, the case in Australia seems to be an interesting exception. The introduction of some elements of this proposal (e.g., the transfer allocation and the transfer instruments), compared to other reviewed cases, refers less to the existing fiscal mechanism and more to the original initiatives.

The *second* observed trend relates to the determination of ecological indicators. All cases in this review choose to introduce ecological indicators along the existing socio-economic indicators. Ecological indicators turn out to be concomitant to those of existing and functioning indicators in the allocation of fiscal transfers. In addition to the fact that this happens to be one of the most plausible ways of introducing new indicators, this choice signals the notion of path-dependency in that intended changes are subject to functioning institutions. As regards the method of allocating fiscal resources by way of an ecological indicator, there is a mixed trend. In some cases a simple method is applied (e.g. India), while in some other cases a more sophisticated and complex method is used,

Table 2.7. Proposals for ecological fiscal transfers

Case study	Instrument of fiscal transfer	Source of fund	Recipient of transfer	Concomitant socio-economic indicators	Ecological indicators, (E_j)	Allocation for jurisdiction i based on ecological indicator j
INDIA. Kumar and Managi, <i>Ecological Economics</i> , 2009.	Revenue-sharing	Shared revenue fund, R	Jurisdiction at state level (i.e., general state, specific state, union territory)	Income distance, population (p), geographic area (p), fiscal effort, fiscal discipline	Forest cover, i.e., for forest, mangrove and tree covers	$Transfer_i^{eco} = 0.075R \bullet f(E_{ij})$
AUSTRALIA. Hajkowicz, <i>Ecological Economics</i> , 2007.	Instrument not defined (presumably a general-purpose transfer)	General purpose fund, S^g	Jurisdiction at state level	A set of indicators relate to geographic extent, multiple use reserves, cultural values, economic role of agriculture, socio-economic conditions	A set of indicators relate to ecosystem threats, water use, water quality, landscape health	$Transfer_i^{eco} \approx S^g \bullet f(E_{ij})$
SWITZERLAND. Köllner, Schelske and Seidl, <i>Basic Applied Ecology</i> , 2002.	Instrument not defined (presumably a federal tax reimbursement arrangement)	Compensation fund for canton with weak structural capacity and (a portion of) revenues from petroleum tax. Both are additive and altogether denoted as F	Jurisdiction at state level (i.e., canton)	Population density (pc), road length (pc), forest cover (pc), river length (pc)	Biodiversity index	High integration scenario: $Transfer_i^{eco} = 0.5F \bullet N_i \bullet f(E_{ij})$ Low integration scenario: $Transfer_i^{eco} = 0.1F \bullet N_i \bullet f(E_{ij})$

Table 2.7. Continued

GERMANY. Ring, GAIA, 2008b.	General-purpose transfer: Lump-sum transfer (S^g) or unconditional transfer for ecological purpose (S^e)	Lump sum transfer and unconditional transfer (analogous to transfers for infrastructure maintenance, cultural provision, or snow management)	Jurisdiction at local level (i.e., municipality including district-independent cities and communities)	Population and number of school pupils	Weighted conservation unit, i.e., for national park, special area of conservation/EU Habitats Directive, special protection area/EU Birds Directive, nature reserve, biosphere reserve, natura park, and landscape reserve	<p>Lump sum transfer scenario:</p> $Transfer_i^{eco} \approx f(S^g, FC_i, FN_i^{eco}),$ $FN_i^{eco} = f(E_{ij})$ <p>Unconditional transfer scenario:</p> $Transfer_i^{eco} \approx S^e \bullet f(E_{ij})$
GERMANY. Perner and Thöne, FiFo-Berichte, 2005.	General-purpose transfer (S)	Unconditional transfer for ecological purpose (or, lump-sum general-purpose transfer)	Jurisdiction at local level (i.e., municipality including district-independent cities and communities)	Population (for the approximation of fiscal need fund)	A system of indicators: “Ecological indicator” (a function of landscape area type, scaled for proximity of nature conservation value) and “point indicator” of nature conservation measure relative to total area and spatial significance	<p>Landscape planning approach:</p> $Transfer_i^{eco} \approx f(S, FC_i, FN_i^{eco}),$ $FN_i^{eco} = f(E_{ij})$ <p>Nature points approach:</p> $Transfer_i^{eco} \approx S \bullet f(E_{ij})$

Notes: (1) p = percentage, pc = per capita, N = number of population, FC = Fiscal capacity, FN^{eco} = Ecological fiscal need.

(2) Concomitant socio-economic indicators affect the determination of the total amount of the transfer, along with those of ecological indicators.

(3) For Australia, proposed indicators are pooled into a set of indicators that are aggregated and not as an individual indicator. The set of cultural values contains natural heritage status and reef status. The latter should be part of the ecological indicator. In the table, the set of cultural values belongs to socio-economic indicators, given the other elements of this set, i.e. indigenous population, historical and aboriginal heritage sites, and indigenous land tenure.

(4) The cases in Germany explicitly acknowledge the complex mechanism in the determination and allocation of general-purpose transfers to a local jurisdiction. Therefore, the allocation formula is presented so that it is a function of the divisible pool of funds, fiscal capacity and ecological fiscal need.

such as a biodiversity index, a geographic information system, or a multicriteria analysis (cf. Switzerland, Germany, Australia, respectively).

The *third* trend stresses the importance of the area approach. An area indicator is present in all cases especially as an indicator in the existing transfer allocation mechanism. In some cases, it is also an indicator through which the ecological dimension is likely to be taken into account, implying the possibility of an indirect and initial approach of acknowledging ecological functions in the structure of intergovernmental fiscal transfers (Bergmann, 1999: 562; Ring 2002: 422). There is a proximate correspondence between area – especially in relation to land use intensity – and ecological public function (Ring, 2001: 388). A full and direct account of the ecological dimension would definitely be in using an explicit ecological indicator.

The choice of fiscal instrument is the *fourth* trend. Whereas there seem to be various choices, most proposals are critical and therefore are not advocate of specific-purpose transfers. As a matter of fact, environmental problems have been addressed largely by different ecological public functions under existing specific-purpose transfers. The criticism about these transfers of specific-purpose include its end-of-pipe tendency (mostly for infrastructure-related measures), insufficient available funds, less supportive of a decentralized structure of government and decision-making, and project orientation of these transfers. Alternatively, a general-purpose transfer and a revenue-sharing based transfer are commonly proposed as ecological fiscal transfer instruments.

The *fifth* trend touches on the distributive consideration. There is a link between ecological purposes and the Musgravian distributive function, which represents the notion of sustainable development.⁶⁵ Certainly, the distributive dimension is an inherent part of fiscal transfers because in transfer allocation the fiscal capacity of a jurisdiction is considered. However, what is meant by the distributive function here is related to the explicit acknowledgement of inequality including the inequality at the inter-personal level (in addition to the discrepancies at the inter-regional level as in fiscal capacity

⁶⁵ For instance in the case of Brazil, the consideration of interjurisdictional fiscal imbalances in ecological fiscal transfer is made explicit. It is argued that “the effectiveness and acceptability of the ICMS ecológico may be undermined if it results in a reduction of income for the poorest group of counties” (Grieg-Gran, 2000: 15).

allocation). This consideration is particularly true in cases where the degree of relatively high economic disparities appears to be obvious, such as in India. Considerations of this kind are also crucial in the real EFT application in Brazil. To some degree, the case of Australia incorporates the distributive consideration of this kind due to the proportion of its poor indigenous population. Not all cases presented here take the distributive consideration into account, however. For example, such a consideration is almost absent in the cases of ecological fiscal transfers proposed for Germany.⁶⁶ In Switzerland part of the mobilized fiscal fund for biodiversity conservation in the proposal even intends to replace the existing fiscal funds allocated to jurisdictions with weak structural economic conditions.

The *sixth* trend is concerned with the rationale underlying the choice of instruments for ecological fiscal transfer. There appears to be a strong intention to emphasize the fulfillment of ecological purposes, which in itself is certainly a legitimate intention. However, most cases appear to lack in, or to have overlooked, the foundation of public finance. For instance, the purposes of the proposed fiscal instruments are often not specified. Nor is it specified what the *raison d'être* of the proposed transfer instrument is if the policy objective is to better tackle a particular ecological problem regarding externalities and the provision of public goods. Arguments of whether (and thus why) the transfer instrument should be a general or a specific-purpose grant or a revenue-sharing scheme, are not sufficiently addressed. Furthermore, most proposals seems to be circumscribed on putting a focus on fiscal need and tend to put less consideration on fiscal capacity, especially the consideration of the tax base of a jurisdiction. Within this particular context of fiscal need and capacity, the cases in Germany are likely to be an exception in that they acknowledge and apply a relatively rigorous analysis built on the established theory and practice of intergovernmental fiscal relations.

⁶⁶ The absence of an explicit recognition of interpersonal inequality in the ecological fiscal transfers proposed in Germany is conceivable. Partly because in this country measures and instruments addressing explicit distributional issues are already in place and become an integrated part of its social state system.

2.4 Recapitulation of the concept and further research questions

The main discussions in this chapter have conceptualized the relationship between economic foundation of fiscal federalism, intergovernmental fiscal transfers, and the inclusion of ecological issues into these concepts. The economic foundation of fiscal federalism is elaborated in the light of division of fiscal function which in turn serves as a useful basis to discuss the rationale behind the assignment of responsibilities to different governmental levels. In the public sector, these two notions lead to the necessity of intergovernmental fiscal transfers whose design involves rational fiscal transfer mechanisms. Upon these, the conception of fiscal instruments and programs as well of fiscal need in relation to fiscal capacity can now proceed.

The conceptual challenge is how to include ecological dimensions into the concept of fiscal federalism and fiscal transfers, which is in general still an infant research field. This chapter makes use of environmental federalism, the most proximate analytical concept to make sense the integration of ecological dimensions into fiscal federalism, as an entry point. This chapter then discusses the empirical works on ecological fiscal transfers – the background of their application, the mechanics of fiscal transfer and the results of transfer distribution. Viewed as a synthetic whole, at this point this chapter seeks to synthesize the concept of ecological fiscal transfer at two analytical levels. At the *theoretical level*, it discusses the interplay through which the incorporation of ecological issues into the notions of fiscal federalism and intergovernmental fiscal transfers may take place. At the *practical level*, it presents the assessment of a number of plausible ecological fiscal transfer schemes, which are derived from both existing and proposed country level cases, in reference to the theoretical discussions.

The present study will continue to look at a country specific case (Indonesia) in the believe that such an undertaking may contribute to further advance our understanding about the applicability of ecological fiscal transfer in nature conservation and sustainability. The questions to be addressed: How is the governing system of intergovernmental fiscal transfer in Indonesia? To what extent have ecological dimensions been considered in the country's fiscal transfer system? In this system, what can be the policy options and concrete applications of ecological fiscal transfer? The discussion on these questions will be provided in the subsequent chapters.

CHAPTER 3

The Indonesian intergovernmental fiscal transfer system

Like any studies in empirical public finance, studies on intergovernmental fiscal transfers are context-specific. The reasons for this are that fiscal institutions and fiscal policies considerably differ from country to country as a result of the developments and the dynamics in the country of concern. Indonesia is the focus of research in this study. Large in size and still decentralizing in fundamental ways, Indonesia is a country of social and political diversity. Furthermore, this archipelago in the tropics is richly endowed with nature and unique ecosystems. This chapter begins with Section 3.1 on the administrative and fiscal contexts in Indonesia. The fiscal transfer system in Indonesia before decentralization occurred is elaborated in Section 3.2. This section first discusses the instrument of fiscal transfers over this period. It then highlights some evolving dimensions of the country's intergovernmental fiscal transfers under both the centralized system and during its transition towards decentralization, which was officially initiated in 2001.

The main and most detailed part of this chapter is devoted to the present fiscal transfer system. Section 3.3 elaborates on the present fiscal transfer system especially with regard to the transfer instruments and their elements. Three primary fiscal transfer instruments are discussed in this section: general-purpose transfer, specific-purpose transfer, and revenue-sharing arrangement. The elaboration of these instruments will serve as a basis for the succeeding discussions in Chapter 4 on the policy options for integrating ecological aspects into the structure of intergovernmental fiscal transfers. Finally, Section 3.4 is devoted to the discussion on the treatment of environmental aspects in the fiscal system and the financing of ecological public functions. This section illustrates the situation before decentralization took place and the conditions during the transition as well as the present period.

3.1 Administrative structure and fiscal transfer system

Indonesia is a democratic unitary state, the three-tier administrative structure of which comprises of national, provincial and local governments. After consecutive waves of administrative reform that followed decentralization (Fitriani *et al*, 2005), it now has 33 provinces and 491 districts and municipalities (in 2008). East Timor, which was a province of Indonesia, became an independent state in 1999. Before the start of decentralization, Indonesia consisted of 27 provinces and less than 300 districts and municipalities (Brodjonegoro and Ford, 2007: 353).

The local Indonesian government consists of kota (municipality) and kabupaten (district or regency). Local government further comprises of the sub-administrative structure of kecamatan, below which there are urban (kelurahan) and rural villages (desa). Although important from other administrative aspects, these structures are of less importance in light of the country's present intergovernmental fiscal system. Prior to decentralization, as Section 3.2 points out, these structures played a comparatively more important role in intergovernmental fiscal transfers. Throughout this study, a "regional" government will refer to the subnational government (province) and the local government (municipality and district), while "local" government will refer only to the level of the municipality and district.

Indonesia is a large decentralizing country. As its political and economic circumstances evolve, after decades of a centralized system, in 2001 it embarked on what is often referred to in the literature as a "big bang" decentralization (Hofman and Kaiser, 2006), a sudden decentralization with far-reaching changes to the administrative and fiscal system.⁶⁷ Henceforth, the country also started fiscal decentralization through which the provincial governmental level exercises more responsibility than its previous standing, yet with a lesser role compared to that of local governments. At present, in terms of fiscal decentralization, local government plays a relatively greater role. To

⁶⁷ For a description of the fiscal system prior to decentralization see Qureshi (1997). Smoke and Lewis (1996) and Beier and Ferrazzi (1998) provide detailed reviews on some initiatives and initial efforts for regional autonomy in the 1990s. One might consult Lewis (2002), Ahmad and Mansoor (2002), Hofman and Kaiser (2006), Brodjonegoro and Ford (2007), or a book-length treatment by Alm *et al* (2004) for discussions of various aspects during the transition phase and the early years of fiscal decentralization.

consider one figure that reflects its present role, local government receives a 90 percent share from the pool fund allocated for the total general-purpose transfer, compared to only 10 percent for the provincial government.

In general, the country's present transfer system has two main channels, that is by way of a grant and revenue-sharing arrangement.⁶⁸ A grant encompasses two types of transfer: the general purpose fund (DAU – *Dana Alokasi Umum*) and the special purpose fund (DAK – *Dana Alokasi Khusus*). The general-purpose transfer draws from a region's fiscal capacity and fiscal need – i.e., the application of a fiscal gap approach – in addition to the Basic Allocation fund for the staff expenses of public employees. A formula-based, fiscal need of a region is defined by a proxy of pre-determined socio-economic indicators. Meanwhile, the conditional purpose transfer of DAK, which is allocated on a criteria basis, finances some specific activities of central government priorities, ranging from education and health to rural facilities and the environment. A revenue-sharing arrangement (DBH – *Dana Bagi Hasil*) comprises of transfers from taxes (DBH Pajak) and from natural resources (DBH SDA). These shared revenues and own source revenues represent the fiscal capacity of a region. Despite some changes in the aggregate transfer composition, the general purpose fund (DAU) is the most important source in the structure of local government revenue both before and after decentralization (Lewis, 2005). In the following we proceed with a description of the fiscal system before decentralization.

3.2 The fiscal system prior to decentralization

3.2.1 The evolution of the fiscal transfer system

In the late 1960s the central government embarked on a series of programs intended primarily for improving infrastructure. In that period, the so-called Inpres (*Instruksi Presiden*, or Presidential Instruction) grant was introduced to finance such programs. Carried out by subnational and local governments, the Inpres programs were

⁶⁸ Details of transfer elements will be provided in the subsequent sections.

financed by earmarked funds from the central transfer and allocated on the basis of guidelines set by the central government (see de Witt, 1973). Booth (1986: 77) refers to these kinds of grants as “regional development subsidies.” In the mid 1970s, a number of new Inpres grants were initiated and later on were expanded to include more specific and sectoral types of infrastructures, such as education, health, the environment and rural facilities (Booth, 1986 and 1996a). These expanded fiscal transfers were made possible owing to a vast increase from oil revenues over those years (Devas, 1997: 355; Booth, 1996b: 186).

In the mid 1980s, the so-called “current transfer from the central government” was a very important source of revenue, if the annualized 1984/1985 budget is of any indication (Azis, 1989). In the structure of the provincial routine revenue, this transfer accounted for more than 67 percent. In this fiscal year, within the regional budget for development, the “capital transfer for first stage regional development” from the central government made up the largest proportion, accounting for more than 44 percent of the provincial development revenues (Azis, 1989: 61-62). At the level of the municipality and district, it seems to follow more or less the same pattern. However, the allocation of these grants lacked clear criteria. These transfers, as the argument goes (Azis, 1989: 63), were solely based on “routine requirements” of the previous year of each region. In such an allocation mechanism, regional variations (e.g., in inflation rates or socio-economic conditions) were not taken into account in cases of an increase or a change in the sum of transfer. At the end of the 1980s, for instance, all provinces received the same amount of increased transfer (Azis, 1989: 63).

The character of the Inpres program evolved further during the 1990s. Silver *et al* (2001) note the following observations. The predominant type of transfer in this period, for instance, shifted from block to earmarked grant programs. Over the years there was also a tendency to earmark grant allocations, a practice so obvious to the extent that it even affected grant allocation that was supposedly for general purpose. Another imperative aspect characterizing the fiscal transfer at that time relates to the formula of grant allocation. It became less reliant on a per capita criterion and instead more on indicators such as land area and “island status” (Silver *et al*, 2001: 351). Less populous jurisdictions received, for that reason, a larger proportion of the grants. In 1994 and

1995, the total amount of specific-purpose grants was on the rise. Silver *et al* (2001: 352) indicate that the overall growth of Inpres funding in 1996 could be explained by the expansion of earmarked grants. The reason, according to the authors, is that besides the population-based allocated grants, small earmarked grants were also introduced in this period such as for municipal spatial planning, infrastructure improvement and housing support in villages (these grants were later terminated in 1996).

In 1997, some special purpose grants were added (Silver *et al*, 2001: 352-353). These new specific grants, which dramatically increased the level of overall funding that year, contained transfers to support the decentralization of agricultural development functions, human settlements, water and sanitation (solid waste, drainage and waste water), and urban infrastructure. The increase of specific-purpose grants outpaced the general purpose grant in 1997, the very year when the country was struck by severe economic crisis and the year that turned out to be the last year of financing through the Inpres scheme.

3.2.2 The elements of past fiscal transfers

During the period prior to decentralization, and in particular before the transition phase to the decentralized system that came in 2001, the grant system from central government to subnational governments could be theoretically observed as having taken two broad categories.⁶⁹ Namely, the general-purpose transfer and the special purpose transfer (Shah and Qureshi, 1994). Figure 3.1 below illustrates the broad components of fiscal transfer before decentralization.

⁶⁹ In the literature (e.g., Booth, 1989; Azis, 1996), the Indonesian transfer system prior to decentralization is typically approached in the categories of “regional” and “sectoral” in which the Inpres grant repeatedly belongs to the latter. Such a categorization becomes problematic, as in the case of the Inpres Grant, for the very reason that the “regional” grants also contained Inpres grants. The terminology applied in this study thus subscribes to the transfer arrangement delineated in Shah and Qureshi (1994) which categorizes all Inpres grants in the manner closest to the theory of public finance, i.e., general and specific-purpose grants.

3.2.2.1 General-purpose transfer

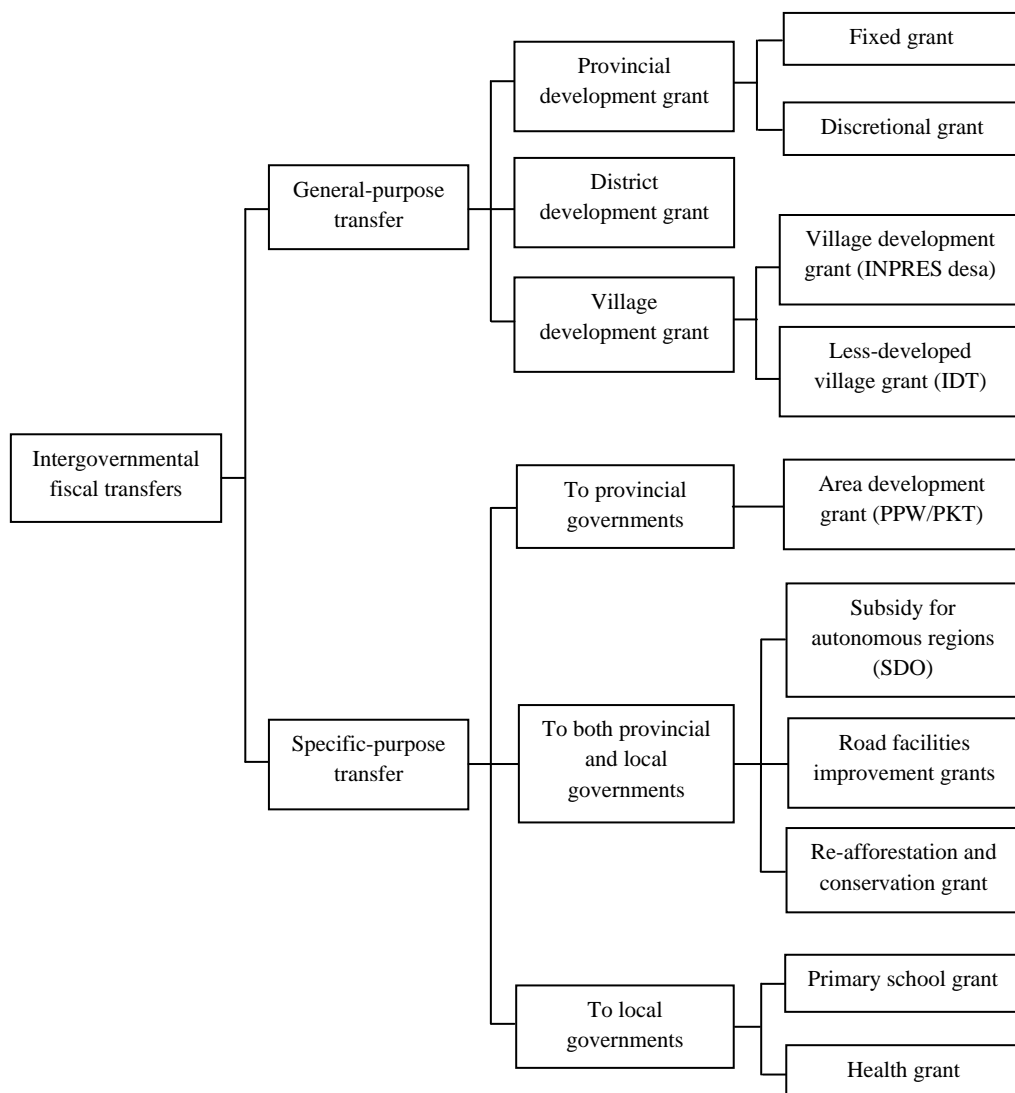
The general-purpose transfer was by and large a block grant. It was directed from the national level to the provincial, local and the village levels. The distribution of the development grants to both provinces and local governments was formula-based, that is, based on an equal share (to the province) and upon a minimum required grant and per capita grant (to the local government). At the provincial level, the transfer was in the form of a development grant in two different forms. Firstly, in the form of a fixed grant (*ditetapkan*) and secondly, in the form of a discretionary grant (*diarahkan*). Fixed grants are investment grants and ought to be spent mainly on specified public infrastructure projects such as the maintenance and extension of road, bridges and irrigation facilities. Discretionary grants were devolved for the provinces although the decision about their final use still came after approval from the central government (Ranis and Stewart, 1994: 46; Booth, 1989; Morfit, 1986: 69).

A district development grant constitutes a grant program on the basis of a population indicator. This is a per capita grant and a minimum threshold to each district is specified (Shah and Qureshi, 1994: 72). According to Morfit (1986: 68), this grant was also intended for creating employment opportunities in rural areas. This grant provided rural labor-intensive public works. With regard to a transfer from the central government to the village level, the development transfer was in the form of two grants: the village development grant or *Inpres Desa* and the less-developed village grant or IDT (*Inpres Desa Tertinggal*). Both of these were block, lump sum grants.

The former grant was distributed equally to all villages nationwide, the objective of which was to promote communal activities and developments in the village. The latter grant, the IDT, which was initiated in 1994, is a grant program generally intended to provide assistance to rural and urban areas whose development is relatively lagging behind (Shah and Qureshi, 1994; Silver *et al*, 2001) and it is a per capita grant. The particular objectives of IDT were somewhat broad and numerous. Shah and Qureshi (1994: 63) identify that the specific objectives of a village grant firstly included, strengthening local democratic institutions and supporting the Government's decentralization policy and secondly providing assistance to poor families, that is those living below the poverty line and thirdly supporting "multiple development objectives of

equity, efficiency, human resource development, social and economic stability, security, environmental quality, participatory development, and cultural enrichment.” All these goals would be achieved by the per capita-based grant.

Figure 3.1. The Indonesian intergovernmental fiscal transfer system prior to decentralization



Source: Own figure, based on Shah and Qureshi (1994).

3.2.2.2 Specific-purpose transfer

In addition to the general-purpose transfer, the fiscal transfer system also comprised of a transfer for specific-purpose which in itself was a conditional grant. Unless otherwise indicated, the description of a special purpose transfer in this section draws on Shah and Qureshi (1994). The special purpose transfer was administered separately from the national level to the provincial and the local level, and to both provincial and local governments as Figure 3.1 shows. At the provincial level, a conditional transfer scheme was administered for the regional and integrated area development (*Program Pengembangan Wilayah and Pengembangan Kawasan Terpadu*, or PPW and PKT Programs). This sort of transfer was merely channeled from the central government to the provinces even if the projects it financed were for both provincial and local governments. It was a matching fund from the central government to meet the required financing for performing such tasks.

As far as grants from central government to both provincial and local levels are concerned, three specific grants were to be found. First, the so-called subsidy for autonomous regions (*Subsidi Daerah Otonom*, or SDO); second, the road facilities improvement grant (*Inpres Jalan Provinsi, Kabupaten dan Kotamadya*); and third, the reforestation grant (*Inpres Penghijauan/Reboisasi*).

SDO is a compilation of grants. It largely financed the staff expenditure of public employees and officials at a subnational level (88 percent of total SDO allocation). This transfer aimed at balancing the budget for performing administrative functions. A less substantial part of SDO also financed the operating costs of primary schools (3 percent), provided support for some decentralized public functions (4 percent), and staff allowances at the village level (5 percent). See the discussion in Shah and Qureshi (1994: 75). Although intended as a subsidy scheme for autonomous regions, SDO is highly centralized since all decisions on staff appointments were made by the central government. The amount of SDO is determined primarily by historical staffing levels (Devas, 1997: 356-357).

As its name implies, a road facilities improvement grant aimed at providing transportation and distribution access to a wider area, the central government made the

road improvement grant available for provinces and local governments. Formula-based, this transfer weighed up a host of indicators such as road condition or construction cost. Finally, transfers were also provided for afforestation and land conservation by way of an *Inpres Penghijauan/Reboisasi* grant.⁷⁰ The allocation of and entitlement for this grant were on a project basis. This grant will be explained in more detail in Section 3.4.1.

In the meantime, the conditional transfers from the central government to the district and the municipality had two additional grant arrangements. Most of these transfers were instituted and initiated in the mid 1970s and early 1980s. The primary school grant (*Inpres Sekolah Dasar*) was intended to provide access to primary schooling and to improve education facilities. The allocation of this fund took into account indicators such as the need for additional or improved classrooms, textbooks, or the special needs of newly settled inhabitants – that is, for relocated transmigrants from densely populated Java and Bali. The *Inpres Kesehatan*, or health grant, was aimed at health service provision and access for the rural and urban poor population. Access to clean drinking water and sanitation in rural areas was another objective. Such transfers were need-based upon indicators, among others, drug, health centre and personnel requirements, as well as the provision of safe water. The central government also assisted local governments in the provision of market facilities such as building small shopping centres by way of *Inpres Pasar*, a project-based grant. This grant, however, was short-lived.

In general, the share of specific-purpose grants was relatively high. This high proportion underlines the fact that Indonesia was centrally-oriented. By way of specific-purpose transfer instrument, there was a strong will from the central government to steer processes and developments at the lower level. Even some of the grants categorized as

⁷⁰ The terminologies of regreening, reforestation and afforestation have been used in the literature. Particularly for reforestation and afforestation, these two terms have been used interchangeably and rather incorrectly. Afforestation refers to a specific conversion of land which has not been forested for a period of at least 50 years (Schulze *et al.*, 2003: footnote 4). The inaccurate expression of “re-afforestation”, as in Shah and Qureshi (1994), would possibly be referring to an “afforestation”.

general-purpose transfer, such as the village development grant and the less-developed village grant, exhibit elements of central steering.

3.3 The present fiscal transfer system

“If it is fat, it belongs to the centre; if it has some meat, it’s the province’s; if it’s really thin, it’s mine.” Metaphors of this kind, once expressed by district-level officials,⁷¹ reflect a common impression about the manner in which the sharing and transfer mechanism had been arranged before Indonesia embarked on decentralization. Under the present system, it has changed substantially. As mentioned at the beginning of this chapter, the country’s present fiscal transfer system comprises three main instruments: general purpose grants (DAU), specific-purpose grants (DAK),⁷² and revenue-sharing. The latter instrument includes shared revenues from property and income taxes as well as from natural resources. In decentralizing Indonesia, the regional governments have the autonomy and full discretion to spend the fund from the allocated general purpose grant on their own. They also have greater power for their own revenue-raising capacity for so-called own-source revenues (PAD). Provinces are now permitted to create new taxes and charges, as are the local governments (municipalities and districts), given some conditions.

In general transfers remain significant sources within the budget structure of local governments compared to other sources such as own-source revenues. Table 3.1 suggests that this proposition seems to hold both before and shortly after decentralization. Although own-source revenues have slowly increased in absolute numbers in the years following the introduction of fiscal decentralization measures in

⁷¹ This quote is taken from Brodjonegoro and Ford (2007: 343), footnote 4.

⁷² In the country’s early phase of decentralization, DAK comprised of two distinct elements: (1) The allocation of the national reforestation revenue, i.e., *Dana Reboisasi*, and (2) the more explicit, “real” special purpose grant. Such a categorization, that lumps these instruments into that of the specific-purpose transfer, can be misleading given that the first element was indeed a simple revenue-sharing arrangement.

2001, their relative significance compared to transfers from shared revenues and grants declined in the late 1990s; their share of total municipal revenues still constituted about 10 percent, but accounted for less than that level afterwards.

Table 3.1. The structure of local government revenue, 1997-2002 (in trillion IDR)

	1997/1998	1998/1999	1999/2000	2001	2002
Own source revenue (PAD)	1.9 (12.9)	1.4 (11.5)	1.6 (10.3)	2.4 (6.7)	3.2 (8.0)
Shared revenue (DBH)	2.5 (16.7)	1.7 (13.9)	2.1 (13.6)	7.9 (21.9)	9.4 (23.4)
Grants (DAU and DAK)	10.5 (70.4)	8.9 (74.6)	11.5 (76.1)	25.7 (71.4)	27.6 (68.6)
Total	14.9 (100)	11.9 (100)	15.2 (100)	35.9 (100)	40.2 (100)

Source: Adapted and amended from Lewis (2005), Table 1, p. 269.

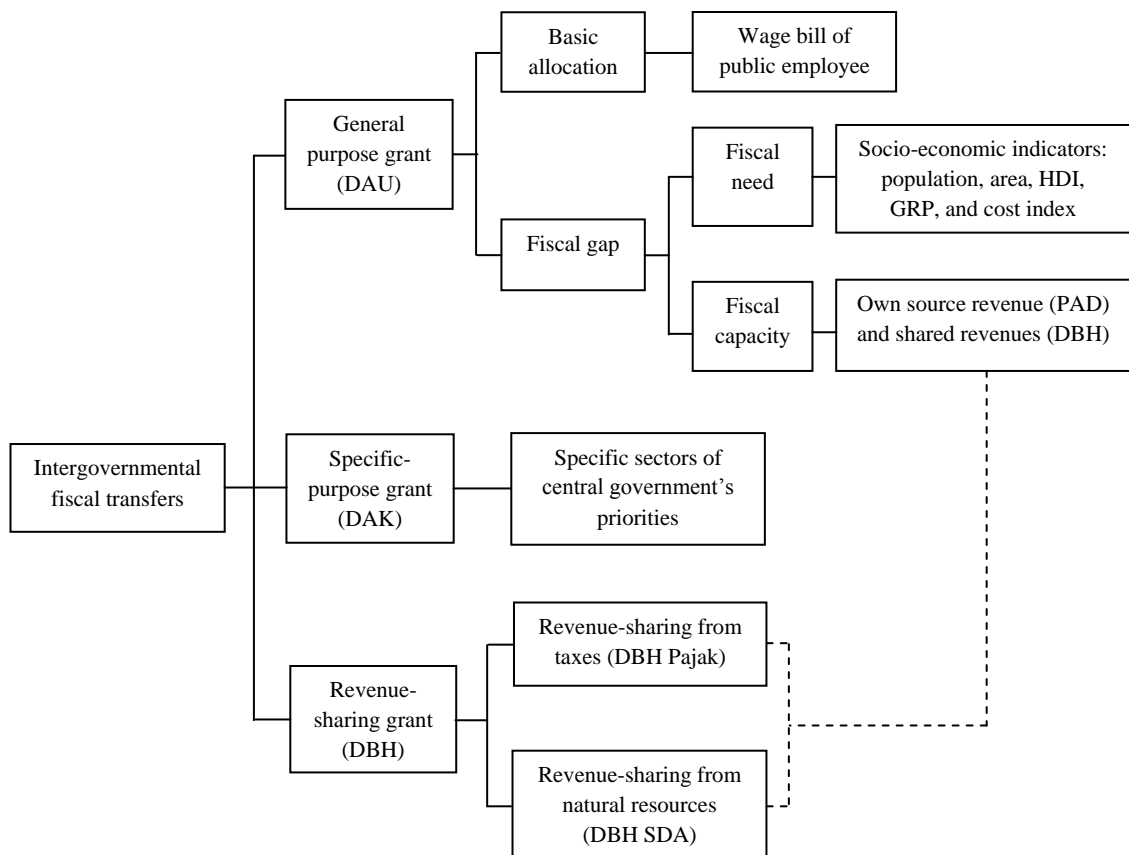
Figure 3.2 illustrates the various elements of the present Indonesian intergovernmental fiscal transfer system, comprising general and specific-purpose grants as well as revenue-sharing schemes from taxes and natural resources. The sections that follow will provide a detailed description of these elements.

In Section 2.2.3.2 of Chapter 2, analytical approaches to the general formulation of the fiscal transfer were presented. Applying these approaches in practice, the present fiscal transfer system in Indonesia does not seem to fully comply with the proposed general framework by Ahmad and Thomas (1997). In their framework, the approaches are based on equalizations of expenditure, need, and expenditure-need mismatch.⁷³ The

⁷³ Consequently, the Indonesian fiscal equalisation transfer is classified outside their proposed general framework (Ahmad and Thomas, 1997: 378). Note that in their classification the context of Indonesian case still refers to the pre decentralization system of equalisation transfer.

reason why the Indonesian system deviates from this general framework is partly due to the fact that the country's equalization system also entails the elements of revenue-sharing arrangements (in the determination of revenue capacity) as well as specific-purpose transfers.

Figure 3.2. Elements of the present Indonesian intergovernmental fiscal transfer system



Source: Own figure, based on Law 33/2004.

Following the logic of the general framework defined in Chapter 2, conceptually the present Indonesian equalization system can be expressed such that the transfer (G) for jurisdiction i equals:

$$G_i = \underbrace{P_i \sum_{k=1}^K \bar{n}_{ik} \bar{c}_{ik} C_k Q_k}_{\text{Expenditure need}} - \underbrace{\left(P_i \sum_{j=1}^J \hat{t}_{ij} B_{ij} + \sum_{r=1}^R RS_{ir} \right)}_{\text{Revenue capacity}} - \underbrace{\sum_{k=1}^K ST_{ik}}_{\text{Specific transfer}} \quad (3.1)$$

where RS is the non-tax revenue-sharing with the revenue base (r) for the sharing arrangement from natural resources revenue. For analytical purpose, it is assumed that own source revenue (PAD) and tax-based revenue-sharing (DBH pajak) are represented in the first term of the revenue capacity formula in Eq. (3.1). We let ST equal the specific-purpose transfer (DAK). The definitions of notation used here are provided in Section 2.2.3.2.

3.3.1 General purpose grant (DAU)

A general-purpose transfer (DAU) is a lump-sum grant. Its prime objective is to address vertical imbalances and help local governments to meet their total expenditure requirements along with other revenue sources. As for the DAU allocation for a given jurisdiction, it is stipulated that such an allocation is contingent upon the so-called Basic Allocation and the fiscal gap approach.⁷⁴

With a DAU transfer, *provinsi*, *kabupaten* and *kota* are allowed far more room for exercising judgment about the kind of public functions which are appropriate for their local needs as well as the appropriate utilization of the general purpose grant. Especially during the early years of decentralization, DAU is arguably a general purpose grant.⁷⁵ However, since 2008 the DAU has increasingly functioned as a consistent general purpose grant. Figure 3.2 shows that the determination of DAU is based on the fiscal gap formula, in addition to the so-called Basic Allocation for the staff salary expense.

⁷⁴ Law 33/2004. Art. 27, Sub Art. 2.

⁷⁵ In that period, a “general” dimension of DAU holds true only at the margin (Fane, 2003: 160). The largest share of DAU was allocated in advance to pay the salaries of government officials as well as the provision of some services, which the local governments are responsible for, such as basic education and health.

In addition, from the perspective of public finance as discussed in Section 2.2.2, the fiscal instrument of the general-purpose transfer serves an equalization function. In Indonesia, DAU is also an important source of revenue for regional governments. For regional governments post decentralization, as Table 3.2 indicates, DAU constitutes between approximately 67 to 74 percent of their budget structure.

Table 3.2. Intergovernmental fiscal transfers from central to regional governments, post decentralization (in trillion IDR and percent of total)

Transfer	2001	2002	2003	2004	2005	2006	2007	2008
General purpose (DAU)	60.5 (74.2)	69.0 (73.6)	76.8 (72.5)	82.0 (67.8)	88.7 (69.1)	145.7 (68.3)	164.8 (68.4)	179.5 (68.1)
Specific-purpose (DAK)	0.7 (0.8)	0.7 (0.7)	2.7 (2.6)	3.6 (3.0)	4.7 (3.7)	11.6 (5.4)	17.1 (7.1)	21.2 (8.1)
Revenue-sharing (DBH)	20.3 (24.9)	24.1 (25.7)	26.4 (24.9)	35.3 (29.2)	35.0 (27.2)	56.0 (26.3)	59.2 (25.6)	62.7 (24.8)
Total	81.5 (100)	93.8 (100)	106.0 (100)	121.0 (100)	128.4 (100)	213.3 (100)	241.1 (100)	263.4 (100)

Source: Own table. 2002-2008 data from MOF. 2001 data from Simanjuntak and Mahi (2004), Table 6.2, p. 103.

Notes : (1) The specific-purpose fund (DAK) in 2003-2005 entailed reforestation fund.

(2) The shared revenue fund (DBH) during 2002-2005 came from realized revenue; in the period of 2006-2008, it is derived from the budgeted revenue.

The comparison between the trends of total fiscal transfers from central government to regional governments (cf. Table 3.2) and to local governments (cf. Table 3.1) to some degree may also reflect a relatively declining role for the provincial government in relation to local governments, that is the municipal and district level. The share of total fiscal transfers for provinces has been decreasing, whereas the share for local governments has been on an increase over time.

The following sections will provide a detailed illustration of the DAU components. The components of the Basic Allocation (Section 3.3.1.1) and the fiscal gap formula (Section 3.3.1.2) are first introduced. The latter encompasses fiscal need and fiscal capacity. Subsequently, the iteration process for determining the final DAU transfer allocation is elaborated on (Section 3.3.1.3).

3.3.1.1 Basic allocation grant

The allocation of a general purpose grant is not on a pure formula-based allocation. Figure 3.2 indicates that it is allocated on the basis of two mechanisms: the Basic Allocation and the fiscal gap formula. This section will elaborate on the former mechanism. In essence, the Basic Allocation (BA) intends to cover the salary expenses of public employees in the provincial and local governments.

The mechanism involved in the Basic Allocation has evolved over the period of decentralization. Its evolution is worth mentioning since it helps to understand the mechanics and final allocation of a general-purpose transfer. In the initial years of decentralization, the final DAU transfer to regional and local jurisdictions was allocated in two complementary ways: first, the fiscal gap-based DAU formula; and second, through additional instruments of (a) the lump-sum factor and (b) the balancing factor. The lump-sum factor is to cover fixed or overhead costs of the jurisdictions, whereas the balancing factor is derived on the basis of the “hold harmless” condition. (See Brodjonegoro and Martinez-Vazquez, 2004: 165).

The lump-sum factor is related to the Basic Allocation for the reasons that salary expenses of civil servants and related costs are covered by this instrument. It can also be argued that the balancing factor operationalizes a possible new expenditure requirement given the transfers of staff and administrative functions, as a result of shifting agencies from central to local governments (Lewis, 2001: 327).

The Basic Allocation grant was derived from the proportional wage allocation, being proportional in the sense that it did not actually cover the expended wages but instead the actual annually realized regional wage bill (Hofman *et al.*, 2006). The new

Basic Allocation replaced the old system of Subsidy for Autonomous Regions (SDO) that was in place prior to decentralization and which for a large part covered the personnel expenses of subnational governments. As such, the Basic Allocation grant is no longer in the category of the special purpose fund for both subnational and local governments as defined in Section 3.2.2, but now as an integrated part for determining the general-purpose transfer. Since 2006, the Basic Allocation grant has been determined exclusively on the basis of the total wage bill of a given jurisdiction. From there on, the Basic Allocation grant was first set equal to 100 percent of the wage bill (Hofman *et al.*, 2006: 34) and the necessary adjustments subject to the rules in Art. 32 of Law 33/2004. To a certain extent, the Basic Allocation-related grant remains a scheme of full cost reimbursement described as a Type C grant in Section 2.2.2.2.

In the above it was mentioned that the additional instruments for DAU transfer allocation includes a balancing factor, which refers to the “hold harmless” clause. A hold harmless arrangement ensures that a jurisdiction will receive a transfer at least equal to the level of its previous transfer, especially as formula-based allocations become increasingly pronounced over time. Hold harmless arrangements of this kind allow for a transition period (see Hofman *et al.*, 2006: 13). With respect to the Basic Allocation for salary and overhead expenses, to some degree the arrangement can also be used to “prevent a downturn in the capacity of regional governments to finance their new responsibilities” (Lewis, 2001: 327).

However, another kind of hold harmless condition emerges with other reasoning – more political. Regions rich in natural resources objected to the new DAU allocation, starting in the fiscal year of 2002 and introducing shared-revenues from natural resources as part of the fiscal capacity calculation (Hofman *et al.*, 2006: 13). As they would receive a lower DAU transfer as a result. Prior to that, the fiscal capacity measures of a region did not include revenues from natural resources. Fane (2003: 165) argues that strong opposition from provinces and local governments that would have received lower DAU transfers in 2002 due to the new formula seemed to be the reason for the birth of this “no harm” clause.

With reference to the mechanism of fiscal transfers discussed in Chapter 2, the hold harmless condition can be interpreted partly as a way of satisfying the criteria of

low sensitivity and monotonicity (Section 2.2.1.4). Low sensitivity criterion requires that changes in the input variables of fiscal capacity will not change the magnitude of transfer that a jurisdiction receives. The monotonicity criterion necessitates that the exposure to a fiscal transfer will not change the *ex post* ranking of jurisdictions given their fiscal capacity. Starting in 2008, after the transition phase was considered to be completed, the hold harmless policy was removed from the allocation of the general purpose grant (Hofman *et al.*, 2006: 34).

3.3.1.2 Fiscal gap formula

The fiscal gap approach forms a principal basis in the allocation of the general purpose grant. It is a differential measurement between fiscal need and fiscal capacity. The mechanism of the fiscal gap ensures a certain extent of adequacy in covering the fiscal need of a jurisdiction due to fiscal capacity deficiency. Definitely, a full fiscal-gap filling is not necessarily implied here.⁷⁶ The practical arrangement about the final transfer based on the fiscal gap that a jurisdiction will receive is regulated in Law 33/2004 (Art. 32) and Government Regulation 55/2005 (Art. 45). A further detailed description of this will be provided in Section 3.3.1.3 on the iteration process of DAU transfer allocation.

The essential rudiments of the Indonesian fiscal gap formula are the *fiscal need* element, which determines the expenditure need of a given jurisdiction, and the *fiscal capacity* element, which comprises its own source revenues and all shared revenues of the jurisdiction concerned. We now look at these more closely.

Fiscal need

Fiscal need constitutes a proxied reference of the required financing for the provision of basic public services of a region.⁷⁷ The fiscal need calculation in Indonesia

⁷⁶ Section 5.2.1.1 in Chapter 5 argues that the Indonesian fiscal gap formula is by design not a full gap-filling.

⁷⁷ Art. 27, Sub Art. 4, Law 33/2004.

is formula-based and has been evolving since it was first introduced in 2001. The DAU formula by and large defines fiscal need as the product of average local expenditure and the index of expenditure needs. In the current Indonesian system, the fiscal need calculation is derived from a local government budget and from a composite index containing a set of socio-economic indicators, which serve as proxies for expenditure need. The fiscal need index of a given jurisdiction, effective since the fiscal year 2006, can be formally expressed as

$$FN_i = \left[\alpha_P \frac{P_i}{\sum P_i} + \alpha_H \frac{1}{H_i} + \alpha_A \frac{A_i}{\sum A_i} + \alpha_C \frac{C_i}{\sum C_i} + \alpha_D \frac{D_i}{\sum D_i} \right] \delta \quad (3.2)$$

whereby FN is the fiscal need of a jurisdiction i ($i = 1, \dots, n$), whether it be a province, a municipality or a district. The socio-economic indicators are denoted as follows. P denotes the population number, H stands for the Human Development Index (HDI),⁷⁸ which is an inverse function, and A is for area coverage.⁷⁹ Further, C is for the cost index, and D is for the gross regional domestic product per capita, which is a proxy of the economic potential of a region. δ represents the average expenditure of the actual government budget of all jurisdictions. A pre-determined parameter of a given indicator is denoted by α , where $\sum \alpha = 1$. The determination of the values for parameters of the fiscal need indicator is by means of a non-quantitative mechanism (cf. Section 2.2.3.4).

Fiscal capacity

In the case of developing countries, one possible objective of establishing fiscal capacity measurement in a fiscal transfer system is “to provide each local government with sufficient funds (own-source revenues plus transfers) to deliver a centrally pre-determined level of services,” as Bird and Smart (2002: 902) put it. In Indonesia, the

⁷⁸ Notice that the poverty indicator is no longer incorporated into the current fiscal need formula as it was in the initial years of decentralization. Since 2006, in addition to the inclusion of regional domestic product (GRP) into the formula, it has been dropped and substituted by the indicator of the Human Development Index (HDI). At present, explicit poverty measures are financed through special purpose grants (DAK).

⁷⁹ Since 2007, area coverage also incorporates a fraction of marine area along with the prevailing terrestrial area.

fiscal capacity of a jurisdiction is estimated from its own source revenue (PAD), added to its realized shared-revenues from taxes (DBH Pajak) and from natural resources (DBH SDA).⁸⁰ These features of fiscal capacity suggests that Indonesia does not apply a macro approach in the measurement of its fiscal capacity, but rather a “variation” of the micro approach although the revenues are weighted, based on each DBH revenue category and not compared to a national average (cf. Sections 2.2.3.3 and 5.2.1.3).

Two important elements which are to be considered in the calculation of the fiscal capacity are own source revenue and shared-revenues. Entitled to a certain degree of revenue-raising, provincial and local governments bring forth their own source revenues known as *Pendapatan Asli Daerah* (PAD). There are two main sources of own revenues: first, a number of regional taxes and levies as well as proceeds from regional assets; second, so-called “other legal PAD sources”, which comprises the proceeds from regional assets, interest income, revenue from exchange rate differentials, and other forms of revenues such as commission or discounts from sales or procurements undertaken by regional government.

In the structure of local government revenue, PAD does not represent a large portion in relative terms. The previous Table 3.1, illustrating the structure of local revenues between 1997 and 2002, shows that prior to and following decentralization it makes up around 7 to 13 percent, and has a decreasing tendency. Although increasing in absolute numbers, the declining significance of PAD in relative terms largely explains the dependence of local governments on other sources of revenue, namely transfers and to a lesser extent revenue-sharing from taxes.

Another component of the fiscal capacity is shared revenues. Revenues from this component are derived from taxes and natural resources. Tax revenue-sharing comprises income tax, land and building tax, and land transfer tax. Natural resource revenue-sharing includes various sources of revenue from forestry, fisheries, mining, oil, gas and geothermal energy.

⁸⁰ Art. 28, Sub-Art. 3, Law 33/2004. See also Figure 3.2.

In terms of revenue-sharing, as it is stipulated in the law on fiscal balance between central and regional governments, the equalization fund consists of revenue-sharing, *Dana Bagi Hasil* (DBH), as well as specific and general-purpose transfers (Art. 10, Law 33/2004; Art. 2, Government Regulation 55/2005). An annual estimation, DBH originates from taxes and natural resources-related revenues, before the shared revenues are assigned to central, provincial and local governments based on a variety of sharing arrangements. As highlighted by the previous sub-section, revenue-sharing co-determines the fiscal capacity calculation of a given jurisdiction upon which the allocation of general-purpose transfers is based. Referring again to Table 3.1, shared-revenues made up between approximately 14 and 17 percent of the local government revenue structure between 1997/1998 and 1999/2000, before decentralization took place. After decentralization, its proportion tended to increase (around 22 per cent in 2001).

Fiscal capacity among jurisdictions seems to vary considerably. In general, revenue-sharing from natural resources is explanatory for the variation, although analogous variations, to a lesser degree, are also observed in shared-revenues from taxes. The source of variation of the fiscal capacity due to revenue-sharing from natural resources can be twofold. First, because of the inherent nature of natural resources distribution. Quantitatively, the distribution of natural resources is concentrated in a handful of jurisdictions. Second, because of the revenue-sharing arrangement from natural resource-based revenues. Under the arrangement, only a handful of jurisdictions are recipients of a large fraction of the shared revenue, while a large number of jurisdictions are not eligible at all. The present structure of the revenue-sharing arrangement already entails an additional feature of horizontal equalization, namely an equal share revenue entitlement for jurisdiction(s) other than the nature resource producing jurisdiction. Nevertheless, disparities in fiscal capacity can still be observed given the aforementioned concentration of resource distribution.

Table 3.3. Per capita fiscal capacity at the provincial level in 2008 (in IDR)

	Own source revenue (PAD)	Revenue-sharing from Taxes (DBH Pajak)				Revenue-sharing from natural resources (DBH SDA)			
		Income tax (PPH)	Land and building tax (PBB)	Land transfer tax (BPHTB)	Total shared revenues	Oil and gas	Forestry	General mining	Total shared revenues
Average	98,405.2	16,682.8	61,766.4	643.2	79,092.4	45,530.4	2,815.8	11,884.9	60,238.3
Minimum	289.0	989.3	3,662.9	38.1	4,690.3	0	0	0	0
Maximum	725,709.8	60,107.0	222,540.2	2,317.3	284,964.5	810,216.0	20,700.9	146,546.1	924,208.0
Median	72,870.3	11,782.7	43,624.2	454.3	55,861.1	25.8	278.0	290.2	3,940.5
Standard deviation	125,077.8	14,443.6	53,476.1	556.8	68,476.6	150,542.1	5,118.6	31,108.3	168,926.7

Source: Own calculation, data from MOF.

Notes: (1) Per capita own source revenue derived from 2006 revenue data and 2005 population data.

(2) Revenue-sharing from fisheries (DBH SDA Perikanan) is not presented since from all provinces Jakarta was the only recipient of the sharing.

(3) The counter-intuitive minimum value of *total* per capita shared revenues from natural resources is due to the fact that DKI Jakarta is not subject to such revenue-sharing.

(4) The reforestation fund is not presented, due to data inavailability.

Table 3.4. Per capita fiscal capacity at the local level in 2008 (in IDR)

	Own source revenue (PAD)	Revenue-sharing from taxes				Revenue-sharing from natural resources				
		(DBH Pajak)				(DBH SDA)				
		Income tax (PPH)	Land and building tax (PBB)	Land transfer tax (BPHTB)	Total shared revenues	Oil and gas	Fisheries	Forestry	General mining	Total shared revenues
Average	57,959.6	10,198.9	89,901.0	14,555.8	114,655.7	161,027.2	2,063.1	27,032.5	66,483.6	256,606.4
Minimum	329.6	421.9	3,719.2	602.2	4,743.3	0	85.3	0	0	162.4
Maximum	772,196.2	136,183.9	1,200,433.0	194,361.2	1,530,978.2	7,607,208.2	27,548.1	1,465,057.4	4,342,811.1	9,014,550.1
Median	37,335.7	6,806.0	59,993.1	9,713.4	76,512.5	104.3	1,376.7	1,530.8	325.6	12,094.6
Standard deviation	75,261.0	12,637.1	111,393.6	18,035.7	142,066.4	652,169.0	2,556.3	103,071.6	284,363.8	808,650.2

Source: Own calculation, data from MOF.

Notes: (1) Per capita own source revenue derived from 2006 revenue data and 2005 population data.

(2) Reforestation fund is not presented, due to data inavailability.

The per capita disparities of fiscal capacity are shown in Table 3.3 (at the province level) and Table 3.4 (at the local level) in 2008. At the provincial level, revenues from land and building tax show an unequal distribution that is slightly higher relative to other tax revenues. As can be seen from the magnitude of its variation, this tax explains much of the aggregate disparities in shared-revenues from taxes. Further, disparities are more obvious in natural resource-based revenue-sharing. The origin of such disparities results primarily from the variations in oil and gas revenues.

At the local level (see Table 3.4), own source revenue and revenue shared from taxes appear to follow the same tendency compared to the provincial level. The per capita disparities in natural resource revenue-sharing, however, are higher at the local level. To put this into perspective, a maximum per capita shared revenue of 7.6 million IDR, compared to that of 0.8 million IDR at the provincial level was recorded in 2008 for the revenues from oil and gas. Although less than the shared revenues from oil and gas, the per capita shared revenues from general mining are relatively high (4.3 million IDR). The explanation of relatively high total shared-revenues at the province level rests largely on both of these. It is noteworthy that the arrangement of natural resource revenue-sharing allocates a larger share to the local than the provincial level (see Table 3.7).

We have elaborated on a general-purpose transfer, including the fiscal gap formula and its elements. But how exactly is the final DAU allocated? We now turn to the process of DAU allocation.

3.3.1.3 The iteration process of DAU allocation

In this section the iteration process for determining DAU will be highlighted. As indicated already, the allocation of DAU is a product of the fiscal gap approach and the basic allocation for a given jurisdiction i in year t . The fiscal gap represents the difference between the fiscal need and the fiscal capacity, whereas basic allocation is the salary expense of the jurisdiction concerned. The determination of the final DAU takes the following major steps.

- *First step:* This step reflects the crux of the fiscal gap approach through which the capacity and the need of a jurisdiction to perform a certain level of public provision will be equalized. In principle, if a jurisdiction has a higher fiscal need than its fiscal capacity, it becomes entitled to receive a transfer (DAU_{it}) in order to bridge its fiscal gap and pay its salary expense. If otherwise is the case, that is if its fiscal capacity is higher than or equal to its fiscal need, the transfer this jurisdiction receives will refer to the amount based on the DAU formula ($DAU_{it}^{formula}$). A transfer of DAU_{it} takes into account the available DAU pool fund as well as the basic allocation for the province under study. 10 percent of the DAU pool is allocated for the province (while the remaining 90 percent are for municipalities and districts). As for the relations between the fiscal gap approach and the basic allocation, in practice the Indonesian transfer for general purpose applies different treatments as follows.⁸¹
 - (a) If the fiscal gap of a jurisdiction is larger than zero, it obtains a DAU transfer equal to the basic allocation plus the ensuing fiscal gap. Meanwhile, a jurisdiction whose fiscal gap is equal to zero receives a DAU transfer an equivalent of its basic allocation.
 - (b) In cases where a jurisdiction has a negative fiscal gap (namely, the fiscal capacity is greater than the fiscal need) then different treatments are applied. If a jurisdiction ends up in a negative fiscal gap and that amount happens to be lower than its basic allocation, then it receives a DAU transfer equal to the basic allocation after taking account of its negative fiscal gap. However, should the magnitude of a negative fiscal gap of such a jurisdiction be equal to or larger than its basic allocation then it is not entitled to a DAU transfer.⁸²
- *Second step:* In this step the question of interest is whether the DAU formula ($DAU_{it}^{formula}$) that a jurisdiction receives equals the final DAU it had in the previous

⁸¹ Art. 32 of Law 33/2004 and Art. 45 of Government Regulation 55/2005.

⁸² In conjunction with the theoretical discussions on the criteria of the fiscal transfer mechanism in Section 2.2.1.3, such differential treatments in this fiscal gap approach apparently intend to fulfill the criterion of incentive compatibility, namely, to facilitate an incentive structure for the improvement of local or regional fiscal capacity.

year (DAU_{it-1}^{final}). If the transfer is less than the amount it gained in the preceding fiscal year then a first adjustment measure is carried out through which an adjustment fund (X^I) is added to the formula-based DAU. This first adjustment aims at adjusting the DAU amount to the formula to ensure that the amount does not exceed the so-called anchor DAU (DAU_{pagu}).⁸³

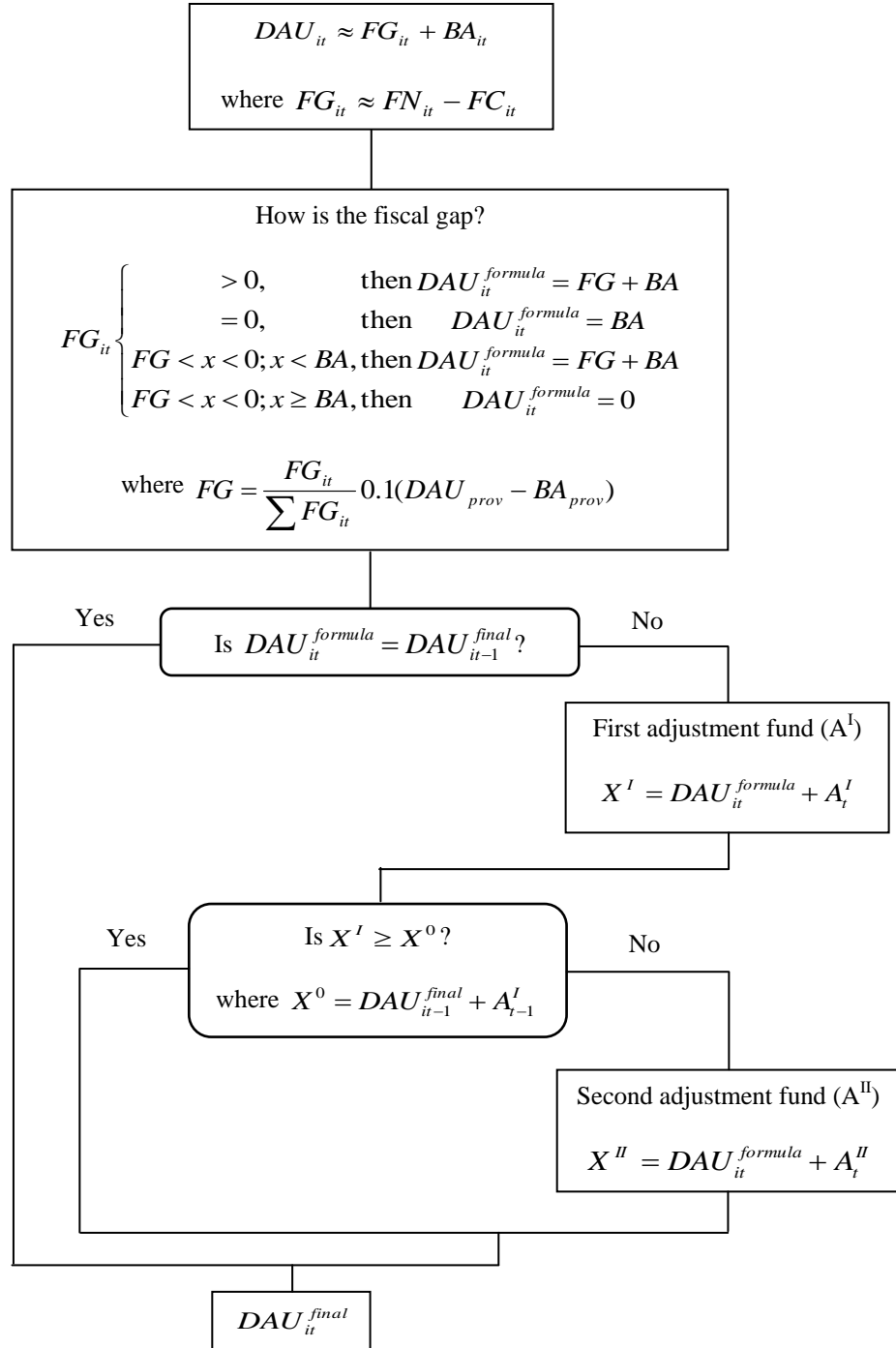
- *Third step:* The point of issue in this step is whether the amount derived from the second step (that is, X^I) is equal to the DAU transfer of the previous fiscal year including the adjustment fund that the jurisdiction received in that year (X^0). If the difference between the two results is a relatively lower amount of DAU with the adjustment fund, then another adjustment process ensues with the second adjusted DAU (X^{II}). This second adjustment intends to fulfill the condition of “hold harmless”, ensuring that a jurisdiction receives no less general-purpose transfer than it had received previously (cf. Section 3.3.1.1).⁸⁴ The group of provinces to which this hold harmless clause applies can be referred to as the “no harm group”, whereas the remaining provinces are referred to as the “formula group” (Fane, 2003: 165-166).

The iteration process of DAU allocation at the provincial level is redrawn in Figure 3.3. Notice that the adjustment fund, although it also applies to municipalities and districts, is given only to the province. Further it should be noted that at the local level, except for a number of differences in terms of parameters, the iteration process remains basically the same as for the provincial level. The variables of this iteration process related to the general-purpose transfer, basic allocation, fiscal gap, and adjustment fund, are described in Table 3.5.

⁸³ Anchor DAU = $\phi(DAU_{pool} + BA_{pool}) + BA_{it}$, whereby ϕ is the weight for allocation which is 0.1 for province.

⁸⁴ To a certain extent, the adjustment funds for “hold harmless” provision can be said to satisfy low sensitivity criteria of a rational fiscal transfer mechanism. The adjustment aimed at ensuring that the present transfer that a jurisdiction receives is approximately the same size as the sum in the previous fiscal year. It thus avoids a considerable change of fiscal transfer as a result of changes in its calculation (cf. Section 2.2.1.4).

Figure 3.3. The iteration process for DAU allocation at the provincial level



Source: Own figure.

Table 3.5. The variables in the DAU iteration process

Notation	Description
DAU_{it}	General purpose grant of jurisdiction i in year t
$DAU_{it}^{formula}$	Formula-based general-purpose transfer of jurisdiction i in year t
DAU_{prov}	Pool of funds available for general-purpose transfer for all provinces
DAU_{it-1}^{final}	The final general-purpose transfer for jurisdiction i in year $t-1$
DAU_{it}^{final}	The final general purpose fund of jurisdiction i in year t
BA	Basic allocation for salary expenses
BA_{it}	Basic allocation for salary expenses of public employees, of jurisdiction i in year t
BA_{prov}	Pool of funds available for basic allocation for all provinces
FG	Fiscal gap
FG_{it}	Fiscal gap of jurisdiction i in year t
FC_{it}	Fiscal capacity of jurisdiction i in year t
FN_{it}	Fiscal need of jurisdiction i in year t
X^I	Formula for the first adjustment fund
X^{II}	Formula for the second adjustment fund
X^0	Formula for the adjusted general purpose fund in year $t-1$
A_t^I	First adjustment fund for jurisdiction for year t
A_{t-1}^I	First adjustment fund for jurisdiction for year $t-1$
A_t^{II}	Second adjustment fund for jurisdiction for year t

3.3.2 Specific-purpose grant (DAK)

In addition to grants designed for general purpose, the transfer system possesses grants, which categorically belong to the special purpose grant, otherwise referred to as the DAK (Dana Alokasi Khusus). This serves the sole objective of financing specifically-defined programs undertaken by the regional government and declared as national priorities.⁸⁵ A program recipient jurisdiction provides 10 percent matching fund for the intended program of the priorities. Comparatively, DAK represents a minor share in Indonesia's intergovernmental transfer system. As can be seen in Table 3.2, the share of all DAK grants between 2001 and 2008 ranges from only 0.7 percent (minimum) to 8.1 percent (maximum) in the structure of the national budget for fiscal transfers both for the province and local governments.

The DAK allocation is established annually, referring to the so-called Government Work Plan (*Rencana Kerja Pemerintah*, or RKP) which is formulated in the current fiscal year and whose expenditure functions are stated in the national budget.⁸⁶ The work plan contains a set of development priorities to which the development sectors – the so-called DAK sector – in the specific grant would refer. Priorities and sectors are set yearly and may thus vary from year to year. In 2007, for instance, the sectors included education, health, public works, regional governance, maritime and fisheries, agriculture, and the environment. In that fiscal year, the environment sector was confined to the development priority of “improving natural resources management and nature conservation” (see Usman *et al.*, 2008: 13).

There are three criteria for DAK allocation: general, specific, and technical criteria. Figure 3.4 illustrates these criteria. The general criterion is based on the net fiscal capacity of a jurisdiction, which is derived from a fiscal index.⁸⁷ The special

⁸⁵ Art. 39, Sub-Art. 1, Law no 33, 2004 and Art. 51, Sub-Art. 1, Government Regulation 55, 2005.

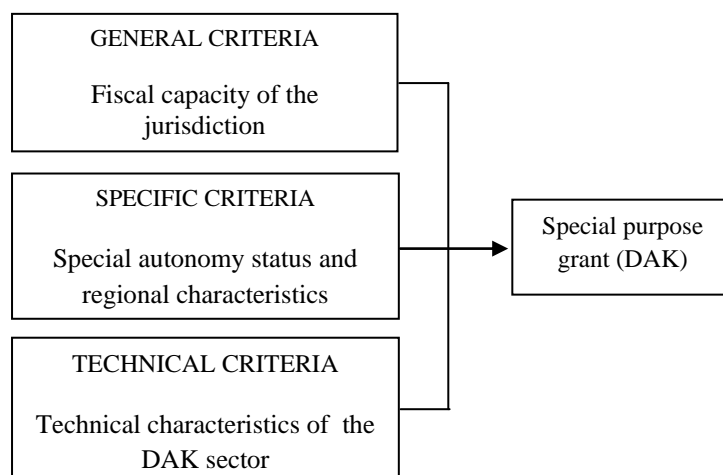
⁸⁶ Art. 52, Sub-Art. 1, Government Regulation no 55, 2005.

⁸⁷ Art. 40, Law 33, 2004, and Art. 54-57, Government Regulation no 55, 2005. Note that fiscal capacity in the DAK general criteria differs in operational meaning from fiscal capacity as it is applied in the fiscal gap formula of the DAU calculation. While the latter is the sum of own source revenues and shared revenues, the former also incorporates DAU transfers alongside that of own source resources and shared revenues (without the reforestation fund). On this, see Government Regulation 55, 2005, Art. 55.

criterion entails two considerations. First the special autonomy status, namely the autonomy, the scope of which is broader than that offered by the regular decentralization nationwide, enacted and given to the provinces of Aceh and Papua. The second consideration relates to regional characteristics. Islands and coastal zones, cross-border areas, underdeveloped and isolated regions, areas struck by floods or landslides, food insecurity, or tourist areas, for example. The decision on indicators of specific criterion is taken on a yearly basis, in line with the national development policies.

The third criterion – the technical one – is particularly concerned with infrastructure characteristics. The indicators, the technical index, and the weighting for each sector, are resolved by the technical departments or related national ministries. In the end, the derivation of the total amount of DAK that a jurisdiction receives is a function of fiscal, regional, and technical indices, as well as technical and regional weightings.

Figure 3.4. The criteria for DAK allocation



Source: Own figure.

3.3.3 Revenue-sharing fund (DBH)

The main objective of revenue-sharing (*Dana Bagi Hasil*, or DBH) is first and foremost to address the problems of fiscal imbalances both vertically between the central and regional governments and horizontally across regions. Besides, revenue-sharing

responds in part to regional aspirations for increased access to, and greater control over certain revenues which epitomizes the essence of regional autonomy. Such aspirations hold especially true in the case of oil and gas revenues (see Sidik and Kadjatmiko, 2004: 148; Hofman and Kaiser, 2004: 29; Lewis, 2002: 147).

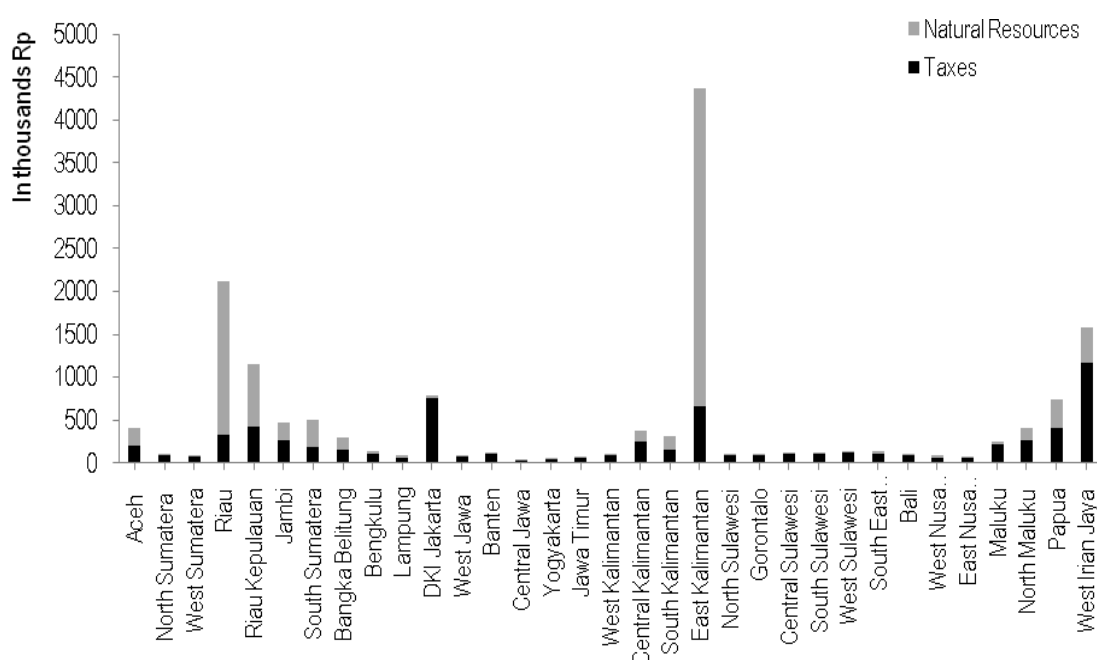
In 2001, immediately after decentralization was in full swing, shared revenues accounted for around 25 percent of the national expenditure budget for fiscal transfers for regional governments, as Table 3.2 shows. In that fiscal year, shared revenues made up around 22 percent in the structure of local government revenues (Table 3.1). At a closer look however, the most important shared revenues turn out to be natural resources (13 percent). Property tax (7 percent) came second, followed by income tax with 3 percent (Lewis, 2002: 146, Table 2). In 2007, the share of revenue-sharing from the total national expenditure was approximately 9 percent (as opposed to 6.6 percent in 2001) and its share of the country's GDP was 2 percent (Usman *et al*, 2008: 23, Table 3.1).

Indonesia's share of revenue from natural resources in GDP is particularly large. At around 10 percent, the country's share is about five times higher than the international median (Bahl and Tumennasan, 2004: 200). In the first years of decentralization, the fiscal transfer mechanism basically ignored natural resource revenues when determining the fiscal capacity of a given region, as argued by Lewis (2001).⁸⁸ Indeed, as Table 3.1 demonstrates, this revenue represents a significant portion; a windfall gain for local governments whose budgets receive large amounts of revenue-sharing from natural resources. The mechanism has evolved, however. After years of various experiments in establishing components and a complex weighting system, as of 2006 the determination of fiscal capacity is fully weighted and turns into a function of own source revenue, shared revenues from taxes as well as natural resources (see Hofman *et al*, 2006: 34).

⁸⁸ In the formula of 2001 it was not natural resource revenues but a natural resource index. The latter represented the local share of natural resources in GRP in relation to its national proportion and was used along with other indices to estimate the fiscal capacity of a jurisdiction (see Lewis, 2001: 328; Brodjonegoro and Martinez-Vazquez, 2004).

The composition at the provincial level of revenue-sharing between taxes and nature resources in 2007 is illustrated in Figure 3.5, counted in per capita unit.⁸⁹

Figure 3.5. Per capita shared revenues from taxes and natural resources
for provinces in 2007



Source: Own figure, data from MOF.

The figure highlights that a large number of provinces' shared revenues are predominantly from taxes. In terms of nominal tax shared revenue, the relatively less populated West Irian Jaya has the highest revenue (1.2 trillion IDR), and benefited

⁸⁹ Notice that it is based on per capita revenue under revenue-sharing arrangement for the province, not the aggregate realization of provincial revenue from taxes and natural resources. Additionally, although any interpretation should be restricted to that particular year (i.e., 2007), a longer dataset for post decentralization (i.e., 2002-2008) suggests that the broad pattern of per capita shared revenue appears in general to remain the same.

largely from resource-based related tax revenues. Meanwhile, densely populated Jakarta comes second (0.76 trillion IDR), followed by East Kalimantan (0.66 trillion IDR). In terms of revenue proportion, Banten, Yogyakarta and Bali belong to the group with the highest proportion – 99 percent of their shared revenues are from taxes. The figure exposes that some provinces appear to be more equal than others in terms of revenue-sharing from taxes. However, in terms of shared revenues from natural resources the pattern shows a rather distinct differentiation as the high proportion of such shared-revenues suggests in the cases of East Kalimantan and Riau.

As Figure 3.5 depicts, in terms of nominal revenue, East Kalimantan has the highest shared revenue (3.7 trillion IDR), outnumbering all other provinces. Riau was also one of the highest (1.8 trillion IDR), followed by Riau Kepulauan (0.7 trillion IDR) and West Irian Jaya (0.4 trillion IDR). In light of the revenue proportion, East Kalimantan has the highest proportion (84.7 percent), followed by Riau (84.3 percent). In addition to these provinces, Riau Kepulauan, South Sumatera, South Kalimantan and Aceh belong to provinces with rich natural endowments, and half or more than half of their income from shared revenue is derived from natural resources. In the following we deal with these two types of shared revenues in a more detailed description.

3.3.3.1 Shared revenues from taxes

At present there are three sorts of revenues from taxes, which are shared between the central, provincial and local governments: the property tax, land rent and personal income tax.⁹⁰ Property tax includes taxes on land and building, land rent is basically a property transfer tax, whereas revenue from income tax is derived from three different personal income taxes.

⁹⁰ For a detailed explanation on revenue sharing from taxes, see Art. 12 and 13, Law 33/2004 and Art. 9-14, Government Regulation 55/2005.

Table 3.6. The instruments and tax revenue-sharing arrangement (in percentage)

Source of revenue	Central government share	Provincial government share	Local government share		
			Share for resource-producing government	Equal share to localities in the same province	Equal share for all localities
Property tax	10	16.2	-	64.8	-
Transfer tax on land and building	-	16	-	64	20
Personal income tax	80	8	-	12	-

Source: Own table, based on Law 33/2004 and Government Regulation 55/2005.

Notes: (1) There is a collection fee (of 9 percent) in the sharing arrangement for property tax.

(2) From the 10 percent of the central government's share of property tax, 65 percent of this is equally distributed to all municipalities and districts across the nation. The remaining 35 percent is for municipalities or districts whose previous year's property tax realization exceeds a certain targeted level.

By derivation principle, the central government receives 10 percent of the property tax, and a large part of personal income tax (80 percent). However, it does not receive any share from land rent. The provincial government receives revenues from all shared taxes, but with a considerably smaller proportion compared to those of the central and local governments. The municipalities or districts receive 64.8 percent of the property tax and 64 percent of the land rent. Furthermore, 20 percent of the land rent is shared equally between all local governments in Indonesia. A small collection fee is imposed on property tax (see Table 3.6).

3.3.3.2 Shared revenues from natural resources

The revenue-sharing in this scheme comprises ten different kinds of instruments pertaining to revenues from natural resource taxes or levies. The revenues are derived from forestry, fishery and mining activities such as general mining, oil, natural gas and geothermal. Table 3.7 lists the instruments across provinces and local governments.

As can be seen from the Table, the central government receives a large proportion of oil and natural gas revenues (84.5 and 69.5 percent, respectively), whereas its share from the remaining instruments is no more than 20 percent. With a share of 16 percent from nearly all instruments, the provincial government receives relatively smaller revenues compared to the central and local governments. It receives a minor share of oil and natural gas revenues (3 and 6 percent each) while the local governments – both the jurisdiction with the oil and gas reserves and the local governments within the same province – receive 6 and 12 percent of the share. The provincial level also does not receive any revenues from the reforestation fund or from fishing and fishery products. These sharing arrangements seem to confirm a declining role of the provinces in terms of intergovernmental fiscal relations compared to their previous standing prior to decentralization, as stated in Section 3.1.

At the local government level, the pattern of sharing arrangements is less straightforward. The share varies from one to another instrument. Local governments receive a high share of 64 percent from the revenues of forestry right and of land rent in mining areas, if they are the resource-producing jurisdiction. Resource-producing local governments get a 40 percent share of the reforestation fund. In the case of forestry resource commission, geothermal, and royalties from general mining sector, these jurisdictions receive a lesser share of 32 percent. As Table 3.7 indicates, the other 32 percent of these shared revenues are equally distributed to localities in the same province.

The distribution of shared revenues takes two forms, namely, by derivation and as an equal amount across the jurisdictions. At the local level an additional equalisation feature is also introduced into the current transfer system in that an equal share of the revenues from natural resources is assigned to (a) the producing local government, (b) to the other non-producing local governments within the same province, and (c) in the case of levies from fisheries, 80 percent of the revenue is shared between all the local governments in the country. The reforestation fund, which prior to decentralization was channeled by means of the specific-purpose transfer, that is the Inpres grant, has now been shifted into the scheme of revenue-sharing transfers to central and local governments, where forest-covered areas are located.

Table 3.7. The instruments and natural resource revenue-sharing arrangement
(in percentage)

Source of revenue	Central government share	Provincial government share	Local government share		
			Share for resource-producing government	Equal share to localities in the same province	Equal share for all localities

<i>A. Renewable natural resources</i>					
Levy on forestry rights to operate	20	16	64	-	-
Forestry resources commission	20	16	32	32	-
Reforestation fund	60	-	40	-	-
Levy on fishing companies	20	-	-	-	80
Levy on fisheries output	20	-	-	-	80
Geothermal revenue	20	16	32	32	-
<i>B. Non-renewable natural resources</i>					
General mining sector receipt:					
Land rent	20	16	64	-	-
General mining sector receipt:					
Royalties	20	16	32	32	-
Oil revenue	84.5	3	6	6	-
Natural gas revenue	69.5	6	12	12	-

Source: Own table, based on Law 33/2004 and Government Regulation 55/2005.

Notes: (1) The law does not distinguish between renewable and non-renewable resources; it is added.

(2) In the table, the total percentage of shared-revenues from both oil and natural gas does not add up to 100 percent as their hidden 0.5 percents are allocated for elementary education at the regional level.

3.4 The financing of environmental expenditures and ecological public functions

The fiscal transfer system in Indonesia both before and after decentralization started in 2001 was discussed in the preceeding sections. Now we turn to the treatment of environmental issues in the fiscal transfer system prior to decentralization, during transition, and in the current process of decentralization. The points highlighted in the

existing rules of integrating environmental aspects in the fiscal system will serve as a basis for Chapter 4 in which options to extend the fiscal transfer schemes incorporating environmental-related elements are explored.

3.4.1 Before decentralization

As noted, in the time before decentralization the ensuing financing of environmental expenditure occurred mainly through conditional transfers that were project-based and directed both at the provincial and local levels. These took place by means of the reforestation and conservation grant, which was introduced in the mid 1970s (Booth, 1996a: 77). Whereas reforestation programs were activities to be carried out on government-owned forest land, covering over 90 percent of the total forest area, regreening programs by contrast were on privately-owned land, primarily in Java (Gillis, 1988: 61). The grants were distributed on a project-basis to both provinces and local governments. Three criteria were counted in such a project, that is, the land area to be regreened, the area to be conserved and the field staff it required (Shah and Qureshi, 1994: 65).

The year 1978 should be mentioned if one is to understand Indonesian history of advocacy for the natural environment, as the specialized Ministry for Development Supervision and Environment was established in that year (Hardjono, 1991). Amidst massive forest destruction due to the demand for timber export, the Ministry played a crucial role in turning the rainforested areas in Kalimantan and Sumatera (20 percent and 27 percent of total forest area, respectively) into Nature Conservation forests, in the period from its founding in 1978 until 1982. Nature reserve areas were expanded by the factor of four and a half, and wildlife refuges and tourist parks were tripled (see Gillis, 1988: 84). Throughout the country, numerous national parks and protected areas were also established from that point on (MacAndrews, 1994). In 1980, one started to impose a reforestation guarantee deposit (*Dana Jaminan Reboisasi dan Permudaan Hutan*) on timber loggers. This deposit was to be refunded on the condition of reforestation measures undertaken by the concessionaire on logged areas. In 1989, this deposit was converted into a nonrefundable fee, renamed *Dana Reboisasi* or Reforestation Fund, a tax on timber based on cubic meters (see Ross, 2001: 186).

As can be seen in Table 3.8, in the period between 1987 and 1994 there was an increasing tendency regarding the nominal transfers available for a greening grant, before these experienced a sharp drop and later on slowly increased in the fiscal years that followed.

Table 3.8. Transfers for greening and reforestation, 1987-1994.

	1986/ 1987	1987/ 1988	1988/ 1989	1989/ 1990	1990/ 1991	1991/ 1992	1992/ 1993	1993/ 1994
Transfers for greening and reforestation								
Nominal (in billion IDR)	41.3	15.9	16.2	16.2	33.1	74.6	97.3	104.3
% of all specific-purpose transfers	1.3	0.5	0.5	0.4	0.6	1.2	1.3	1.2
% of specific-purpose transfers without SDO	6.2	5.1	4.0	3.0	2.6	4.1	4.3	4.0
% of all transfers (general and specific)	1.1	0.4	0.4	0.3	0.5	0.9	1.0	1.0

Source: Own table and calculation, data is from Qureshi (1997), Table 11.1, p. 297.

Notes: (1) The symbol “/” refers to a fiscal year that spans two calendar years.

(2) SDO refers to a compilation of grants which was largely for staff expenses.

In the consecutive years, after a drastic decrease between the fiscal years 1993-1994 and 1994-1995, the total yearly Inpres grant for greening had been steadily increasing. In billion IDR, it was 82.5 (in 1994/95), 88.9 (in 1995/96) 99.7 (in 1996/97), and 99.7 (in 1997/98).⁹¹ The criterion of field staff for grant eligibility was introduced for the first time in 1992/1993, in addition to the existing land area-related indicators.

Moreover, it is worth noting that from 1987 to 1994, grants allocated for greening and reforestation accounted for 0.4 to 1.3 percent of all specific-purpose transfers. If transfers for staff expenses (that is, SDO) are excluded from the category of

⁹¹ From Silver *et al.* (2001), Table 2, p. 353.

specific-purpose transfers, then the reforestation grant would be 6.2 instead of 2.6 percent. It was between 0.3 and approximately 1 percent of all transfers from central to local governments over that period. In 1997/1998, in a time before the centralized system gradually came to an end, the environmental impact assessment related to solid waste, drainage and waste water, was introduced as a program financed through the earmarked Inpres grant (Silver *et al.*, 2001: 352).

Table 3.8 warrants some further notes. The table shows, perhaps counterintuitively, that the specific-purpose transfer represents a larger proportion than that of the general-purpose transfer. Possible explanations include the way in which transfers were structured at the time when INPRES of general purpose were categorized as specific purpose. Another possibility is that it suggests a degree of centralization; namely, the higher the proportion of specific transfers, the higher the role of the central government. The reforestation and greening grant did not meet the target of increasing forest cover, nor did the program aim at an appropriate spatial position of forest area. All the reforestation efforts notwithstanding, the results were questionable (Gillis, 1988: 62). Gillis contends that between 1946 – after the country's independence – and 1983, reforestation programs had covered about 20 percent of deforested area. However, in the following period, until the end of the 1980s, the deforestation rate turned out to be higher than the reforestation rate. The cause was apparently related to the survival rates of planted trees, which were only 72 and 54 percent in Sumatra and Kalimantan, respectively.⁹² The location of the reforestation program, for instance in terms of virgin forest, was also decisive for the expected results. Since 1968, the concentration of deforestation had been in Kalimantan yet only 1 percent of the area was reforested as of 1983 (Gillis, 1988: 62).

Although lacking in their documented details, ecological public functions were also performed by different public agencies outside those of ecological public activities carried out by the environment agency. For example in 1993, such public functions included land zoning, forestry seed programs, urban water supply, surface water

⁹² Optimistic figures on reforestation results should be perceived with caution. For example, as Williams (2006) argues, in the tropical forests where trees are relatively more difficult to propagate in comparison to cool coniferous forests such as in Canada or Scandinavia, replanting might not offset forest depletion.

drainage, flood prevention, sanitation, solid waste collection and disposal, and fire prevention (Shah and Qureshi, 1994: 20, Table 2.1).

3.4.2 The transition period and the present

A conceivable description about financing environmental expenditure in the transition period to the present may touch on two dimensions. First, how the public finance of the environment at that particular transitional period appears to be. Second, how the instruments of ecological fiscal transfers have evolved. Admittedly, the term transition and its definition may pose difficulties here. A “big bang” decentralization in 2001, ensuing a regime change in 1998 and the devastating economic crisis in 1997, may certainly mark a qualitative shift but the process is extensive and organic. However, for instance in the early 1990s some initiatives for more regional autonomy had been introduced, although in a piecemeal way and under the best conditions that a centralized system of that time would allow.⁹³ Therefore, a transition period was to take on a rather broad definition including an extended time span from a centralized to a decentralized system.

As for the financing of environmental public functions, the following account sheds some light on the approximate state during the transitional period in Indonesia.

“During the period 1994-1999, public expenditure for environmental services has been generally low in Indonesia. In FY98-99, expenditure of domestic resources on development projects with environmental objectives was only about a third of the level in FY 94/95. This caused environmental expenditure to fall from 0.9 percent of the overall development program to 0.5 percent, and from 0.04 percent of GDP to less than 0.02 percent. These percentages were already lower than in other East Asian crisis countries before the crisis, and the declines were greater. *Most worrisome in light of decentralization is evidence that expenditure fell more in the regional budget than in the national budget*” (World Bank, 2001: 81, italics supplied).

⁹³ Smoke and Lewis (1996) and Beier and Ferrazzi (1998) discuss some of these initial efforts and initiatives.

Two pertinent issues arise from this description. First, the relative budget is small, as various measures and comparisons suggest. Out of this already relatively small and declining public expenditure, a closer look at the content of the environmental expenditures reveals another aspect of concern. In their review of public environmental expenditures in Indonesia, Vincent *et al.* (2002) argue that first most spending in the nominal environmental sector is on non-environmental activities, ones whose sole purpose are not aimed at providing environmental public provisions or addressing negative environmental externalities.⁹⁴ Second, regional governments bear more from the decline because of the economic crisis. Since the crisis in 1998, environmental expenditures at this government level suffered deep cuts. At the same time, however, the amount of budget share for the central government had increased (World Bank, 2001; Vincent *et al.*, 2002).

The decentralization has also lent local governments a greater revenue-raising and decision-making power with some fundamental consequences. For example in the case of forest management, where provincial and district governments have issued numerous forest concession permits, allowing the “illegal” logging sector to become “legal”, in exchange for generating revenues from taxes. In this case, “autonomy” is replaced with “automoney”, to use Casson and Obidzinski’s (2002: 2137) contrasting expressions which appear to aptly capture recent developments under regional autonomy and fiscal decentralization. In fact, the forestry sector has always been a crucial revenue source. Resosudarmo *et al.*, (2006: 62) point out that, for example, prior to decentralization three important taxes and levies in this sector included (1) the levy on the forestry right to operate (*Iuran Hak Pengusahaan Hutan*, HPH), (2) forest resources rent provision (*Provisi Sumber Daya Hutan*, PSDH) or earlier known as forest product royalties (*Iuran Hasil Hutan*, IHH), and (3) the Reforestation Fund (*Dana Reboisasi*). HPH constituted a timber concession area-based, single-paid levy which was paid at the time the timber concession was first issued or renewed. PSDH was a commission paid on the basis of volume on each cubic meter of harvested timber. Dana Reboisasi was a fee paid on a volume-basis for each cubic meter of harvested timber. Notice that all of these

⁹⁴ However, Vincent *et al* also reveal that a substantial amount of environmental expenditure are to be found in other sectors whose primary functions are categorically non-environmental.

three revenue instruments continue to exist under the decentralization period, as can be seen in Section 3.3.3.2 on shared-revenues from natural resources.

Turning to the intergovernmental fiscal transfer for environmental public functions, the evolution appears to show both continuity and change. One may anticipate that the latter is driven more by the restructurization of the country's fiscal transfer system, and less by the change in substance of the fiscal instrument. As aforementioned, the transfer for such purposes is presently under the specific-purpose grant, namely the DAK Environment. It "upholds" the former practice; prior to decentralization the financing of the environment took the form of a specific-purpose grant, predominantly by means of a conditional Inpres grant for greening and afforestation, including land conservation. Notice, however, that the so-called specific-purpose fund for reforestation prior to decentralization was in principal that what now emerges as *Dana Reboisasi*, a revenue-sharing scheme.

An important change occurred over the first years of decentralization. Earlier in that period, in the fiscal years 2001 to 2002, the specific-purpose transfer consisted exclusively of the DAK environment – an earmarked conditional grant (Hofman and Kaiser, 2004: 27, Table 2.1; Sidik and Kadjatmiko, 2004: 154). As such, an analytical separation between DAK environment and revenue-sharing for reforestation (i.e., *Dana Reboisasi*) thus proves to be difficult since both instruments were lumped together. At a later period, between 2003 and 2005, the DAK transfer had been categorically documented separately between (a) all specific-purpose grants and (b) specific-purpose grants for reforestation (*Dana Reboisasi*). After decentralization, fiscal transfers for the environment evolve to two more established and distinct fiscal transfer instruments. One is the DAK environment, which is distributed under a specific-purpose grant, and the other one is the Reforestation Fund, which is a grant under the revenue-sharing scheme.⁹⁵ The DAK Environment is a conditional grant on an annual basis, the presence of which is contingent upon the so-called Government Work Plan, which sets the central

⁹⁵ The change of status of the Reforestation Fund (from a DAK transfer to a revenue-sharing scheme) is in accordance with the adoption of Law 33/2004 issued in October 2004. Yet the law was in effect somewhat later. This lagged time explains why in 2005 the fiscal documentation of the Reforestation Fund was still under a DAK transfer.

government's development priorities, and has included the environment over recent years. The Reforestation Fund is derived from a payment from companies extracting forest and nature in the form of timber products. The switch of the Reforestation Fund from a DAK transfer to a revenue-sharing scheme is intended in part to facilitate a more efficient allocation to regional governments along those of other shared-revenues related to forestry (Barr *et al.*, 2010: 36). The revenues from the Reforestation Fund at present are directed solely towards financing reforestation, forest rehabilitation, and public functions related to forest conservation. Abiding by the arrangement of revenue-sharing, the Reforestation Fund is distributed to central and local governments upon the basis of forest location. The sharing arrangement is 60 and 40 percent, respectively, as Table 3.7 showed earlier.

Section 3.4 has elaborated on the treatment of ecological aspects in the intergovernmental fiscal relations in Indonesia and two broad conclusions can be drawn from this. First, over the period under study, this section reveals that ecological dimensions have been incorporated into the structure of the country's intergovernmental fiscal transfers in response to the country's increasing needs for ecological public functions. The presence of the Reforestation Fund to indirectly consider the negative externalities from timber-based forest extraction is a case in point. The other case is the existence of land area or forest area in the allocation mechanism of some fiscal transfer instruments. Second, this section also reveals that both the extent and magnitude in which ecological aspects are treated in intergovernmental fiscal transfers are still limited. The extent of instruments for ecological fiscal transfers are based only on a limited scope of specific-purpose transfers and revenue-sharing arrangements. The magnitude of fiscal transfers for ecological purposes is relatively speaking negligible.

Chapter 4 will propose a number of policy options for ecological fiscal transfers. These are drawn from the options permitted by the existing fiscal institutions of the Indonesian intergovernmental fiscal transfers, which were discussed in Chapter 3, and will be built upon the insights from theoretical foundations of fiscal transfer as well as the practices and the proposals of ecological fiscal transfers as elaborated in Chapter 2.

CHAPTER 4

Policy options for ecological fiscal transfers

This chapter presents the policy options for ecological fiscal transfers. In order to be of relevance any proposal with policy options needs to comply with the embedded institutional context within which the policy is to be implemented. The context is equally important as theoretical abstraction. Discussions in the previous chapters have provided a conceptual framework drawing on the theoretical review and the foundations of policy options (Chapter 2). The discussion also highlighted the Indonesian context of the intergovernmental fiscal transfer system (Chapter 3). The present chapter serves as some kind of convergence between these discussions and proposes a number of policy options for ecological fiscal transfers.

The proposals for ecological fiscal transfers are principally based on three policy options. Section 4.1 illustrates the first option. With this option an explicit ecological indicator is introduced into the structure of the fiscal need formula in the calculation of general-purpose transfers, the DAU. Here, the protected area indicator is proposed as a plausible proxy for an ecological indicator. Section 4.2 is devoted to the second option related to the revenue-sharing arrangement, the DBH. This section distinguishes between shared revenues from taxes and from natural resources. Assigning a proportion of shared revenues from taxes on the basis of ecological considerations is the first of two policy sub-options (Section 4.2.1). The other sub-option suggests earmarking of shared revenues from natural resources to finance environmental public purposes (Section 4.2.2). The third policy option, presented in Section 4.3, concerns the specific-purpose transfer for the environment, the DAK environment. It intends to extend the existing DAK environment by having more ecological public functions as its features. Section 4.4 summarizes the entire policy options by emphasizing again the potential incentive effects as well as the allocative and distributive dimensions.

Finally, by broadening proposals beyond options only available in the context of the national level, in an excursus this chapter discusses a global discourse, which is of

relevance to the Indonesian system of ecological fiscal transfers, with particular reference to global fiscal mobilization in relation to climate change in Section 4.5.

4.1 The incorporation of ecological indicators into the fiscal need formula

The general-purpose fund (DAU) is allocated across jurisdictions partly through the so-called fiscal gap approach, as noted earlier. This approach principally intends to close – at least to a certain extent – the difference between the fiscal capacity and the fiscal need of a jurisdiction, and is often formula-driven. In Indonesia, the fiscal capacity formula takes account of weighted values of own-source revenues, and of shared revenues from both taxes and natural resources. The fiscal need formula is a function of average expenditure and a number of socio-economic indicators. The latter consists of population, area (land and marine), the human development index, economic potential, and the cost index.

The incorporation of an explicit ecological indicator into the fiscal need formula is the proposed policy option; as noted, the existing official formula invokes only social and economic dimensions. The proposal hinges on the recognition that the ecological dimension has hardly been considered in the calculation of a jurisdiction's spending requirement. The introduced indicator might comprise ecological attributes such as, yet not limited to, the protected areas of both terrestrial and marine systems.⁹⁶ The new formula of fiscal need can then be defined as:

$$FN_i = \left[\left(\alpha_j \frac{\beta_{ih}}{\beta_h^*} + \dots + \alpha_m \frac{\beta_{in}}{\beta_n^*} \right) + \left(1 - \sum_j^m \alpha_j \right) \frac{E}{E^*} \right] \delta, \quad \forall i \quad (4.1)$$

This formula has two main parts. The first term represents the existing socio-economic indicators, whereas the second one is the suggested ecological indicator including its

⁹⁶ For investigations on fiscal transfer allocation with various ecological indicators see the following literature: protected area (Ring, 2008b), biodiversity index (Köllner *et al.*, 2002), forest, mangrove and tree covers (Kumar and Managi, 2009), ecosystem threats, water use, water quality, and landscape health (Hajkowicz, 2007), and landscape area type and nature conservation (Perner and Thöne, 2005). Section 2.3.3.2 discusses these investigations in greater detail.

parameter. In this equation, FN denotes the fiscal need of jurisdiction i (whether it be a province, municipality, or district). The socio-economic indicators of the jurisdiction are denoted by β_{ih} , where $h= 1,..n$, and $\beta_h^*, ..., \beta_n^*$ are the average across jurisdictions of respective indicators for the region. The parameter of indicator h is given by α , where $\sum_j^m \alpha_j \leq 1$. E refers to the newly introduced ecological indicator of a given jurisdiction and E^* stands for the average of the ecological indicator across all relevant jurisdictions. Finally, δ denotes the average expenditure nationwide.

In addition to balancing disparities in fiscal capacity and the level of public service provision, which belong to the primary impetus for formula-driven allocation (e.g., Bahl and Linn, 1992: 441), the incorporation of a straightforward ecological indicator in the allocation of general funds would reflect simultaneous considerations of (i) the ecological expenditure needs of a region and (ii) its capacity to finance spending and to deliver ecological public functions. An implementation of the latter is likely to include cases of jurisdictions of ecological importance and yet falling short of fiscal capacity (i.e., the consideration of a tax base).

Formula-driven allocation might also enhance transparency (e.g., Schroeder and Smoke, 2002: 26) through which the recipient jurisdiction is able to identify the size of the transfer, the socio-economic and ecological characteristics of the region, as well as the mechanism of its distribution. If this is the case, then by introducing a formula-based ecological fiscal transfer we should observe the likelihood of the following two effects: First, the presence of an ecological indicator in the calculation of fiscal needs could induce awareness of the jurisdiction in the design of its environmental public expenditure. Second, the formula includes the expected stability and predictability of the transfer that a jurisdiction will receive in the forthcoming fiscal year. This should enable the jurisdiction, for example, in the planning of more sustained, less *ad hoc* ecological public functions.

A general-purpose fund is a lump sum transfer. This is precisely one of the limitations of this option. The decision on the use of the received lump sum, the disbursement of which employs the fiscal need formula, lies in the hands of subnational and local governments. They may (or may not) spend the allocated general-purpose

grant for ecological purposes. Unless there are credible commitments to conservation and sustainability from the side of the decision makers, and/or there are local dynamics within their jurisdiction demanding ecological considerations to be taken into account, the effectiveness of achieving particular intended ecological outcomes may be restrained. To ensure that the envisioned ecological considerations are optimally acknowledged, this option is although necessary still insufficient. Furthermore, this option may not be entirely persuasive in terms of data availability. In fact, this is a prominent problem surrounding formula-based transfers especially in developing countries where timely and sufficient data are often lacking (e.g., Bahl and Linn, 1992: 5-7). Although it is arguable that in general the socio-economic data (e.g. population, area, domestic product, etc) in Indonesia are updated on a regular basis, ecological data are comparatively more difficult to update (here data on carbon capture springs to mind as one dramatic example). Such data limitation may render this policy option less operational. For this reason, the ecological indicators that are considered should be rather simple and easy to retrieve and update.

As is often the case in reality, however, transfers on a formula basis employ simple data by which a proxy for a particular fiscal need can still be guaranteed. The proportion of protected areas in a given jurisdiction (relative to the overall area of the jurisdiction and/or overall protected areas) may be one plausible proposal. In public finance the area-based approach constitutes a first step towards acknowledging public functions with ecological dimensions (Ring, 2002: 422). Although indirectly, the importance of this approach concerns land uses for various ecological functions such as for forestry or as habitat for endemic or endangered species. The relative territorial size of a jurisdiction as well as the population density and proximity to an urban agglomeration, all of which impinge on per capita fiscal capacity and the cost burden for financing local public functions, are considerations underpinning the importance of an area-related approach (Ring, 2002: 422). On the archipelago of Indonesia, embracing protected areas as an ecological indicator should naturally include marine and coastal protected areas as well as those of terrestrial systems.

A dilution of incentive appears to be intrinsic in any formula-based transfers. An additional number of protected areas may result in an increasingly smaller average DAU

revenue. Eq. (4.1) suggests, however, that the incentive effect would depend on the parameter value of the protected area indicator as well as on the changing slot of the DAU pool fund. As such, the problem turns out to be inherent in any formula-based transfers. Hence, arguing that over time a DAU transfer based on the protected area indicator would decrease is comparable to arguing that the incentive for a jurisdiction to increase its fiscal capacity would decrease given an increase in GRDP.

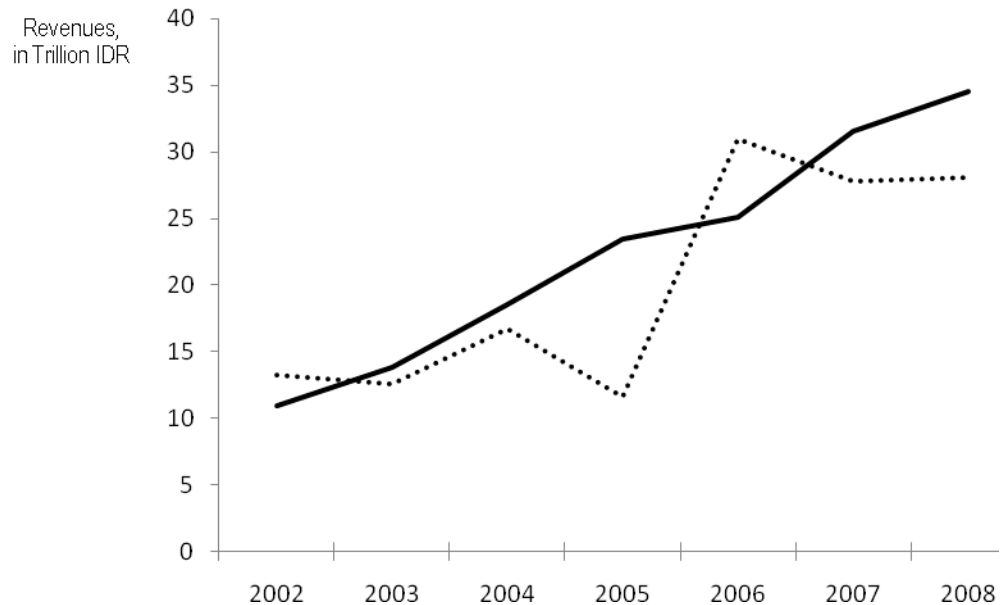
4.2 Policy options for a “greening” of revenue-sharing schemes

The following two sub-sections examine revenue-sharing schemes from taxes and from natural resources. With reference to natural resources, we distinguish between renewable and non-renewable resources. Revenues are shared in two ways: by derivation (i.e., on the basis of tax origin) to all jurisdictions, and by equal share to localities. Both revenues from taxes and natural resources exhibit an increasing trend (Figure 4.1). Whereas revenues from taxes show comparative stability, however, those from natural resources tend to fluctuate.

4.2.1 Assigning shared revenues from taxes (DBH Pajak) on the basis of an ecological indicator

Revenue-sharing from taxes (DBH Pajak, or *Dana Bagi Hasil Pajak*) includes property tax, land and building rent (transfer tax), and personal income tax. Whereas provinces and local governments in particular receive a large chunk of property and income taxes, central government retains a major share of personal income tax. In addition, the purpose of revenue-sharing is to address fiscal disparities both (i) vertically between central and regional governments, and (ii) horizontally among regions. For the latter purpose, the sharing of land and building transfer tax is also intended to meet horizontal equalization through which part of its share also goes to all other localities nationwide as opposed to simply being distributed within the province from which the tax revenue originates.

Figure 4.1. The trend of shared revenues (DBH) post decentralization, 2002 to 2008.



Source: Own figure, data from the Ministry of Finance.

Notes: Shared revenue from taxes (DBH Pajak) is shown by the solid line, while the broken line represents shared revenue from natural resources (DBH SDA).

The general idea of the present option is the following: A certain percentage of the revenue-sharing arrangement from taxes would be allocated based on ecological indicators. The questions then asked are (i) which tax is to be chosen and (ii) at which level of government the proportion of shared tax revenues will be derived for the scheme, i.e. the proportion of provincial or municipal entitlement of shared tax revenues. Choosing the tax that is of closest proximity to the environmental externality is one possibility; namely, the tax by which the effect on the environment of its tax objects is most obvious, for instance tax from renting land or property. With regard to the government level from which the share is to be taken, it will largely depend on the specific ecological problem under investigation, such as the type of externalities. For example, while watershed protection would only be relevant for those specific jurisdictions belonging to a watershed area within a province or a country, biodiversity conservation is of international relevance.

Another conceivable alternative would be to choose an important source of tax revenue for local government, such as property tax. In 2008, for example, this revenue accounted for 61 percent (IDR 21. trillion) of all shared revenues from taxes. The other two taxes in this tax shared-revenue scheme, i.e., personal income tax and building and land transfer tax, account for only 25 percent (IDR 8.5 trillion) and 14 percent (IDR 4.9 trillion), respectively.

The Brazilian fiscal transfer mechanism to some extent could be a point of reference for this particular option. A federal country, Brazil distributes its shared revenues to localities. This revenue comes from the ICMS, a value-added tax based on sales. The federal constitution stipulates that 75 per cent of this most important tax at the state level is to be redistributed from the state to the local level based on the value added generated in the relevant local jurisdiction. The state government then decides on the criteria for distributing the remaining 25 percent of this tax to local governments. Since the early 1990s, some states disburse part of this proportion based on ecological criteria such as watershed protection area, biodiversity conservation, solid water disposal and sanitation systems, controlling slash and burn agriculture and soil protection, among others, in addition to the existing socio-economic criteria such as population, area or primary economic production capacity (Ring 2008a: 490; Section 2.3.3.1).

A number of incentives from this option are in order. In comparison to revenues from natural resources, the stream of revenue from taxes is relatively stable and predictable – it is particularly evident for the case of property tax. Provided that the pre-determined proportion of the share for the environment is fixed, one would expect that the financing of ecological public functions shares such stability. It may enable various ecological measures to be arranged, for instance in terms of planning for protected area management to go beyond the level that an *ad hoc* transfer would allow. Moreover, these jurisdictions cannot demand revenues from natural resources – e.g., as compensation – to the comparable extent that those jurisdictions that are richly endowed with timber, fishery or mining resources are so keen to claim. Under these circumstances, the option of revenue-sharing from taxes channelled for ecological purposes should provide an incentive to non-natural resource regions, which are ecologically important yet fiscally become less advantaged, to participate in conservation.

It is for certain that this option has some limitations. The first limitation relates to the nature of tax elasticity in this revenue-sharing scheme. Tax elasticity is relatively poor, especially in response to changes in prices, population and incomes. This is particularly obvious in the case of property tax, given among other factors the difficulties in updating property values, notably in most developing countries (Norregaard, 1997: 60). Theoretically, a tax that responds less sensitively to the proportion of income changes, that is inelastic such as a property tax, may reduce the flexibility of a local government to increase the provision of public goods (Bahl and Linn, 1992: 105-106); this likelihood can also be expected in terms of ecological public provisions. Furthermore, looking from a distributive perspective, transfers based on tax sharing tend to be counter-equalizing across local jurisdictions, particularly if the tax revenue is elastic (Schroeder and Smoke, 2002: 28). With respect to personal income tax, the redistributive effect is somewhat elusive. Whilst income tax is generally perceived to be better for distributive purposes, some evidence seems to counter this perception. Especially in developing countries where personal income tax is neither very progressive (such a progressive tax system could be costly) nor comprehensive, namely that the cover of its tax base has not expanded due in part to an extensive proportion of a non tax-paying informal sector (see Bird and Zolt, 2005: 929 and 932).

As for the second limitation, the option may also encourage subnational and local governments to underutilize their own tax base. In this way, they count on the shared-revenues and finance local public functions at the expense of the national revenue pool that might otherwise be spent for other purposes or in other regions. Local fiscal capacity is minimized, and the benefit, which is financed by other jurisdictions, is maximized. This kind of free-riding behavior implies an unequal burden-sharing in the provision of public goods (De Mello, 2000). The third limitation, as mentioned earlier, is due to the percentage of shared-revenue from this option, which is predetermined and constant. Given an unchanged proportion from the shared tax revenue, a potential dilution of the incentive effect may arise, particularly as more jurisdictions decide to participate in the scheme (Grieg-Gran, 2000: 28). Consequently, a jurisdiction interested in the scheme yields increasingly lower expected return from establishing and expanding

protected areas, or from land-use restriction for conservation.⁹⁷ This sort of incentive dilution is not necessarily the case. It holds particularly true however provided that the *aggregate nominal* amount of shared revenues increases – and the rate of that increase at least equals the rate of increase of the protected area registered by the jurisdiction for this arrangement – the level of available DBH fund for the environment for each jurisdiction can still be increased in spite of the unchanged proportion assigned to this tax-based revenue-sharing. Section 2.3.3.1 in Chapter 2 has touched on this issue.

4.2.2 Earmarking shared revenues from natural resources (DBH SDA) for environmental purposes

Indonesia's share of the GDP from natural resource revenues is particularly high. At around 10 percent, this share is about five times higher than the international median (Bahl and Tumennasan, 2004: 199). The sharing arrangement comprises a number of instruments from the sectors of forestry, general mining, fishery, oil and natural gas, and geothermal. The fiscal instruments related to the forestry sector include taxes on operation rights, the forestry commission and the so-called Reforestation Fund (*dana reboisasi*).

The central government receives a large part of oil and natural gas revenues (84.5 and 69.5 percent, respectively), whereas its share of the remaining revenue-sharing instruments based on natural resources amounts to around 20 percent. The provincial governments receive a relatively smaller resource rent as opposed to the central and local governments. They receive 16 percent in nearly all instruments, and no share from fishery revenues. Additionally, aiming at horizontal equalization, the largest proportion of revenues from the fishery sector is distributed equally among all local governments (see Table 3.7 in Chapter 3). It also seems worth noting that by and large, as Bahl and Tumennasan (2004: 221-222) argue, the Indonesian system of natural resource revenue-sharing from natural resources has not aimed at financing the planned replacement of

⁹⁷ This does not necessarily need to be the case. For instance provided that the aggregate shared revenues increase, and the rate of that increase at least equals the increase rate of the registered protected area, the available DBH fund for the environment may also increase in spite of an unchanged proportion. Section 3.1 earlier has more to say about this.

economies based on exhaustible resources with an alternative, more sustainable one. Indeed, the present system appears to neglect both inter-temporal and inter-generational dimensions of transfers.

In view of public finance, the reforestation fund is particularly interesting on at least two grounds.⁹⁸ First, the revenue-raising for this fund applies the “polluter-pays-principle” by which companies pay taxes for their timber production from forest resources. Second, the revenues finance and promote the GERHAN program. GERHAN literally means the “national movement to rehabilitate forest and land”, and recovered approximately 3 million hectares of critical land and forest area during 2003 – 2007 (Ministry of Forestry of the Republic of Indonesia, 2008). The province of concern determines the need for its land and forest rehabilitation programs and submits this to the Ministry of Finance that will then distribute the required GERHAN fund to the district and municipality governments of the province that is applying. As of 2009, the program only undertakes the carry-overs from previous years. The GERHAN program has come to an end as the country now implements the so-called “soft-landing” policy in the forestry sector, which intentionally reduces the rate of tree-cutting. In the period following decentralization (2001 to 2006), on average the revenue from the Reforestation Fund including interest amounts to roughly IDR 2.2 trillion annually. It was the largest source of revenue in the forestry sector.⁹⁹

⁹⁸ Financing from the Reforestation Fund is limited to reforestation, forest rehabilitation and conservation, and supporting activities. Included among these supporting activities are forest protection, forest fire prevention, forest zoning, management of the Reforestation Fund (its derivation and use), plant breeding, and activities related to research and development, training and education, and local community empowerment for forest rehabilitation (see Government Regulation No. 35/2002, Art. 17). These measures appear to continue for most ecological public functions that were covered in the fiscal transfers for greening and reforestation prior to decentralisation, except for measures regarding the management of waste, water and pollution. The latter measures are presently under specific-purpose transfers for the environment, *DAK Lingkungan*, as discussed in Section 3.4. Meanwhile, for jurisdictions which are not eligible for a Reforestation Fund, another schemes are available for them. For example through specific-purpose transfer for the forestry, *DAK Kehutanan*. This scheme also targets jurisdictions with *inter alia* critical land, flood and drought potentials, mangrove forest, salt water intrusion or fresh water catchment area (see Regulation of the Ministry of Forestry No. 3/Menhut-II/2009, Art. 3).

⁹⁹ In part, the bulk amount of the revenues that the Reforestation Fund generates explains the incentive structure underlying the possibility why fiscal arrangement, allocation, and implementation related to the fund have been highly contested and at times misused for rent-seeking purposes. Barr *et al* (2010) provide a critical review on the evolution of governing the Reforestation Fund.

Earmarking a proportion of shared-revenue from natural resources for financing ecological public functions is the policy proposal. Buchanan (1963: 457) defines earmarking as “the practice of designating or dedicating specific revenues to the financing of specific public services”. The suggested fund from revenue-sharing is supposed to cover public environmental costs associated with the extraction of natural resources or with a sustained provision of ecological services. This should be conceivable since, as mentioned, some tax-based instruments for that option are already in place, and the reforestation fund represents only one of the instruments in the forestry sector, let alone in all natural resource-based sectors. Furthermore, while all of these instruments share a varying degree of relationship with the resource system (from which the rent for revenue is collected), all of the instruments from natural resource revenues are relevant for nature conservation.

The decision about which share – that is, the central, provincial or local share – is to be channelled into environmental purposes would not be an easy undertaking since revenue-sharing from natural resources is often highly contested and politicised, both between levels of government and between jurisdictions at the same level (Searle, 2007: 380-381). With reference to practical experience with the reforestation fund, one might consider the possible source of funds by (i) taking the largest revenue share and (ii) from the share of the central government. The first possibility is more or less a pragmatic response in search of a source of financing and is rather similar to the Brazilian experience with VAT share. The second possibility corresponds to the principle of revenue assignment in that the scale of externalities created from the extraction of natural resources is often greater than the jurisdiction of concern – the reason for a centralized assignment. Considerations of this kind may induce local governments to impose stringent limits on natural resource exploitation, especially if the rent from the exploitation is centralized but the responsibility assignment for an ecological public function (such as environmental protection) has been decentralized to the local level (Brosio, 2006: 452). However, in order to achieve an efficient level of environmental protection, sharing the revenue from natural resources between levels of government is required (Brosio, 2006: 452-453), which is implied in the proposal to have a relatively large proportion of the central government share of shared-revenues to compensate the negative environmental consequences at the local level. If these points can be justified,

then the central government's share from oil and natural gas revenues would probably be a likely candidate.

With regard to the potential, this option touches on the environmental dimension in two ways. First, the source of financing comes from the tax from natural resources extraction or exploitation. The whole range of instruments of revenue-sharing from natural resources involve the rent sources – forests, oceans, mining, etc – which are related in one way or another to the environment. As such, this policy option addresses environmental problems better than would otherwise be the case with shared revenues from taxes. Second, the linkages appear to be more straightforward between rent-generating activities on the one hand and the associated costs and benefits, which the externalities embody for the environment, on the other. To mention an existing case, the royalties from forestry are logically earmarked for forest and land rehabilitations, as in the case of GERHAN. By the same token, it is conceivable to suggest that shared revenues from fisheries should be earmarked for a particular function such as coral reef protection, which at this particular point in time could somewhat be regarded as an extension of the benefit principle of taxation – the beneficiaries of publicly financed services are the ones bearing the associated cost – linking the expenditure side with the revenue side (McCleary, 1991: 85).

The notion of resource depletion and its effects on the economic development of a region might also be better considered through this option. As already discussed, in the calculus of the DAU allocation the present system of revenue-sharing treats shared revenues as one component of fiscal capacity determination. Bringing up the perspectives of a degraded environment and the possible exhaustion of natural resources, this policy option is likely to create awareness on the sustainable use of natural resources as well as on its associated fiscal need.

Nonetheless, this option has a number of limitations. In particular the option of distributing natural resource revenues by derivation, that is by the location of the revenue's origin, as is current practice in Indonesia, poses some problems (see the discussion in e.g., Searle, 2007). This relates in particular to the revenue base during post-production. For instance, after a region stops its timber production and produces no more royalties from forestry, the forest is completely degraded and the land-use changes.

Its resource system providing ecological services may also become critical after the exposure to timber production. Under the logic of derivation by origin, this very region is no longer eligible for the shared-revenue. Thus, while the notion of “by derivation” might not be able to properly justify this option, the concept of ecological fiscal need might. It then follows that the region needs continued financial resources to bear the cost burden from performing post timber production activities on for example reforestation, irrespective of the condition of its present revenue base. However, even if this might seem appealing from an ecological perspective, politically it is difficult to achieve as the pressures for derivation by the place of origin are strong in decentralized Indonesia, particularly from those regions that are (currently) rich in natural resources. Public environmental expenditures supported by this shared revenue may seem to make sense only at the time of exploitation or extraction, but not thereafter.

Therefore, it must be appropriate to distinguish between the type of natural resources on which the revenues are based. Whereas mining, oil, natural gas and geothermal are non-renewable resources, forestry and fishery are renewable ones. The former has a definite supply of the resource, i.e., it is irreplaceable and will be exhausted. The latter can be used perpetually given that sustainable management is applied and no drastic change occurs in the resource system (Searle, 2007: 387). Such a distinction of natural resource revenues calls for different approaches in the consideration of conservation and environmental cost in the post-extraction period since it leads to different revenue streams. For instance, whereas resource use in the fishery sector may yield a constant flow of revenue, this is not always the case from mining or oil exploitation. Moreover, not only does it stop producing revenues (such as forest-related royalties), exhaustible resources might still entail costs even after they have been exhausted. The cost of toxic substance disposals into the land, river or ocean, from mining activities is a case in point. The distinction between renewable and non-renewable resources can also be justified in fiscal transfers arrangement since, Boadway and Flatters (1982: 59) contend, the jurisdictions presently rich in non-renewable resources may at a point of time become net recipients of equalization transfers when their relative fiscal position begins to deteriorate.

Revenue volatility from natural resource rents also puts another limitation on this proposal (e.g., Brosio, 2006; Bahl and Tumennasan, 2004).¹⁰⁰ This holds true especially for non-renewable resources such as from oil.¹⁰¹ Since the fiscal revenue stream from natural resources is relatively unstable and thus unpredictable, a longer term planning and implementation of ecological measures becomes more difficult to achieve. Unless the distribution of revenue takes account of the equalizing effect, this option is also biased towards regions that are rich in natural resources such as the provinces of East Kalimantan, Riau, Aceh, South Sumatera, and provinces in Papua. Other effects of this option may appear less encouraging as well. Receiving a large portion of this shared-revenue might create an indirect incentive for a region to focus solely on this source and to overlook revenue-raising possibilities from other sources other than natural resources. One rather direct effect is that this option simultaneously suggests a reduction in the general-purpose transfer, since shared-revenues make up the fiscal capacity component for the allocation of DAU (cf. Figure 3.2).

4.3 The extension of ecological public functions in the specific-purpose fund (DAK Lingkungan)

The specific-purpose fund (*DAK, or Dana Alokasi Khusus*) is intended to finance the designated expenditures of provincial and local governments. In financing the public functions and affairs at these governmental levels, such designated expenditures automatically pursue central government priorities. The overall amount available from DAK in general shows an increasing trend; in particular from 2005 (see Tables 3.1 and 3.2). In 2009, it amounted to IDR 24 billion. By contrast, the available fund for DAK-Environment remained constant between 2007 and 2009, and with an increasing number

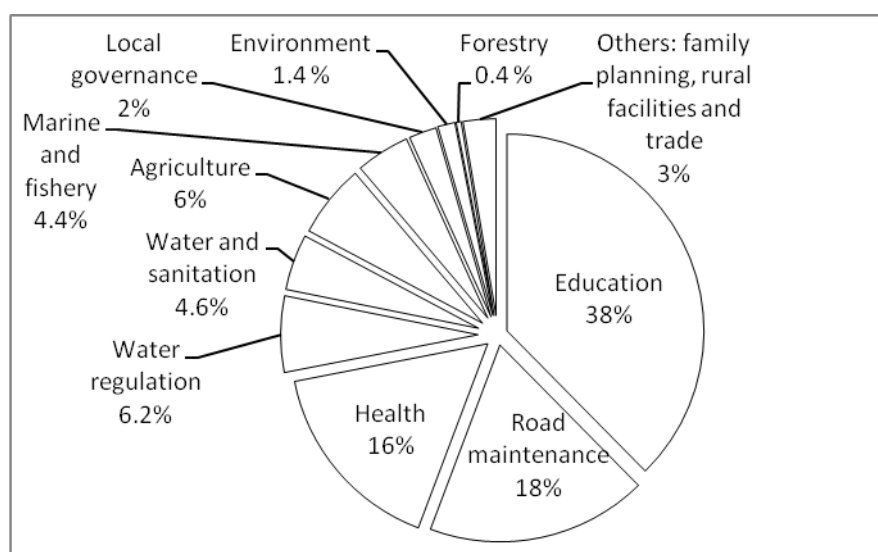
¹⁰⁰ Bahl and Tumennasan (2004) include the period prior to decentralization in their discussion on the fluctuations of revenue from natural resources. See also Figure 4.1.

¹⁰¹ Empirical findings, presented in Davis *et al* (2001) and Barnett and Ossowski (2003), suggest that the prices of non-renewable resources such as oil tend to have a time-invariant average. It is thus rather difficult to clearly define oil price cycles. In addition, the prices of nonrenewable resources take a relatively long time to return to their average. These practically lead to difficulties in assessing revenue shock and the fiscal cash flow.

of jurisdictions in this period, on average the region received a declining amount from the fund (Table 4.1).

In the earlier years of decentralization, DAK was exclusively made up of a reforestation fund (Lewis, 2002) before it was shifted in 2006 to become part of the revenue-sharing scheme from forestry. Moreover, in the period from 2003 to 2005 a distinction between reforestation and non-reforestation funds was introduced. Transfers for the environment (*DAK lingkungan hidup*) accounted for only 1.4 percent in 2009, as Figure 4.2 illustrates. The share apportioned to the environment is very low compared to the other sectors, in spite an increasing trend for all DAK transfers. A considerably higher amount is allocated for infrastructure under DAK, compared to the amount allocated for water and sanitation (4.5 percent), water regulation (6.2 percent) and forestry (0.4 percent).

Figure 4.2. The distribution of the specific-purpose fund (DAK) in 2009



Source: Own figure, data from the Ministry of Finance.

Among these few fiscal instruments addressing environmental questions, specific transfers for the environment are the most explicit. Table 4.1 lists the ecological public functions under this instrument. It finances a limited range and scope of environmental

public functions, mainly on the provisions of surface water quality monitoring and pollution control facilities. All of the functions are oriented towards terrestrial ecosystems. In addition to community waste management facilities, other main activities include water resource protection (tree-planting in non-forest areas adjacent to water sources as well as the construction of water catchment systems) and the development of an information system on environmental quality. The allocation criteria evolve over time. The criteria range from the length of a polluted river and population density to the proportion of critical land, and from land cover to the forms of institution in a particular jurisdiction such as the existence of farmer groups. Albeit less explicit, environmental considerations are also apparent in DAK transfers for infrastructure. The maintenance of water regulation facilities in the provinces and localities is part of such transfers, while its main purpose is actually aimed at fostering food security. Community-based water provision and sanitation facilities for low-income people in rural and urban poor areas also belong to the activities encompassed by this particular transfer. A fraction of the specific-purpose fund for the marine, fisheries and forestry sectors entails some components of sector-specific ecological public functions.

For these reasons an extension of the current DAK fund for the environment is therefore suggested. The extension should include wider measures and cover the existing functions, in addition to other ecological public functions, including functions related to the marine resource system. As already mentioned, the DAK Environment fund covers a number of rather restricted functions of water quality and pollution control as well as water resource protection, which are mainly concerned with the provision of physical facilities. These limited scopes of the DAK Environment fund are also due, to some degree, to the presence of other instruments addressing similar environmental issues such as forest and land rehabilitation financed through a revenue-sharing scheme. Such a scheme, however, is a different fiscal transfer instrument from that of the specific-purpose transfer. Another reason for extending the existing DAK for the environment fund is in accord with the scope of existing measures that are still rather limited. In spite of several ecological public functions that it embodies, the transfer under the DAK Infrastructure largely supports the end-of-the-pipe functions and is therefore less conservation-oriented.

Table 4.1. Ecological public functions covered by the DAK fund for the Environment

Fiscal year	2006	2007	2008	2009
Ecological public functions	<p>Providing facilities for water quality control measures related to water source protection, water pollution mitigation, and water quality recovery. The purpose of such provision is to establish a database for a provincial environmental quality control as well as provincial environmental status.</p> <p>Providing facilities for environmental management at the municipality and district level.* The transfer is allocated for water source protection, water pollution mitigation and water quality recovery.</p>	<p>Monitoring the surface water quality of rivers as well as natural and artificial lakes.</p> <p>Pollution control of waste from household and home industries.</p> <p>Protection of water resources and water catchment areas.</p>	<p>Monitoring the surface water quality of rivers as well as natural and artificial lakes: Provisions of laboratory facilities (e.g., equipment, buildings and mobile laboratories), equipment and information system management.</p> <p>Pollution control of waste from household and home industries, including setting up waste processing and biogas technologies.</p> <p>Protection of water resources and water catchment. The measures include planting buffer trees and setting up water resource protection such as water enclaves and absorption wells.</p>	<p>Monitoring the surface water quality of rivers as well as natural and artificial lakes: Provisions of laboratory facilities (e.g., equipment, building and mobile laboratories), equipment and information system management.</p> <p>Pollution control of waste from household and home industries, including setting up waste processing and biogas technologies.</p> <p>Protection of water resources and water catchment. The measures include planting buffer trees and setting up water resource protection such as water enclaves and absorption wells.</p> <p>Environmental information system: Database of water quality control.</p>
Allocation criteria	<p>The length of polluted river</p> <p>Building material cost index</p>	<p>Proportion of river length</p> <p>Population density</p> <p>Proportion of critical land area</p> <p>Proportion of land cover</p>	<p>Proportion of river length</p> <p>Population density</p> <p>Proportion of critical land area</p> <p>Proportion of land cover</p> <p>The form of institution</p>	<p>Proportion of river length</p> <p>Population density</p> <p>Proportion of critical land area</p> <p>Proportion of land cover</p> <p>The form of institution</p>
Total transfer (in billion IDR)	112.9	351.6	351.6	351.6
Average transfer (in million IDR)	343.1	810.2	810.2	777.9

Source: National Board of Planning (Bappenas), unpublished document.

Note: * It applies to local government receiving a specific-purpose grant for the environment (DAK LH) in 2006 higher than 500 million IDR .

In light of ecological spillovers, the rationale underlying specific-purpose grants is its ability to induce local jurisdiction to produce the optimal provision of the ecological goods and services. Among several types of specific transfer programs, a specific-purpose fund in the form of a matching transfer is recommended. For instance, a matching transfer should make the additional cost of producing a unit of ecological service (or the additional benefit if seen from the perspective of the receiving jurisdiction) match the additional unit of received benefit for the producing region. Theoretically, the correct matching rate represents the proportion of the cost paid by the central government to the producing local governments and its determination depends on either the size of the benefits or on the preferences of the central government for the activity it helps to finance with that specific transfer (Bird and Smart, 2002: 905).

The matching rate for a conditional transfer, as Bird and Smart (2002: 905) suggest, depends on the income elasticity of the demand and on the price elasticity. The higher the income elasticity, the higher the matching rate that is required for low-income recipients in order to offset the higher public spending need (in the producing jurisdiction) for the service in the higher-income jurisdiction, such as in the watershed relation between poor rural upstream areas and rich urban downstream areas. Meanwhile, as regards price elasticity, the higher it is, the lower the matching rate needed to achieve a certain level of total expenditures. Having these elasticities in mind, to achieve an equalizing effect the matching rate should vary inversely with the income level. In Indonesia, since conditional transfer disbursement is criteria-based and has featured the price and income level (such as specific-purpose transfers for the environment and infrastructure), one can conjecture that a certain equalizing effect is probably at work, other things being equal, even if the precise extent of the equalization effect is an empirical question.

Specific-purpose transfers help to achieve allocative efficiency provided that the marginal benefit is equalized. This is one of the rationales as to why conditional instruments became one of the common approaches for allocating transfers (Schroeder and Smoke, 2002; Section 2.2.2.2). If this is the case, then environmental priorities may find justification and are considered worthy of fiscal support from the central government. Conditional grants also seem to be advisable due to their effectiveness in

meeting specific objectives of the central government. This is a point of particular relevance for a decentralized unitarian state like Indonesia partly because some institutions at the provincial and local government level serve as agencies of the ministries at the central level. In addition, the specific transfer is an instrument that finances specific local needs, which at the same time gain the priority status of the central government.

Furthermore, since the transfer is conditional upon a certain measured performance, which is pre-determined and applies to the recipient governments, specific-purpose transfers are desirable in terms of financing environmental public activities with an expected level of specified outcome. Conditions that spring to mind are for example those that are imposed by the central government or donor community on future transfers regarding a certain level of expansion of protected areas or a specific increase in the carbon sink within a defined time frame. In addition to fostering transparency, attached strings of that kind also allow limits to be set on the elite capture or on the potential misuse of public funds. These are pertinent problems adapting to, and evolving with, the new environment under the country's ongoing decentralization (see e.g., Hofman *et al.*, 2002). The practice of earmarking is also deemed persuasive on effectiveness grounds. It provides greater assurance in the provision of minimum levels of financing for worthy ecological public functions, which are considered priorities by the government. In addition, the decision-making of such public provisions, for instance on financing, might well minimize among other things both bureaucratic and parliamentary negotiations (see McCleary, 1991: 85).

Although specific-purpose transfers have great potential, they also have their limits. Differences in fiscal capacity are one of these. Specific-purpose transfers are considered to encounter difficulties in making adjustments to differences in terms of the revenue-raising capacity of the recipient jurisdictions. Indeed, given the specificity of the public functions that the transfer should finance as well as the attached conditionality on which the transfer is based, the allocation of specific-purpose transfers is largely unrelated to fiscal capacity (Searle and Martinez-Vazquez, 2007: 413).¹⁰² Nevertheless,

¹⁰² As a general theoretical proposition, it holds true that a specific-purpose transfer is specially intended to finance narrowly defined public functions. However, casual empirical evidence suggests that this may

the specific transfer in Indonesia has taken the innovative path of partial-cost sharing in addition to the inherent matching character of DAK. A recipient government of low fiscal capacity contributes 10 percent of its own source revenue for the cost of a particular activity, while one endowed with a higher fiscal capacity pays up to 50 percent.

Another limitation corresponds to the distributive dimension. In contrast to general-purpose transfers, specific transfers have a relatively small distributional impact. This is of relevance as the objectives of environmental sustainability and nature conservation are increasingly coupled with the livelihood issues of people and societies living with or close to natural resources, as is the case with poverty reduction strategies for the forest-dependent poor. Conditional grants may discriminate against poor communities, particularly when their fiscal capacity is not equalized and the transfer is uniform across all jurisdictions (Bird and Smart, 2002: 905). On the basis of his examination of INPRES grants in the 1980s, Azis (1990) shows that Indonesian general-purpose grants equalize more than the sector-based specific grants, especially for poor Indonesian regions in the East. The earlier work of Ravallion (1988), which in spite of treating general and specific grants as undifferentiated under INPRES scheme, lends empirical credence to this finding although he found that the effect is biased towards regions with low population numbers and densities. Lewis (2002), with more recent fiscal data from 2002, found that the variation of per capita revenue across local governments largely decreases in the presence of general-purpose (DAU) transfers added to own source revenues (PAD), compared to cases where the latter is the only element in the revenue structure of local governments.

The way in which externalities are understood under this instrument reflects another limitation. The existence of externalities is one of the defining justifications for specific-purpose transfers (e.g., Searle and Martinez-Vazquez, 2007: 413). Such a justification rests in part on the assumption (e.g., Baumol and Oates, 1988) that demarcation is complete. With this assumption, if demarcation is complete – meaning

not warrant a universal claim. In Indonesia for instance, by regulation the determination of the DAK allocation is subject to a set of criteria. As discussed in Section 3.3.2, one of the criteria is the so-called general criterion which is a function of the fiscal capacity of a jurisdiction.

that exclusion or transaction costs are equal to zero – then externalities are supposed to be internalized into the price system and hence into the compensation mechanism. After spillovers have been demarcated, one could proceed for instance to establish the “matching rate”. In consequence, the arguments for a matching grant, which is intended to finance narrowly defined public functions and activities may be advanced. However, a full demarcation might not necessarily be the case. A demarcation of resource entities might hold *only partially* in which the exclusion cost would be exceedingly high and the seemingly internalized cost(s) might not represent all of the relevant costs as some of the costs are simply shifted (Vatn, 2005: 270-271). This may be particularly true in systems where a host of organic interrelationships exist. For example, in complex natural systems that interact with a human system, such as those observed in ecosystems and biospheres (Levin, 1993; Costanza *et al*, 1993; Vatn, 2005). One might consider such systems in terms of ozone depletion, climate change or loss of biodiversity, to mention some of the most prominent examples. In a complex ecosystem, any economic decisions that are made with reference to one particular natural resource, will generally affect more than a singular ecological element; the interdependency of economic activities occurring at different points in space and time can often delay or impede the appropriate assessment of the impact of such a decision (Dalmazzone, 2006: 460).

One simple example can help to elucidate this point. The enrichment in nutrients (known as *eutrophication*) from the runoff of land transformation or from human pollutants such as nitrogen and phosphor affects ecosystems detrimentally. As a result, the structure and function of fresh water, terrestrial and oceanic ecosystems change. Numerous undesirable effects can be observed, ranging from an increased concentration of algal biomass and toxic phytoplankton, to health risks in water supplies and a disruption of crucial chemical processes at water treatment plants, to losses of coral reef habitats (Smith *et al.*, 1999a). Different types of costs are juxtaposing and hence the implausibility of demarcation becomes higher. In this account, whilst technically both the right to use – e.g. the right over land, water stream or reservoir use – and the right to emit is likely to be entirely demarcated, the cost of human-induced emissions can only be incompletely demarcated (Vatn, 2005). To a certain degree this may undermine the allocative reasoning underlying transfers for specific purposes.

There are also other cases where practical problems of the matching rate dimension behind specific-purpose transfers are more apparent. For example, this applies to the asymmetric interest between the levels of governments. Bird and Smart (2002: 905) maintain that the matching rate depends on how large the central interest and the local enthusiasm on the program are. As the scope and feedback loop of the incentive effects become less tight and more abstract participating regions may exhibit varying degrees of interest. Locally apparent threats from floods, droughts, landslides, or food shortages might have a more urgent appeal to local governments than, say, programs to reduce global greenhouse gas emissions.

4.4 A summary of the policy options

Against the ecological and institutional backdrops highlighted in the previous sections, exploring the choice of instrument, following Bird (1993), considers turning the attention from the fiscal instrument into the effects of the policy outcomes that the instrument intends to achieve. To a considerable degree, this consideration strikes a chord with the Musgravian distinction of allocative and distributive objectives of fiscal functions. A summary of policy options entailing fiscal functions and their incentive effects, both of which have been the subject of discussion throughout this chapter are presented in Table 4.2.

In this vein, for instance if the intended policy outcome were to be allocative efficiency then the instrument should entail conditional, DAK-like specific transfer; In the same way a general-purpose transfer of DAU might relatively fit better with distributive equity. Certainly, although some instruments are obvious in terms of the function that they intend to pursue, the distinction among fiscal functions might not always be unambiguous. In practice, distributive transfers for example could at the same time also involve a degree of allocative aspects. Meanwhile, accountability and transparency in fiscal need derivation for example can be the sources of efficiency gains.

Table 4.2. Policy options for ecological intergovernmental fiscal transfers

Instrument	Type of transfer	Potential incentive effects	Allocative function	Distributive function
1. General purpose fund (DAU). The incorporation of ecological indicators into the fiscal need formula.	Lump sum	Possibilities for a long-term conservation plan Interjurisdictional equity dimension Stability and predictability of the revenue stream Consideration of the region's tax base Accountability and transparency in fiscal need determination	+	+++
2. Shared revenues from taxes (DBH Pajak). Assigning a certain portion of the revenue based on ecological indicators.	Generally lump sum	Revenue sources for regions poor in natural resources yet of ecological importance (e.g. for biodiversity conservation) Stability and predictability of the revenue stream	++	+
3. Shared revenues from natural resources (DBH SDA). Earmarking a certain portion of the revenue to finance environmental purposes.	Earmarking	Clear link between benefits/costs and the environment The presence of resource exhaustibility	++	+
4. Specific-purpose fund (DAK). The extension of functions and measures under DAK Environment.	Earmarking	The promotion of specific environmental areas and measures The effectiveness of achieving specific expected outcomes Declared priorities from the central government Accountability and transparency in financing conservation measures	+++	-

Source: Own table.

4.5 An excursus: Channelling global REDD funds into the Indonesian fiscal system

So far, the discussion in this chapter has focused on the national context. This section offers some insights into the country's fiscal transfer system in the global context. Recently, several proposals have emerged that consider the options of reducing global emissions from deforestation and forest degradation (REDD) after the first Kyoto Protocol's commitment years, among which the REDD (Reducing Emissions from Deforestation and Degradation) scheme has become a prominent mitigation strategy (e.g., Meridian, 2009).

A cursory discussion on the nexus between global and national contexts brings us to the present state of condition in Indonesia in relation to deforestation and forest degradation. Palmer and Obidzinski (2009) cite a number of sources and provide the following account on the trend of the country's land use.

“Indonesia's current forest area is estimated at around 90 million ha. With a 28 million ha decline in forest cover observed since 1990, the annual rate of deforestation increased from 1.6 per cent between 1990 and 2000, to 1.9 per cent between 2000 and 2005. Of this total forest loss and of importance in the context of avoided deforestation, 7.2 million ha was classified as primary forest with the annual deforestation rate increasing from 2.1 per cent between 1990 and 2000, to 2.6 per cent between 2000 and 2005. In absolute terms, the overall rate reached 1.8 million ha per year between 2000 and 2005. Indonesia's low land tropical forests, the richest in timber and biodiversity, in Sumatra, Sulawesi and Kalimantan, have been particularly prone to deforestation and degradation.” (Palmer and Obidzinski, 2009: 114. Cross-references are erased).

Obvious consequences perhaps can be inferred from the account above as one observes why Indonesia releases a large quantity of CO₂ from deforestation. In circumstances as extreme as during a series of fires in 1997 Indonesia emitted an equivalent of between 13 and 40% of the average annual global carbon emissions from fossil fuels – the largest annual increase of CO₂ in the history of documented carbon concentration in the atmosphere (Page *et al.*, 2002). The role this tropical country plays in climatic change is therefore pivotal, notably for the reason that tropical deforestation accounts for around a quarter of global human-induced emissions (IPCC, 2007). Between 1994 and 2006, Indonesia recorded a 233 per cent increase in green house gas

emissions resulting in the country's position as the world's third leading emitter, after the USA and China (Palmer and Obidzinski, 2009: 110).

It is common knowledge, however, that conservation and reducing emissions are not inexpensive measures. Developing countries on the whole generally experience financial shortfalls in managing and expanding their protected areas (e.g. Bruner *et al*, 2004). On the one hand, as already explained, Indonesia's limited financial resources inhibit the country's capacity to perform reasonable ecological public functions. On the other hand however, these functions require a sound and sustainable source of financing, involving tremendous costs. Looking at just one example, the avoided costs of deforestation in Indonesia amount to approximately US\$ 8 billion annually, according to a study estimating the foregone costs of land conversion into extensive plantations such as those for palm oil and rubber (Grieg-Gran, 2008). In addition, the planned ecological public functions related to mitigation, adaptation, and cross-cutting strategies would have to consider various causes of deforestation and forest degradation that are influenced by and inter-related with social, economic, political, demographic and cultural dimensions (e.g. Geist and Lambin 2002; Angelsen and Kaimowitz, 1999), all of which imply higher fiscal needs.

Institutionally, an international REDD scheme would only be effective if it is integrated into the functioning Indonesian budget and fiscal system.¹⁰³ Subsequently, the national REDD strategies to conserve and enhance forest carbon stocks, and to manage forests sustainably, are established as the basis for decisions on international funding. The implementation plans of these strategies would include expenditures of defined ecological public functions, which entail *inter alia* reduced logging (such as the "soft landing" in timber production), expansion of protected forest and management areas, prevention of forest and peatland fires, or rehabilitation measures for degraded land and watershed systems. As is current present practice in some Indonesian provincial and

¹⁰³ The Law 17/2003 stipulates that all transactions relating to expenditure and income (part of which includes foreign grants) of government institutions are to be recorded in the national budget. See also the Indonesian proposal in Bappenas (2008). In the context of a decentralized forest management, Irawan and Tacconi (2009) seek to integrate the general idea of ecological fiscal transfers, as possible financing instruments, into the distribution structure of REDD-based revenues.

local jurisdictions, *state-based* compensation schemes for ecosystem services to land users, communities or local jurisdictions, may become an integrated conservation part of publicly financed activities (i.e., ecological public functions).¹⁰⁴ Unfortunately, the policy relevance of state-based compensation schemes has yet to be subjected to proper discussion with an equal footing as analogous schemes of *market-based* direct compensation such as the PES (Payment for Ecosystem Services) schemes that are widely discussed at present. Under such state-based compensation schemes, a local or a provincial jurisdiction provides, for instance, income-generating exit options (such as a revolving fund) for “forest-adjacent” and “forest-dependent” poor land users. Such schemes are expected to induce poor land users to switch from their present practices of detrimental land use. These schemes can also serve as an incentive for poor land users to undertake future sustainable land uses which reduce the local threats to carbon sequestered in the landscape.

In light of this, the choice of the fiscal transfer instrument is likely to rest on the policy objective (or the criteria, as for example Vatn and Angelsen, 2009, suggests for national REDD+ funding option). As noted earlier, if it is to serve efficiency and effectiveness objectives, then some kind of specific-purpose transfer (DAK) would appear to be most suitable. This specific transfer would involve an expansion of ecological public functions and measures. Certainly, some modifications are required if DAK is to be applied as a policy instrument for achieving the objectives of efficiency, effectiveness and equity.

Among other possibilities for achieving these objectives, we envisage the following specific proposals. *First*, by setting up a new specific-purpose transfer that is solely targeted at the livelihoods of forest-dependent or forest-dwelling poor communities. This option could also be achieved by expanding the current yet still limited scope of measures in the existing DAK Environment. *Second*, the objectives can be achieved by establishing a kind of closed-ended sectoral block grant for the environment in that the recipient jurisdiction would have room for undertaking

¹⁰⁴ Van Noordwijk *et al.* (2009: 19 ff.), in their institutionally sensible proposals for REDD-based payment mechanisms in Indonesia, touch on some points which are similar to some degree with the perspectives brought up here.

distributive, but ecologically-relevant activities only within the sectorally-limited environment-related sector. A closed-ended sectoral block grant is discussed in Section 2.2.2.2. This option is not an entirely new instrument. At present, a number of some subnational governments and localities in fact have provided, for instance, exit options for local farmers living close to the forest or watershed areas by means of income-generating funds. These levels of government implement such ecological public functions under a closed-ended sectoral block grant as part of their environmental public expenditure. *Third*, a requirement of clear burden-sharing between the levels of government is attached as a condition in the disbursement of specific-purpose funds. This attached string is typical for a conditional grant, while burden or cost sharing is often associated with open-ended matching grants (cf. Section 2.2.2.2). Under this scheme, the recipient region will, for example, contribute a portion of its own source revenue to perform or co-finance required distributive measures in achieving the equity objective of the REDD-scheme. The equity objective that such as REDD-scheme seeks to meet may be in congruence with the objectives of the jurisdiction of concern.

Alternatively, should equity (or distribution) become the major policy objective, then a general-purpose transfer (DAU) as an instrument might accomplish the task better.¹⁰⁵ Although due to the block grant character of this instrument, it would to a certain degree contradict with the effectiveness objective, for instance in terms of assessment and verification of the expected outcome (such as the quantified changes in carbon emissions or carbon sinks). The capacity of this instrument to consider environmental dimensions, however, can be enhanced through the introduction of ecological indicators such as protected areas into the fiscal need calculation of DAU. At the same time, the *domestic* shared revenue (DBH) instrument, especially from natural resources, may *co-finance* REDD-related measures such as the monitoring, reporting, and verification (MRV) of carbon emissions and removals at national and subnational levels, among other possible domestic activities. In fact, some Indonesian local governments have recently financed similar activities, yet for different purposes, by way

¹⁰⁵ The issues of equity and effective community development measures for the poor seem to be important features to warrant a successful REDD-scheme. Just how imperative these issues are, is increasingly emphasized in the discussion of REDD implementation e.g., in Madera (2009) and Blom *et al.*, (2010).

of DBH, either individually or jointly with other transfer instruments and/or their own source revenue (PAD).¹⁰⁶

Nonetheless, whereas a REDD-scheme offers potentially encouraging impacts in some respects, it is conceivable to consider the following unfavourable effects, particularly those of domestic direct and indirect perverse incentives. Intuitively, the presence of REDD-funds should simply mean an enlargement of the pie of the available national budget. The scheme, however, may be expected to crowd out existing independent fiscal innovations on financing ecological public functions. Despite some obvious shortcomings, the recently discontinued GERHAN program on forest and land rehabilitation could be a case in point. Furthermore, future expectations of a large financial flow from REDD may also create incentives for national and local governments to move away from initiatives and efforts in the mobilization of domestic fiscal resources and the improvement of local fiscal capacities. These possibilities evoke concern, above all if a continuous level of funding from overseas is not guaranteed after national and local governments have been exposed to the REDD-scheme.

The fiscal channels, through which a possible integration of REDD-based global revenue into the domestic fiscal institution can be carried out, may be in the form of specific-purpose transfers and general-purpose transfers. Environmental projects financed by international donors or foreign countries often take the form of specific-purpose transfers which are often more effective, efficient and outcome-oriented. It is more difficult when it comes to general-purpose transfers, however, given the complexity of the fiscal gap approach in this instrument. One possibility is to consider REDD-based revenue in addition to the DAU pool fund so that the global fund becomes part of the domestic net revenue (PDN). This practice would be similar to an increase in oil revenues due to an international rise in oil prices over the level of assumed prices in the national budget. However, it is quite plausible that a general-purpose transfer might

¹⁰⁶ For reasons of political acceptability, for states in the Brazilian Amazon, Börner and Wunder (2008: 508) suggest investing a proportion of REDD funds for measures that are not directly linked to the REDD objectives of reducing emissions and for parties that are not directly eligible for the REDD compensation scheme. Börner and Wunder mention in their proposal the concept of rewarding good forest stewardship and local communities for assistance in monitoring protected areas.

not guarantee the efficiency of the fund and the effectiveness of a desired achievement of carbon level. This implies the need for a different type of grant program – still under a general-purpose transfer scheme – which is able to emphasize the dimensions of monitoring and verification.

As far as the plausible fiscal channels are concerned, the proposal of revenue-sharing instrument (as in Irawan and Tacconi, 2009: 434 f.) deserves some comments. There are reasons to conceptually argue that channeling international REDD funding through a revenue-sharing arrangement would to a certain extent contradict the essence of the arrangement itself, especially if the revenue comes from carbon trade. Revenues from carbon trade may not be similar to revenues from timber trade or timber products, and therefore the way their revenues are distributed may be different.¹⁰⁷ Consider *inter alia* the way in which revenues are shared based on the place of origin, what is known as the derivation principle in revenue-sharing (cf. Section 2.2.2.2). Under the perspective of additionality, which is often associated with REDD scheme, carbon reduction may not depend on a specific place nor on a specific tax base; the total sum of carbon reduction is more important. As a result, it would be rather intricate to share the revenue to a particular tax jurisdiction by derivation. In addition, whereas the taxation of timber products is basically driven by the “polluter-pays-principle”, REDD-related carbon trade on the other hand is driven more by the spirit of a voluntary Coasean-like bargaining.¹⁰⁸

Given that global REDD scheme possibly involves a structure beyond the national state, the proposal to distribute international REDD funding through a revenue-sharing needs to be institutionally adjusted with the domestic setting. The appropriate assignments of responsibility in terms of decision, implementation, expenditure and the financing of REDD measures should be taken into account (cf. Section 2.1.2).

¹⁰⁷ For example, the Reforestation Fund in Indonesia is based on the revenues from taxes on timber product (not on timber trade) and shared by derivation.

¹⁰⁸ This may lead to a set of new issues. For example, the problematic relations between the purpose of intergovernmental fiscal transfers and the possibility of voluntary bargaining. Consider this: if voluntary bargaining between jurisdictions is able to take place in a Coasean world, then there would be less justifications for the national state to be involved (see e.g., Myers, 1990). In light of this, a state-based intergovernmental fiscal transfer could require a new different rationale for its existence than the one it has under the common (non-Coasean) mechanism.

CHAPTER 5

The simulation of ecological fiscal transfers at the provincial level

A number of policy options for ecological fiscal transfers were identified in the previous chapter. One of the options suggests the possibility of incorporating an ecological indicator into the calculation of fiscal need as part of the allocation of general-purpose transfers (DAU). In this chapter, this particular option is exposed to further empirical examinations in the context of the prevailing Indonesian intergovernmental fiscal transfer system. On the basis of simulations, some of the possible options introduced in the previous chapter are translated into actual observations. This chapter begins with the discussion in Section 5.1 on the rationale of general-purpose transfers, taken a step further than the discussion in Chapter 4. In this section, the discussion includes the existing area-based approach and the possibility of its extension. In the proposed new fiscal regime of general-purpose transfers, the protected area will serve as an entry point for introducing the ecological indicator into the structure of the fiscal need of a jurisdiction. The area-based approach proposed here largely draws inspiration from the introduction of protected area as one of ecological indicators in fiscal transfers which is discussed in Section 4 of Chapter 2.

The simulations of DAU transfer will be the major discussion later on in this chapter. Section 5.2 is devoted to this discussion. Given the data availability, the focus of inquiry is limited to the fiscal year 2007 and to the provincial level. The simulations are run with different scenarios of transfers, primarily derived from different combinations of area-related parameter values, namely between an area in general and an area protected for nature conservation purposes. Parameter variation enables us to test different options of the intended fiscal policy (Gottfried and Wiegard, 1992: 154). Different possible values are then assigned to these parameters. On the basis of these different scenarios, the impacts of fiscal transfer distributions on the provinces are examined. Since equalization is imperative for both science and policy, the equalizing effects of the proposed transfers are examined in this section. The discussions on the

potential shortcomings of the simulations, both at the conceptual and practical levels, are presented at the end of this chapter, in section 5.3.

5.1 General-purpose transfer and the area approach

5.1.1 Why a general-purpose transfer, why a DAU?

An area-based indicator related to the forest proportion of a jurisdiction was once part of a country's fiscal transfer system, as noted in Chapter 3. However, this indicator was instituted in the allocation structure of specific-purpose transfers. A number of theoretical and practical arguments were in favor of general-purpose transfers to incorporate protected areas as a new area-based indicator.

One is that specific-purpose transfers partly draw on the allocative assumption that a resource system and its corresponding externalities can be completely demarcated (e.g., Baumol and Oates, 1988; Dasgupta and Heal, 1979). Compensation mechanisms can be established accordingly in order to equalize an additional unit of cost and benefit. Conditional matching grants would in turn be a preferable instrument for this task. Nevertheless, while use and emission rights can technically be demarcated, in many complex, interdependent and organic resource systems the cost of anthropogenically-caused emissions can only be partially demarcated (Vatn, 2005). A number of viable costs may be incorporated by the transfer of specific purpose, whereas some other costs are simply shifted, either unintentionally or intentionally (see Vatn and Bromley, 1997: 147). Furthermore, as Vatn and Bromley (1997: 137) argue, any recognition of externalities would mostly arise after they had been produced. Precautionary or time-dependent ecological public measures may thus appear inapt in the allocative reasoning of specific-purpose transfers.

In the presence of such externalities that cannot be demarcated, inefficiency arises in resource allocation. Conditional transfers in particular could in this particular context become an inefficient instrument although intended to foster efficiency. In order to undertake ecological public functions, a jurisdiction may therefore have to (i) face a higher fiscal need and a limited ability to finance these functions, or (ii) substitute some

of its fiscal resources from other functions, such as from socio-economic activities. In light of this, a general-purpose transfer (based to some degree on environmental consideration) or a broad open-ended conditional transfer for the environment would seem to suggest some alternatives (see Schroeder and Smoke, 2002). Moreover, unconditional grants often result in an increase in local public expenditure although the expenditure is lower than the transfer (Slack, 1980). In this way, a general-purpose transfer opens the plausibility of an increased capacity to widen the range and deepen the extent of ecological public measures.

The second argument for general-purpose transfers stems from the presumption that incorporating protected areas into the fiscal need formula would more obviously spell out the perceived need of a jurisdiction. This kind of need has been hidden so far in the existing area indicator. Additionally, the consideration of a jurisdiction's tax base would possibly be better addressed by a protected area indicator by way of a capacity-need gap approach of a general-purpose transfer. Specific-purpose transfers, in contrast, by definition tend to ignore the dimension of fiscal capacity or own revenue raising capacity (e.g., Searle and Martinez-Vazquez, 2007), which is likely to send the wrong signal on the actual fiscal need for ecological purposes.

The third argument relates to the primary intention of fiscal transfers. It is the equalization of fiscal imbalances both between the levels of government or between jurisdictions at the same level of government. Albeit this intention is not necessarily achieved, unconditional transfer of general purpose appears to achieve this policy objective better than that of specific purpose, as the literature on fiscal federalism commonly suggests (e.g., Oates, 1994; Boadway and Shah, 2008). Empirical evidence with Indonesian data seems to be consistent with this proposition, as Ravallion (1988) and Azis (1996) suggest and as it was shown in Section 4.1.

The fourth argument concerns emerging critical tendencies post decentralization. Among others, provinces and localities demand more autonomy and thus more public revenues to be assigned to subnational governments. It is not uncommon that specific-purpose transfer – determined centrally, imposed top-down – may be associated with central priorities, not those of the province or local governments. Against the backdrop of this important drift, emphasis on proposing general purpose grants for ecological

purposes in the country's intergovernmental transfer system seems to share a certain degree of incentive compatibility and policy applicability. It should be acknowledged, however, that this argument posits its own predicament. Given the lump sum nature of DAU, the degree of effectiveness in attaining a specific expected outcome then depends considerably on the province under discussion. In its hand rests the decision on the design of subnational ecological public functions and, more importantly, upon the final use of the DAU transfer.

The last argument is connected to the revenue structure of lower level jurisdictions in Indonesia. Given functional consideration, the introduction of ecological dimension is more likely to occur if it is plugged into a transfer instrument that ensures relatively sufficient source of fund. As has been pointed out in Section 3.3.1, after decentralization general purpose transfers make up around 60 to 70 percent of the revenues of provincial and local governments.

5.1.2 The present area approach and its extension

5.1.2.1 The importance of the area-based approach

Area has been one of the common indicators in the grant formulas of many countries, in part due to data availability (Bahl and Linn, 1992). In Indonesia, land area has been an important indicator in its fiscal transfer system for many years. Prior to decentralization, provincial development transfers under the Inpres grant for local governments were allocated based on area criterion in addition to the equal share arrangement (Qureshi, 1997: 297). In the 1990s, the Inpres grant relied on an allocation formula whose indicators were land area and island status, which according to Silver *et al* (2001: 351), had reduced the influence of per capita criteria. After the decentralization was initiated, the calculation of the fiscal need of a jurisdiction for general-purpose transfers rests on the *inter alia* area approach – area cover is one of the criteria of the fiscal need formula (see Section 3.3.1.2). Indonesia's large marine area also brings about the relevance of both the area approach and the protected area indicator. Since 2007, 25 percent of marine area (up to 12 nautical miles from the coastline) has been included

into the existing terrestrial area indicator for the calculation of provincial fiscal need of this world's largest archipelagic country.¹⁰⁹

Space is an essential feature of both fiscal and ecological magnitude. Jurisdictions with urban-rural interfaces are a case in point. In contrast to many economic and cultural services, by which rural beneficiaries “exploit their urban taxpayers” (Bradford and Oates, 1974) or put in another context, that urban governments are in general fiscally neglected by state governments (Morgan, 1974), in numerous cases of ecological services, provision urban jurisdictions are dependent on and benefit from rural jurisdictions. To approach the resource flow between different jurisdictions in a metabolic relation is to evoke for example that rural interactions create externalities to urban third parties (e.g., Kane and Erickson, 2007). These externalities may manifest themselves in the form of negative environmental spillovers such as cross-border toxic emissions or nutrient enrichment from upstream land use runoff. Other externalities manifest themselves in positive environmental spillovers such as a sustained supply for an off-stream hydro power plant generating electricity for own and adjacent regions. In view of this, it is quite conceivable to imagine that such spatial linkages may also exist in the context of broader cross-spatial, inter-jurisdictional interdependences. For example, this holds true in the context of Indonesia's 472 water basin systems extending across its 33 provinces whereby systems of water, land, forest, and marine estuaries, are organically interlinked – including a number of urban agglomerations in the downstream jurisdictions (Dephut RI-RLPS, 2008).

An area-based approach can thus be of extensive fiscal and ecological relevance. Consider the relationship between area cover and population density. Quite the opposite of urban areas, rural jurisdictions often have a much larger area coverage. However, the latter has a relatively less number of inhabitants, leading to a low density population. Moreover, in many cases the rural hinterland is home to valuable nature-related services providing ecosystem services, such as forest or water. Urban areas and their inhabitants are dependent clients of such services. Referring to area coverage, the size of the area is

¹⁰⁹ Unpublished MOF calculation of the general-purpose transfer.

also connected to the biodiversity level – the number of species within a taxonomic group tends to increase with area size (Connor and McCoy, 1979). Empirical observations in ecology have documented this tendency in terrestrial (e.g., Rosenzweig, 1995: 8-25) or marine ecosystems (e.g., Chittaro *et al*, 2009). Should a proportion of the area under discussion be designated for conservation, then economic developments would be largely restricted, limiting the opportunities to realize any economic rent potential for fiscal revenues. Finally, urban areas typically develop agglomerations that attract and concentrate economies, resources and facilities, giving urban areas the relative advantage in terms of their tax revenue raising capacity (Bardhan, 2002: 189).

Given this state of affairs, considerable effects on both fiscal capacity and fiscal need are plausible. In this way, the incidence – who is paying and who is gaining – of the benefits and costs of provision are highlighted. A lower population density can be taken to mean that rural areas of ecological significance bear higher conservation costs or costs of ecosystem services provision, implying a higher per capita fiscal need. A lower population density simultaneously implies a relatively lower fiscal capacity. Both effects may limit the capacity of local jurisdictions to perform the necessary ecological public functions whose benefits of ecological services extend beyond the producing area. Examples of ecological public functions are the protection and sustainable use of natural resources, ecosystems and landscapes, or the restoration of deforested areas, degraded land, and critical coastal zones (see Section 2.3.2.2).

The presence of protected or conservation areas in a rural jurisdiction may exacerbate the joint effects even further: a higher fiscal need to cover conservation costs, and a lower fiscal capacity due to a restrained realization of economic returns from land use. Conversely, densely populated urban jurisdictions have a higher fiscal capacity and a lower fiscal need for ecological public functions. As a consequence, urban jurisdictions shoulder a lower cost burden per capita, while enjoying ecosystem services produced outside of their borders.

In addition, given the non-excludable nature from the consumption of inter-jurisdictional ecosystem services, which reduces the tax burden of other consuming jurisdictions to finance these services, externality may emerge in another important form as well, in what is often referred to as fiscal externality (e.g., Dahlby, 1996). From the

expenditure side, the fiscal externality may carry some pertinent implications between jurisdictions, both direct and indirect. One direct effect is the suboptimal provision of public function that engenders or ensures positive ecological spillovers to other jurisdictions. Indirect fiscal effects occur, for instance, through a reduction in the tax base of a province producing ecological services, as is the case with designated conservation areas through which further economic developments are constrained. In turn, this indirect effect implicates a financing capacity to embark on ecological public functions.

Throughout the analysis in this chapter, we choose to apply the area approach in an attempt to substantiate the introduction of an explicit ecological dimension in the general-purpose transfer mechanism that maintains operability and at the same time practicality. Staggering through the country's fiscal institution, this area-based policy proposal would presumably find ample political resonance in that the protected area (as a proxy of the ecological indicator) by no means makes a qualitative difference from the existing general area indicator. Retaining most of the main features of the existing fiscal institutions, the proposal suggests *prima facie* that it would incur no extensive additional administrative and transaction costs. Moreover, dramatic changes in the new revenue distribution after the introduction of an area-based ecological indicator would be less expected.

5.1.2.2 Extending the present area approach

In spite of the above apparent plausible linkages between area and ecology, ecological significance is only acknowledged by the area indicator in an indirect way (Ring, 2002). Whereas the linkage may provide justifications by virtue of the presence of potential imbalances between the fiscal need and the fiscal capacity of a region, especially that of endowing conservation or the natural resource base, the area indicator does not necessarily ensure that an explicit acknowledgement of the relevant ecological public functions would ensue. A jurisdiction endowed with a large area cover, for instance, might still demonstrate less effort or invest nothing in conservation. Such a

jurisdiction happens to be in this case a recipient of an area-based transfer that regions of ecological importance should have otherwise received.

As such, the incentive problem becomes noteworthy. If all jurisdictions act in their best individual interest, namely they refuse to cooperate in the costly provision, then no sufficient level of conservation would take place. At a society level all would move to a pareto-inferior position. For jurisdiction(s) of ecological significance that would have every reason not to participate in conservation or sustainable land-use change, the positive externality is still to be compensated. Apparently, opportunity costs seem to be notable here. Consider a proportion of area that a jurisdiction sets aside for conservation; a weighing process of the best foregone alternative land uses. Taking into account the benefits from conserving land use change and potential addition (or loss) of fiscal revenues, the higher the share of protected area from the jurisdiction's area cover, the higher both the opportunity cost and the need for fiscal transfer would be.

In Brazil, one of the very few countries having implemented ecological fiscal transfers, land restriction affects the economic realization of the jurisdiction. A consideration of the potential economic loss that a jurisdiction may incur, is reflected in the country's transfer allocation mechanism of revenue-sharing from value-added tax to the subnational federal government (May *et al*, 2002; Section 2.3.3.1). Given the demand from jurisdictions with a large protected area to consider the potential opportunity loss, a considerably larger weight is assigned to the protected area than to the area in general. In the state of Rondonia, for example, it is 5 percent compared to 0.5 percent respectively (Grieg-Gran, 2000). An additional argument by which opportunity cost is notable is that the higher the present value of an area and the extensive use of land, the higher the switching cost for conservation might become. Indonesian high-valued plantations of palm oil and rubber in Sumatra (Grieg-Gran, 2008) or coconut and clove plantations in Sulawesi are a case in point. Moreover, the presence of an alternative external economic opportunity of land use for the municipality, such as from commercial forest logging in Kalimantan, may make the opportunity cost higher and conservation therefore more costly (Engel and Palmer, 2008).

Moreover, as List *et al* (2002) observe in the US, the state tends to free-ride in the expenditure for endangered species protection since preservation requires large

habitat areas and clashes with economic development. Therefore, if compensation – such as through fiscal transfers – appears to be a functioning instrument inducing a certain behavior of jurisdiction(s) towards an optimal, sustained provision of ecological public goods, then a more direct approach such as the protected area indicator may seem justifiable in the consideration of uncompensated production costs of undertaking ecological public activities.

The area approach also has another important feature regarding the allocation mechanism of transfer. As a matter of fact, the protected area as an indicator fulfils the requirement of simplicity in the design of the fiscal need formula. Rose (1999: 269-270) maintains that an area approach for nature conservation, such as a protected area indicator which links ecological considerations to land or area use, reduces the complexity of ecological performance in the modelling of fiscal transfers for ecological equalization among jurisdictions. The protected area indicator reduces such complexity and translates it into a comprehensible and clear signal of ecological performance (both partial and potential performances) relating to *inter alia* nature conservation or habitat restoration, recreation, as well as water and climate protection. This signal provides information about the ecological performance capacity of a specified area (Rose, 1999).

Another factor of consideration might be rather historical. Indonesia once incorporated the forest land area indicator into its fiscal transfer system (Azis, 1990; Qureshi, 1997). A proportion of municipal or provincial forest area was a criterion for allocating the now-concluded INPRES grant in the 1980s onwards. In the present transfer system, revenue-sharing from natural resources complies with a sharing arrangement under which provinces and local governments (in the case of forestry-related revenues) or local governments (in the case of the reforestation fund) are the recipients.

5.2 Simulations, results and limitations

Before proceeding with the simulations it is appropriate to pay tribute to some of the institutional boundaries, as these seem to define the conceptual limitation (and possibility) of the planned simulations. It is more or less common knowledge that any

policy proposal to a large degree implies a need for institutional change. As such, a policy proposal such as ecological fiscal transfers may suggest a change in the existing fiscal institution. The drive for institutional change in that matter originate from the perceived discrepancies that seem to distinguish existing conditions from plausible expected conditions, both of which were discussed in the previous chapters. As such, one would consider for instance that the sub-optimality of ecological public good provision is apparently a result of (the existing) institutional arrangements. In consequence, ecological fiscal transfers would be anticipated as a set of instruments from which an inducement of behavior of the relevant jurisdictions for a socially optimal provision of public goods can be expected.

In an attempt to reconcile the discrepancies between the existing and the expected, a recommendation is in turn reflected in the very outcome of the policy proposal. Indeed the vision of introducing a protected area indicator into the structure of fiscal need calculus might turn out to be a vision of modifying the existing institutional setting. In other words, policy advocacy based upon the new fiscal regime – and the ensuing new configuration of fiscal transfer – presupposes an imagined change in the institutional arrangement. The forthcoming simulations will be derived from some sort of postulated states with reference to the theoretical discussions and in light of the institutional boundaries of the Indonesian setting. In doing so, these postulations underlie the very motivations of running the simulations.

To begin with, the simulations intend where possible to be in strict accord with the prevailing normative condition for the fiscal transfer mechanism. Normative requirements concern the rules and norms which serve as the directive for regulating the fiscal transfer mechanism (Lenk, 1993; Section 2.2.1.1). The rules and substantive norms in such normative requirements are enacted in the existing Indonesian law on intergovernmental fiscal transfer between central and regional governments. Hence, the simulations to be undertaken are subject to institutional constraints, both to their general and particular principles. This way of undertaking is roughly analogous, albeit in a rather different context, with the approach advocating that fiscal institution should be analyzed

“as they exist in reality, and not unreachable ideals” (Frey, 1990: 445).¹¹⁰ In other terms, in its conscious compliance with the existing legal-regulatory framework, the intended analysis on the fiscal transfer mechanism and its implementation should not be a product of an institutional vacuum (e.g., Gawel, 2005).

Such a fiscal institution that exists in reality indeed evolves from, and therefore is a product of, past accumulated changes and dynamics of certain circumstances. At least an understanding of this notion is essential to any idea of modifying an existing fiscal institution for an alternative fiscal transfer. In this particular case, it is hardly a possible endeavor to propose intended changes which are detached from prevailing institutional contexts, within which the changes may materialize. Spahn (2007: 199) succinctly characterizes the magnitude of institutional dimensions by putting forward that “[a]ll decentralized or federal governments will have to respect their historical and political conditions, so reforms will be highly path-dependent.” This characterisation seems to reemphasize the point, which Bird and Tarosov (2004: 99) brought up that each decentralized system such as a federation, “is a complex political and economic entity tracing out a path-dependent course in a changing environment”.

The question remains as to what kind of interaction between the existing and the desired conditions would emerge from presuming a path-dependent sequence of economic changes. As for the desired condition of fiscal transfer, for one thing the change, such as fiscal reform, would follow the course of the existing institution in need of a change. At the same time, the desired condition constitutes a created outcome in the sense that it intentionally emerges from a growing recognition that the condition as it

¹¹⁰ Frey proposes that analysis of institutions should be confined to the existing, the *realized*, institutions. Voigt (1997: 20) contends however that such a proposal is a shortcoming, given that not yet realized or unrealizable institutions then become non-amenable to comparable analysis. The analysis here invokes the plea of Frey in as much that (a) the point of departure for the analysis of fiscal transfers is the existing, functioning, real fiscal institution and (b) the imagination to realize a desired future condition of ecological fiscal transfers is defined by the set of limitations *and* possibilities within the framework of the existing fiscal institution. As much as the potential benefits from an experimental approach in analyzing the planned and (yet) unrealized outcome for Voigt, so are the benefits of simulation, such as one applied in this study, to test the plausibility of intended policy and the effect of imagined institutional change. The virtues of fiscal transfer simulation can be seen in e.g., Lenk (1993) and Gottfried and Wiegard (1992).

exists is not sufficient to ensure sustainability. It is a sort of dissatisfaction that in turn forces a need for institutional change (Bromley, 2006: 71 ff.).

Definitely, motivations for an institutional change may arise on many grounds. They may arise for instance from efficiency considerations which promise potential gains for all relevant participants, as discussed in the theoretical section.¹¹¹ Institutional changes may also be driven by other equally legitimate motivations. One such motivation is as follows.

“Institutional change is motivated, *ab initio*, by an inchoate yet emerging recognition that something must be done about existing institutional settings and their associated outcomes to mitigate probable harms that would otherwise emanate from a continuation of the status quo ante institutional setup” (Bromley, 2006: 74).

The intended simulations emerge in part from an understanding that the proposed ecological fiscal transfers – by way of general-purpose transfer incorporating the ecological dimension in its fiscal need calculus – might become a plausible alternative to the existing one, among other available possibilities. This instrument of ecological fiscal transfer is deemed to be of particular value for possible alternatives in terms of ensuring a relative optimal provision of ecological public goods (i.e., to a certain degree mitigating sub-optimality of provision) and is capable of internalizing ecological externalities (i.e., relevant positive and negative spillovers), while still being largely compatible with the existing normative characters and the functioning decentralized system of the Indonesian fiscal institution.

¹¹¹ Economic efficiency as a requirement to some degree has a tendency to preserve the status-quo. That is, an institutional change may not be accommodated if the change is simply not efficient. It is problematic if the status-quo is, say, detrimental to the environment. In need of an institutional change, in practice it is not a rare case that problem-solving and collective decision-making related to environmental policy might, *inter alia*, (i) require an expanded definition of the economic efficiency condition, such as one that also incorporates social efficiency not only of individual; or (ii) require more than the economic efficiency condition alone; or (iii) violate the economic efficiency condition in favour of other more socially desirable conditions (Vatn, 2005; Bromley, 2004; Bromley and Paavola, 2002).

5.2.1 The simulation

This section discusses the simulations of general-purpose transfers for ecological purposes at the provincial level. In the spirit of the area-based approach, the section starts by incorporating the protected area as a plausible indicator into the mechanics of fiscal need calculation of the provincial fiscal gap. Further, building on the country's existing mechanism of general-purpose transfer, simulations to analyze the effects of introducing the ecological dimension into DAU transfer are carried out. In this part, different scenarios are developed on the basis of various parameter values of general area and protected area indicators. Serving as the baseline of changes to the general-purpose transfer are the original DAU allocations of the fiscal year 2007.

The following provides a detailed account of the simulation systematics regarding the formula and the parameter values, as well as the assumptions, data and the simulation process.

5.2.1.1 The fiscal need formula

The general purpose fund (DAU) for the province (DAU^p) is channeled for the salary expenses of public employees, that is the basic allocation (BA), and for the fiscal gap (FG),

$$DAU^p = BA^p + FG^p . \quad (5.1)$$

Let FG^p be the size of the available fund for financing the fiscal gap of all provinces, province i then yields a transfer of general purpose that equals:

$$DAU_i = BA_i + \frac{FG_i}{\sum^n FG_i} FG^p \quad (5.2)$$

The fiscal Gap (FG) approach reflects a theoretical intention of filling the gap between the fiscal capacity (FC) and the fiscal need (FN) of a given province, i.e., $FG_i - (FC_i - FN_i) = 0$.

At this point it is appropriate to note, however, that in practice the Indonesian fiscal gap approach does not necessarily mean a *full* gap-filling; at least on the following grounds.

- The limited available fund (FG^p) implies a constraint upon such an endeavor. In other words it is not the entire fiscal gap that is to be filled by a general-purpose transfer.
- The fund allocated for fiscal gap financing is determined together with the allocation for Basic Allocation. Consequently, the amount of funds available for the fiscal gap depends on how much of the fund remains after the Basic Allocation for all provinces.
- The fiscal capacity formula is not set as a function of the richest region but as a function of a weighted sum of province's own source and shared revenues. Eq. (5.3) later clarifies this point. Bird and Tarasov (2004: 83) argues that a full equalization is only achieved if the reference for the revenue-raising capacity is set at the level of the richest jurisdiction.
- The fiscal need of a province, in addition to the function of socio-economic indicators defined in Eq. (5.4), does not refer to the expenditure level of the poorest province but to the average of all provincial expenditures (δ).
- In the formula of fiscal need, the values of the GRP indicator (which serves as the proxy of the economic potential of a province) from Jakarta and East Kalimantan, respectively the first and the second wealthiest provinces, are set to be equal to the third wealthiest province, Riau.¹¹²
- Although this argument is not directly related to the fiscal-gap, in order to minimize interjurisdictional disparities the indicator of economic potential in the

¹¹² In the practice of the fiscal transfer system, one way to derive the average value in fiscal equalization transfer that narrow the disparities in fiscal capacity is through the exclusion of extreme values such as the values of the richest or the poorest province(s). Canada, for instance, excludes the rich province of Alberta and four other relatively poor provinces to derive a national average for its equalization transfer (Clark, 1997b: 81).

fiscal need formula is operationalized by the exclusion of the mining, industry and processing sectors, which are only spatially concentrated in certain jurisdictions.

As for the fiscal capacity (FC), this is derived from own source revenue (OR) as well as from revenue-sharing transfers both from taxes (RS^T) and natural resources (RS^N). Every element of the fiscal capacity is assigned to a predetermined weight, Φ . Fiscal capacity can be expressed as follows:

$$FC_i = \Phi_1 OR_i + \Phi_2 RS_i^T + \Phi_3 RS_i^N \quad (5.3)$$

The fiscal need (FN) of a province, equivalent to Eq. (3.2) in Chapter 3, is given by

$$FN_i = \left(\alpha_j \frac{\beta_{ih}}{\beta_h^*} + \dots + \alpha_m \frac{\beta_{in}}{\beta_n^*} \right) \delta, \quad \forall i \quad (5.4)$$

The fiscal need in this equation is a function of socio-economic indicators, β_{ih} , where $h = 1, \dots, n$, and $\beta_h^*, \dots, \beta_n^*$ stand for unweighted averages of respective indicators across the provinces. α denotes the parameter value of indicator h where $\sum_j^m \alpha_j \leq 1$. The average expenditure of all provinces is denoted by δ .

Equation (4.1) in Chapter 4 suggests an incorporation of ecological consideration into the fiscal need formula. Introducing the ecological indicator into the fiscal need formula leads to:

$$FN_i = \left[\left(\alpha_j \frac{\beta_{ih}}{\beta_h^*} + \dots + \alpha_m \frac{\beta_{in}}{\beta_n^*} \right) + \left(\alpha_a \frac{A_i}{A_i^*} + \alpha_{pa} \frac{E_i}{E_i^*} \right) \right] \delta, \quad \forall i \quad (5.5)$$

Equation (5.5) has two elements. The first term represents the socio-economic indicators. In principal it is the existing fiscal need formula in use by the Ministry of Finance, as in Eq. (5.4), except that it is without the area indicator. The second term comprises all area-related indicators, namely, the existing area indicator, A , and the suggested protected area indicator, E .

5.2.1.2 Choice of parameter values

There is an area indicator in the existing fiscal need formula. This indicator is to be divided into the general area indicator and the protected area indicator, implying the explicit inclusion of the ecological indicator. This section discusses the choice of parameter values for these indicators in the fiscal need formula.

In Eq. (5.5), the value of the entire area-related parameters implies that $(\alpha_a + \alpha_{pa}) \leq 1 - \sum_j^m \alpha_j$. In the official formula of fiscal need, the aggregate parameter values for these area-related indicators should be $\alpha_a + \alpha_{pa} = 0.15$. In the simulations that follow, the parameter values of indicators other than area-related indicators will remain the same as they are currently in use in the present calculation of fiscal need for the provinces. The focus of the simulation is chiefly on various parameter values from area-related indicators. By focusing only on the parameters of area in general (α_a) and of protected area (α_{pa}), in terms of area the fiscal need of a given province simplifies to

$$FN_i^{area} = \left((1 - \alpha_{pa}) \frac{A_i}{A_i^*} + \alpha_{pa} \frac{E_i}{E_i^*} \right) \delta, \quad \forall i \quad (5.6)$$

Drawing on this, the proposed selected combinations of parameter values for general areas and protected areas are presented in Table 5.1 below.¹¹³ The following four scenarios are selected for the sake of exposing different parameter values.

¹¹³ If $\alpha_{pa} = 0$ then the existing fiscal need formula is reproduced given that the parameter values of protected area indicator, $\alpha_{pa} = \begin{cases} 1, & \alpha_a = 0 \\ [0,1], & \alpha_a \leq 1 - \alpha_{pa} \\ 0, & \alpha_a = 1 \end{cases}$.

Table 5.1. Scenarios and area-related parameter values

Simulation	Scenario	α_a	α_{pa}	$\alpha_a + \alpha_{pa}$
DAU 1	Scenario 90:10	0.1350	0.0150	0.15
DAU 2	Scenario 75:25	0.1125	0.0375	0.15
DAU 3	Scenario 50:50	0.0750	0.0750	0.15
DAU 4	Scenario 25:75	0.0375	0.1125	0.15

Consider one example of the scenario, say DAU 1. This is generated from a fiscal need formula under a scenario where its proportion of area in the general indicator is 90 percent (the parameter value is thus 0.1350) and 10 percent for the protected area indicator (with a parameter value of 0.0150). This is then referred to as *Scenario 90:10*. Hereafter in the discussion, the indicator's proportion (rather than the indicator's value of parameter) will be used by virtue of its descriptive and practical advantages as an orientation.

5.2.1.3 Assumptions, data and the simulation process

We refer to the fiscal need assumptions equivalent with the country's actual general-purpose transfer calculation in 2007, unless otherwise indicated. In that fiscal year, 26 percent of the total net domestic revenues (PDN), amounting to IDR 164.8 trillion, is channeled for the pool of the DAU fund.¹¹⁴ 10 percent of this sum is allocated to all provinces ($n = 33$). The area indicator in the fiscal need formula includes marine area – up to 12 nautical miles from the coastline to be precise.¹¹⁵ In the calculation, 25 percent of the marine area is added along with terrestrial area cover, making up the total area indicator. The parameter values of the formula indicator (i.e., the α in Eq. 5.5) are

¹¹⁴ As regulated in Art. 27, Law 33/2004, the total DAU pool fund shall be at least 26 percent of the net domestic revenue in the national budget (APBN).

¹¹⁵ The (maximum) 12 miles of marine area falling into the responsibility of the province is in compliance with Art. 18 (4) of Law 32/2004.

as follows: 0.3 (population), 0.15 (area), 0.1 (Human Development Index), 0.15 (per capita GRP),¹¹⁶ and 0.3 (cost index). In the simulation, changes to the general-purpose transfers given the changes to the parameter value of the area indicator are of interest to us, now building on the general area and the protected area of a jurisdiction.

Moreover, fiscal capacity comprises revenue elements of own source revenue (PAD), realized shared-revenues from natural resources (DBH SDA)¹¹⁷ and from taxes (DBH Pajak) and the weight for each variable (i.e., the Φ in Equation 3.3.) is respectively 0.5, 0.5, and 0.75. All data on variables related to fiscal need and fiscal capacity in this simulation are identical to the data in use by the Ministry of Finance.¹¹⁸

This simulation applies an area approach. The determination of which indicator to use in allocating fiscal resources to meet ecological objectives will depend on the technical value of nature conservation attached to a certain type of area of a jurisdiction (e.g., Perner and Thöne, 2005; Rose, 1999). The task of such an area indicator involves a certain degree of ambivalence (Perner and Thöne, 2005: 181). On the one hand, it must portray – to the widest extent possible – the various layers of nature conservation objectives. On the other hand, it must simultaneously reduce – again, as far as possible – the complexity of the indicator, which itself develops as a result of attempting to satisfy the first task mentioned. Achieving the objective is traded off against the simplicity of the indicator. Perner and Thöne (2005: 181) argue that any indicator system for nature conservation will therefore more or less involve a compromise between objectivity and practicability.

In the simulations, the protected area (*PA*) is defined as a designated protected area which has been legally declared through a ministerial decree and dedicated to the

¹¹⁶ With the intention of reducing the inter-provincial gap, MOF exclude mining (sector 2) and industry and processing (sector 3) from the calculation of the average per-capita GRP. The same treatment also applies to outliers of provincial GRP. Both affect the average values in Eq. 5.4.

¹¹⁷ For the province Nangroe Aceh Darusalam, shared revenues from natural resources provisioned under the Special Autonomy Law no. 18/2001 are excluded in this simulation, as well as in the MOF calculation.

¹¹⁸ The calculation uses up-to-date data. However, as stipulated in Art. 41 (2) of Government Regulation 55/2005, in case of the most recent data not being available, the basic DAU data of *N-2* is to be used. For example, the 2007 DAU allocation is based on 2005 PAD data.

protection and maintenance of biological diversity and natural resources. The PA data here include *kawasan konservasi* (conservation areas) of terrestrial and marine origin. For the present purpose, conservation areas defined in other ways are excluded, for instance those of emerging local initiatives for protected areas. The Ministry of Forestry's *Data Strategis Kehutanan 2007*, from which the 2006 data of protected areas is derived, is our source. It provides information on the size of both terrestrial and marine/littoral protected areas for nature reserves, wilderness areas, national parks, and natural parks, in addition to forest parks and hunting parks. The data for the newly-established province of West Papua is not available. It was carved out of its parent province, Papua, in 2006. The area proportion of this new province in relation to Papua is therefore used here as an approximation for its protected area.¹¹⁹

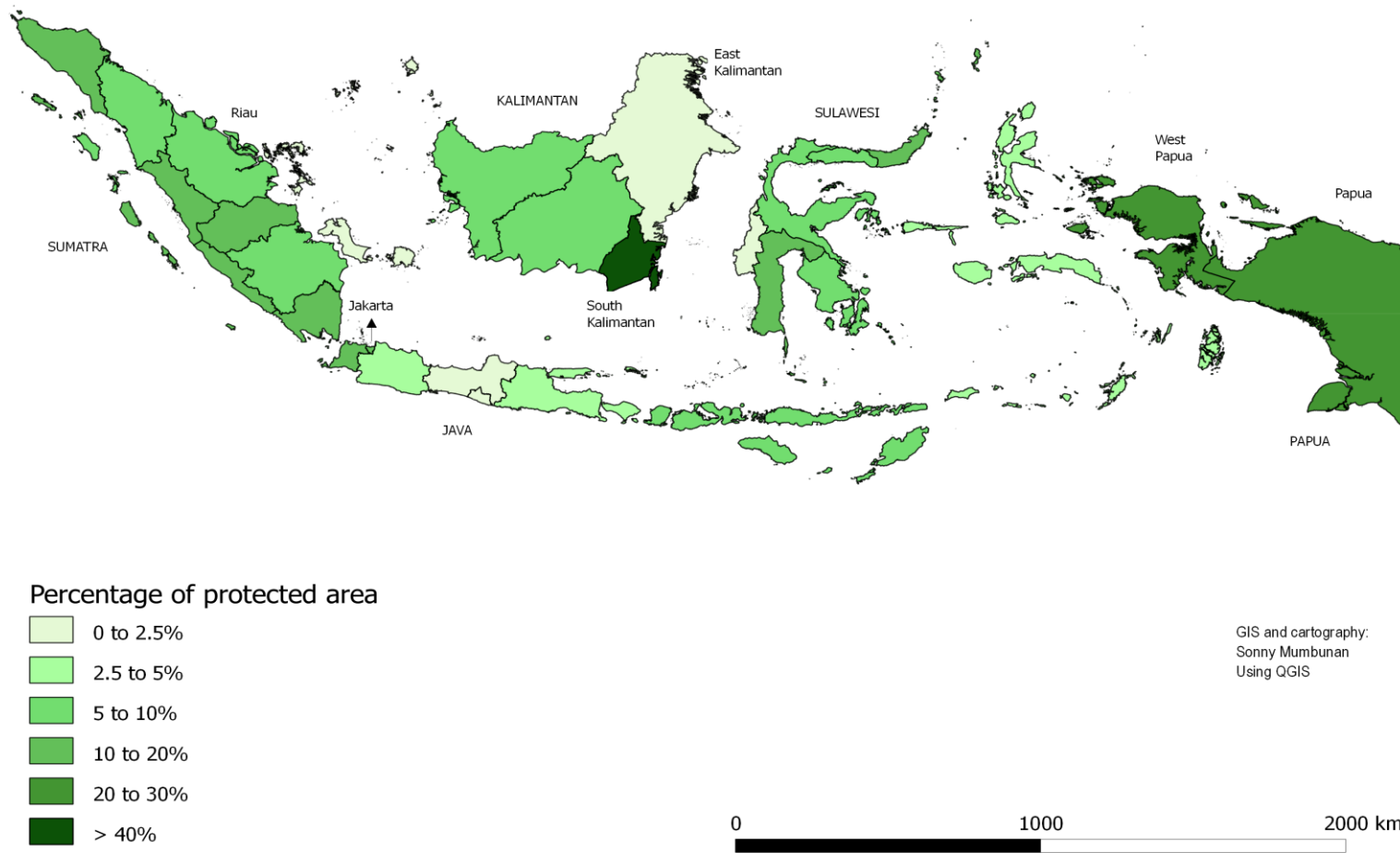
The spatial distribution of terrestrial and marine protected areas is revealed in Figure 5.1. A higher proportion of protected areas can be found in Papua (Provinces of West Papua and Papua) and in the province of South Kalimantan. By contrast, most provinces in Java have a relatively very low proportion of protected areas, except for Jakarta and Banten at the east end of the island. Sumatera and Sulawesi show a mixture between low and moderate proportions of protected areas.

For reasons of maintaining simplicity and transparency for a fiscal need calculation,¹²⁰ in the simulations the various categories of protected areas are not differentiated – all of them are unweighted and additive. It should be acknowledged that in doing so, some protected areas which may belong to more than one category, could be overlapping and result in a higher fiscal need than is actually the case. Furthermore, with respect to the iteration process of DAU allocation, the simulation will not perform the whole set of iterations as described in Section 3.3.1.3. The adjustment mechanisms in the Second Step and the Third Step will not be carried out. The simulation will therefore

¹¹⁹ In the case of data lacking for newly-formed jurisdictions, data from its parent jurisdiction in proportion is usually used, as stipulated in Art. 46 (3), Government Regulation 55/2005.

¹²⁰ For discussions on simplicity and transparency requirements for the fiscal transfer mechanism, see Bahl and Linn (1992), Lenk (1993), Bird and Smart (2002), and Section 2.2.1.2. Perner and Thöne (2005) make an explicit reference to these requirements in the case of fiscal transfers for nature conservation.

Figure 5.1. Spatial distribution of the proportion of protected areas at the provincial level



be limited to a standard formula-based calculation (i.e., only the First Step), examining the effect of introducing an ecological dimension into the mechanics of fiscal need calculation and the resulting observable changes in the general-purpose transfers, both of which are the main scientific and policy interest of this study.

In the preceding sections, the mechanics of the simulations have been highlighted. The following sections are devoted to discussing the results of the simulation. Section 5.2.2.1 discusses the impact of the proposed ecological fiscal transfer on the distribution of DAU transfer. Those provinces that could be classed as “winners” of the new transfer and those that would be “losers” are presented in this section. This section also analyses the possibilities of introducing ecological fiscal transfer in the presence of a DAU transfer configuration containing winning-losing provinces. Section 5.2.2.2 shows the spatial distribution of the transfer in light of a configuration as illustrated in the previous section. The equalization effect of ecological fiscal transfers in Section 5.2.2.3 rounds off the discussion by examining the equalization effects of the proposed ecological fiscal transfers relative to a baseline fiscal year.

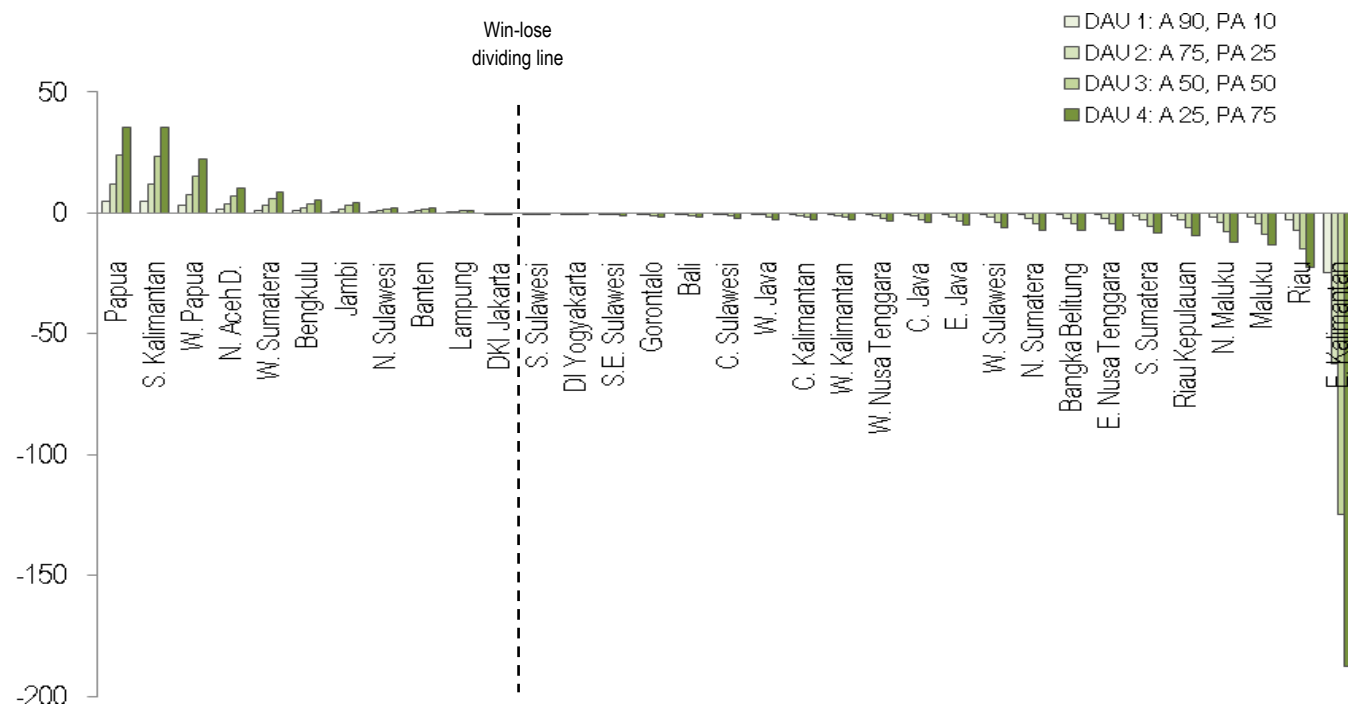
5.2.2 Results and discussions

5.2.2.1 The impact on fiscal distribution

A zero-sum distribution of transfer is implied in the simulation. This inevitably leads to a new transfer configuration in which some provinces gain and others lose from the suggested redefinition of fiscal need. In subsequent discussions, the so-called outlier provinces – DKI Jakarta and East Kalimantan – are differentiated from the other provinces. The reason behind this is that a compatible comparison cannot be established on the basis of the inverse fiscal balance (i.e., capacity is higher than need) of these provinces and a very high per capita fiscal capacity.

The main results of the simulation indicate that the number of losing provinces is more than twice the number of the winning ones. The configuration of the new fiscal distribution on the basis of percentage change is graphically presented in Figure 5.2.

Figure 5.2. The simulation of ecological fiscal transfers in Indonesia: Percentage changes from DAU 2007



Notes: (1) The baseline for comparison is DAU 2007.

(2) Basic Allocation is excluded.

(3) A = Percentage proportion of the area indicator; PA = Percentage proportion of the protected area indicator.

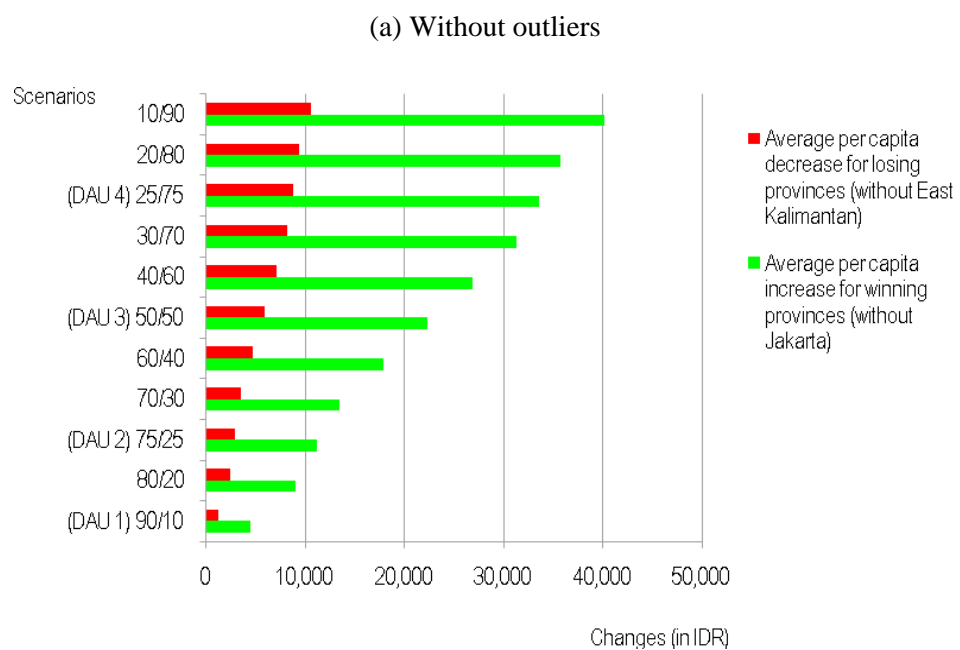
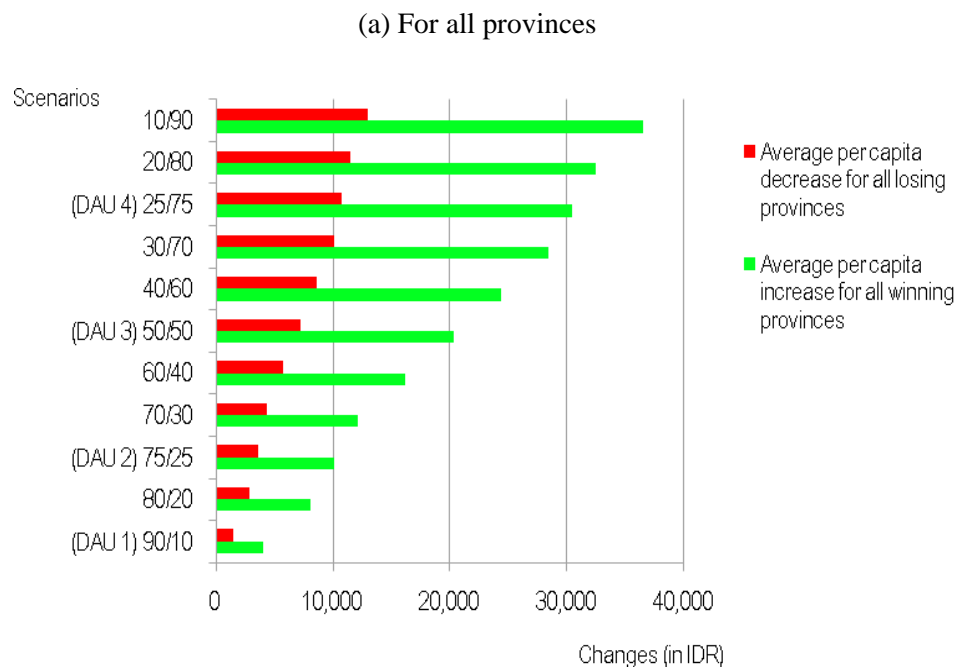
In total, 22 provinces would lose from the new ecological fiscal transfers, while the remaining 11 provinces would be better off. Arranged in *descending* order the winning 11 provinces are Papua, South Kalimantan, West Irian Jaya, Nanggroe Aceh Darussalam, West Sumatra, Bengkulu, Jambi, North Sulawesi, Banten, Lampung and DKI Jakarta. The 22 losing provinces, in *ascending* order, are South Sulawesi, DI Yogyakarta, South East Sulawesi, Gorontalo, Bali, Central Sulawesi, West Java, West Kalimantan, Central Kalimantan, West Nusa Tenggara (NTB), Central Java, East Java, West Sulawesi, North Sumatra, East Nusa Tenggara (NTT), Bangka Belitung, South Sumatra, Riau Kepulauan, North Maluku, Maluku, Riau, and East Kalimantan.

The case of East Kalimantan merits further notice since, as the figure shows, this province would suffer a dramatic decrease in DAU transfers (in DAU 4 of *Scenario 25:75*, reaching up to a 187 percent decrease). First, because its fiscal capacity and fiscal need basically do not differ by a large magnitude, East Kalimantan lies on the edge of the fiscal gap border. As a result, up to a particular point of area-protected area proportion, the province still receives a positive transfer before starting to have negative transfers (in *Scenario 50:50*) as the protected area indicator in the fiscal need calculation increases in proportion.¹²¹ Second, Figure 5.2 is based on the percentage change from DAU 2007. However, in the nominal absolute term the change would be relatively less dramatic. Later in Table 5.3, it will be shown that the nominal decrease in DAU 4 amounts to 72 billion IDR. This sum is much lower compared to the average nominal decrease of the losing provinces which is about 340 billion IDR. (In the scenario where the proportion of area is 60 percent, the nominal DAU transfer for East Kalimantan is about 70 million IDR, a negligible amount. See Figure A.6.a in the Annex).

The comparison between winning and losing provinces suggests interesting results. Relative to the baseline, on average the extent of the DAU transfer increase for the winning provinces is larger than the average decrease for the losing provinces. In other words, it is fairly obvious that the winning provinces on average receive a higher transfer from the new fiscal regime. In general, this holds both for per capita changes (see Figure 5.3) as well as for nominal absolute changes (see Figure 5.4).

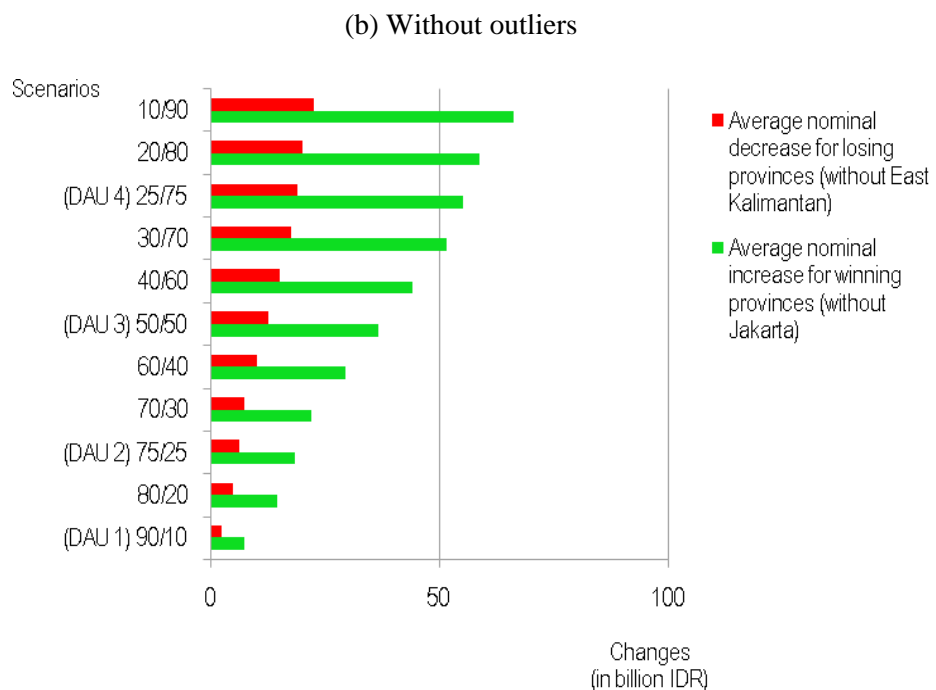
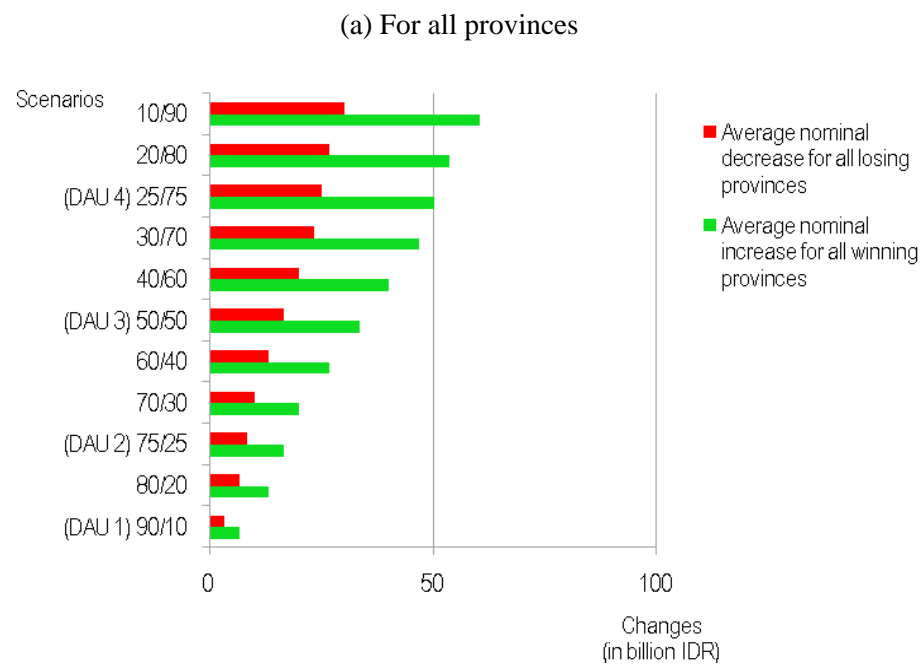
¹²¹ Figure A.6(a) in the Annex illustrates this unique case of East Kalimantan. Notice that the Basic Allocation is excluded from the calculation.

Figure 5.3. Average per capita changes in DAU transfers relative to the baseline



Notes: The baseline is DAU 2007 and the Basic Allocation is excluded.

Figure 5.4. Average nominal changes in DAU transfers relative to the baseline



Notes: The baseline is DAU 2007 and the Basic Allocation is excluded.

In particular, the difference in relation to the extent of the changes is proportionally even larger if outlier provinces are excluded from the pool of winning and losing provinces, as can be seen in Figures 5.3(b) and 5.4(b). In these figures, the vertical axis represents different scenarios with various combinations in the proportion of general area and protected area. (Further comparisons in both per capita and nominal terms are presented in Figures A.2 to A.5 in the Annex).

Let us take a closer look at the group characteristics in Table 5.2 below.

Table 5.2. The summary of descriptive statistics on fiscal characteristics

	Protected area (thousand ha)	Protected area per capita (ha)	Fiscal capacity		Fiscal need	
			Nominal (billion IDR)	Per capita	Nominal (billion IDR)	Per capita
<i>The winning provinces, n=10</i>						
Mean	1,551.7	0.92	247.1	78,058	1,421.2	654,268
Median	823.4	0.27	240.5	69,683	1,371.9	402,474
Std. Deviation	1,991.5	1.48	141.0	38,422	433.6	668,642
Maximum	6,759.9	4.00	553.4	159,706	2,549.3	2,320,792
	(Papua)	(W. Papua)	(Banten)	(W. Papua)	(Papua)	(W. Papua)
Minimum	175.4	0.02	69.1	43,405	981.3	155,175
	(Banten)	(Banten)	(Bengkulu)	(Lampung)	(Bengkulu)	(Banten)
<i>The losing provinces, n=21</i>						
Mean	396.9	0.14	445.7	64,263	1,630.3	512,659
Median	234.5	0.09	158.9	48,273	1,293.9	347,864
Std. Deviation	430.6	0.18	575.4	51,720	829.2	354,984
Maximum	1,507.3	0.73	1,883.9	264,760	3,671.7	1,173,103
	(W. Kalimantan)	(C. Kalimantan)	(W. Java)	(Riau)	(W. Java)	(N. Maluku)
Minimum	2.0	0.001	28.8	21,845	866.2	92,606
	(W. Sulawesi)	(C. Java)	(Gorontalo)	(NTT)	(Gorontalo)	(W. Java)
<i>The outliers, n=2</i>						
DKI Jakarta (winning)	27,105	0.003	8,804.9	982,339	1,603.2	178,866
E. Kalimantan (Losing)	212.6	0.072	1,716.1	584,436	1,988.5	677,186

Source: Author's calculation based on data from the Ministry of Finance (2007) and the Ministry of Forestry (2006).

Notes: (1) Fiscal need calculation refers to the original formula (without protected area).
(2) Protected Area (in thousand ha) comprises 100 percent terrestrial area and 25 percent marine area, referring to the practice by the MOF. The marine area constitutes 12 nautical miles from the coastline.
(3) The outliers are provinces with a fiscal capacity greater than their fiscal need, yielding a negative general-purpose transfer. In addition, the per capita GRP of these provinces is relatively high.

On average, the winning provinces have a relatively much higher per capita protected area— by a factor of more than 6. In addition, they have a higher per capita fiscal need which is likely to confirm the preconception that provinces of higher fiscal need would gain once the protected area is considered in the general-purpose transfers. However, these provinces also exhibit a higher fiscal capacity per inhabitant than the losing provinces. This observation appears to run counter to theoretical conjecture that the per capita fiscal capacity of winning regions is lower than that of losing regions, given their proportion of protected area. The best tentative explanation for this is the presence of provinces rich in natural resources within the grouping – Papua, West Papua, Nanggroe Aceh Darussalam – which seem to contribute to the overall higher fiscal capacity. On the other side, a number of losing provinces, such as West Kalimantan and Central Kalimantan, appear to have a relatively higher proportion of protected area. The negative effect from the reduction in the weight of the general area criteria seems to outweigh the positive effect of the protected area.

At the level of the individual province, East Kalimantan loses the most and undergoes a relatively drastic change from the new fiscal need calculation given its low level of per capita protected area. In the case of East Kalimantan, it shows a somewhat sensitive response to changes in the parameter value of the protected area indicator in the transfer calculation (Table 5.3). For instance, under *Scenario 25:75* it would receive 187 percent less than its original 2007 DAU transfer. Nevertheless, as noted above, one should also consider the absolute change in the transfer of East Kalimantan in nominal terms as well as its unique position regarding fiscal capacity and fiscal need in order to gain a better interpretation. In nominal terms, compared to the 2007 baseline, it would receive approximately 155 billion IDR less (derived from –72.2 billion IDR minus 82.6 billion IDR), which is still comparably lower than the average nominal decrease among the losing provinces under this scenario (340.5 billion IDR).

In the pool of winning provinces, Papua would gain the most from the transfer simulation if the protected area is introduced into the allocation mechanism of a DAU transfer. Under *Scenario 25:75*, it would receive about 950 billion IDR, a 35 percent increase from the baseline. In the same pool of winning provinces, the DAU transfers to Jakarta, a province on the edge between the winning and the losing provinces, would show a slight increase.

Table 5.3. DAU transfer simulations: Absolute and relative changes

Scenarios	DAU 2007 Without PA	DAU 1 90:10	DAU 2 75:25	DAU 3 50:50	DAU 4 25:75
<i>The winning provinces, n=10</i>					
Mean	356.3	363.7 (1.68)	374.7 (4.20)	393.1 (8.40)	411.6 (12.60)
Median	316.1	317.4 (0.91)	321.7 (2.27)	335.1 (4.54)	341.2 (6.80)
Std. Deviation	132.2	141.7 (1.79)	156.1 (4.48)	180.3 (8.97)	205.0 (13.45)
Maximum	701.2	734.1 (4.72)	783.7 (11.79)	866.4 (23.58)	949.0 (35.37)
Minimum	266.4	267.1 (0.14)	268.0 (0.35)	269.7 (0.69)	271.3 (1.04)
<i>The losing provinces, n=21</i>					
Mean	359.5	357.0 (-0.79)	353.2 (-1.96)	346.8 (-3.93)	340.5 (-5.89)
Median	326.4	325.8 (-0.55)	324.9 (-1.37)	323.4 (-2.74)	321.8 (-4.11)
Std. Deviation	116.9	116.6 (0.70)	116.3 (1.76)	115.8 (3.51)	115.5 (5.27)
Maximum	605.5	602.2 (-0.03)	597.2 (-0.06)	588.9 (-0.13)	580.6 (-0.19)
Minimum	120.1	116.5 (-3.03)	111.0 (-7.57)	101.9 (-15.15)	92.8 (-22.72)
<i>The outliers, n=2</i>					
DKI Jakarta (winning)	-2,185.5	-2,185.46 (0.00)	-2,185.36 (0.01)	-2,185.2 (0.01)	-2,185.0 (0.02)
Kalimantan Timur (losing)	82.6	62.0 (-24.98)	31.0 (-62.45)	-20.6 (-124.89)	-72.2 (-187.34)

Source: Author's calculation based on MOF data.

Notes: (1) All numbers are in billion IDR.

(2) The numbers in parentheses are percentage changes to the DAU transfer compared to DAU 2007; the transfer excludes the Basic Allocation.

(3) The outliers are provinces with a fiscal capacity greater than their fiscal need, yielding a negative general-purpose transfer. Additionally, the per capita GRP of these provinces is relatively very high.

The proposed transfer regime to incorporate an ecological indicator into the fiscal need calculation would result in 22 provinces being worse off. A transfer configuration which entails a higher proportion of losing provinces can be without political substantiation. Political acceptance is crucial for the suitability of any policy proposal.

The experience of Indonesia's transition to decentralization can be an important lesson here. The DAU payment in 2002 gained strong political opposition because 11 provinces (out of 30 provinces at the time) would have received a lower amount under the new formula-based transfer than they had received in the previous fiscal year (Fane, 2003: 165).¹²²

If maximizing transfers is assumed as a primary behavioral predisposition, then transfer-maximizing provinces would predominantly have the incentive to stick to the status quo arrangement. That is, they would basically prefer transfers without ecological indicators to ensure that there is no reduction in their transfer receipts. This is one possible explanation. However, a transfer configuration containing winning and losing provinces may enunciate a different explanation. Albeit seemingly less desirable from the point of view of *ex post* losing provinces, the new transfer configuration might at the same time highlight the importance of ecological production and provision costs that have been concealed so far. The now winning provinces would most probably be those of losing provinces *ex ante* given their higher fiscal need due to their incurred – and uncompensated – costs of undertaking cross-provincial ecological public functions. Conversely, the now losing provinces might *ex ante* free ride and inflict costs on the now winning provinces.

The effects of the new configuration seem to work both ways, to both the winning *and* the losing provinces. With this possibility in mind, in a less desirable new configuration – i.e., with losing parties after the new fiscal transfers – there are reasons to anticipate that the introduction of an ecological dimension into the instrument of the general-purpose transfer can still be carried out, at least under the following conditions: (1) provided that ecological reasoning and sustainability are worth pursuing as discussed in earlier sections; (2) due to the presence of losing provinces, fiscal transfer distribution turns out to be a political-economic matter that implies compensation mechanism for the losing provinces.

In the presence of losing provinces, the introduction is likely to take the following tentative trajectories, either individually or jointly.

¹²² This political untenability due to a transfer reduction gave rise to the 'hold harmless' condition and adjustment fund (Fane, 2003: 165; cf. Section 3.3.1.1), ensuring that a jurisdiction receives at least as much as its previous transfer.

Possibility 1

The implementation of a scenario entailing a formula-based fiscal regime that at least seeks to ensure the least sensitivity to changes, so that there would be no abrupt changes in transfer. In other words, a scenario that conforms to a large extent to the existing fiscal need formula, such as by assigning a larger proportion to the general area compared to the protected area in the parameter value of land-related indicators.

Possibility 2

The introduction may proceed in stages in that the proportion of the area cover is reduced in the consecutive years, while at the same time the proportion of the protected area is gradually on the rise. Brazil took this step-by-step route when it introduced a protected area indicator into its revenue-sharing arrangement from value-added tax in many of its federal states (May *et al.*, 2002: 176).

Possibility 3

The introduction of ecological fiscal transfers takes place at the moment when net domestic revenue (PDN) is on the rise and is sufficient enough to offset the magnitude of losses from transfers.¹²³ The additional increase in PDN allocated for the general-purpose transfer should at least be no less than the average level of all losing provinces. The existing fiscal institution facilitates this option. By regulation, the distribution of revenue-sharing from oil and natural gas refers to 130 percent of the assumed oil and gas prices in the current national budget (APBN). If actual prices happen to exceed the price assumption, then the revenue differential is to be distributed in the revised budget through net domestic revenue (PDN) on the basis of the DAU formula.¹²⁴

¹²³ This merits some further notes. Consider an increase in oil revenues. This would result in an increase in the share of net domestic revenue (PDN) available for transfer (DAU) as well as a simultaneous increase, to a different degree, in shared revenues from natural resource (DBH SDA) for the provinces. (The provincial share of oil revenue is 3 percent). Fiscal capacity, which determines general transfer allocation, depends in part upon the revenue-sharing arrangement (cf. Figure 3.2). The analysis of the overall effect of a PDN increase on the transfer that a jurisdiction receives would thus require an understanding of the exact magnitude and impact of revenue-sharing grants in the jurisdiction's revenue structure in addition to the proportion of its protected area in the calculation of fiscal need. This is an empirical question which is not pursued further here.

¹²⁴ Art. 24 of Law 33, 3004, and Art. 31 of Government Regulation 55, 2005.

Possibility 4

The worst possibility of all – or the best possibility as the case might be – is due to the existence of the adjustment fund. As discussed in Section 3.3.1.3, an adjustment fund ensures that a jurisdiction should receive no less general-purpose transfer than the level of its previous year transfer. The introduction of a new fiscal regime may ensue, as the magnitude of the relative reduction in the transfer will be buffered by the fund.

Whereas *Possibility 1* seems to be self-explanatory, the remaining possibilities warrant further explanation. As we have pointed out, the incorporation of the ecological indicator into the fiscal need structure implies a change in the distribution of the general purpose fund (DAU). The change results from an alteration in parameter values of the fiscal need criteria; a proportion of the general area indicator is reduced (or enlarged), while a proportion of the protected area indicator increases (or decreases). Therefore, in the new distribution of DAU we would observe some jurisdictions “winning” and some others “losing” by virtue of the alteration. *Possibility 2* suggests that the introduction of the ecological dimension would seem to require a sort of “transition period”, relative to the existing fiscal regime. A transition period at the same time serves to gain a wider political acceptance for the policy proposal, in addition to fulfilling conditions of consistency and low sensitivity of a fiscal transfer mechanism. A formula-based transition also fulfills the condition of transparency.

During the transition, the “losing” jurisdictions are compensated, at the time the reform takes place. That is, at the time when the introduced protected area indicator takes effect at the same time that the area indicator loses significance, until both indicators reach their appropriate footings. Modifying Eq. (5.2.), the formula of the general-purpose transfer (DAU) that is required during the transition period can be stated as follows:

$$DAU_{it} = BA_i + \left(\frac{FG_i^e t + FG_i^o (T - t)}{\sum_i^n FG_i * T} \right) FG_i^p \quad (5.7)$$

Whereby, in addition to the notations used in previous equations, FG_i^e denotes the fiscal gap function including the introduced *protected area* indicator in its fiscal need formula, and FG_i^o represents the existing fiscal gap function. Further, i indicates the jurisdiction, t

is the fiscal year where $t = (1, \dots, T)$, and $t-1$ the previous fiscal year. Note that, due to Eq. (5.5), the fiscal need parameter value in the fiscal gap function (FG), is subject to

$$\sum_{j \in S} \alpha_j^e \frac{\beta_i}{\beta^*} = \sum_{j \in S} \alpha_j^0 \frac{\beta_i}{\beta^*} = 1 \quad (5.8)$$

where S is a set of parameters of *socio-economic-ecological* indicators in the fiscal need calculation.

The new DAU formula of Eq. (5.7) allows us to introduce a transfer regime incorporating the ecological indicator. At the same time, this formula allows the proposed ecological indicator to be incorporated into the structure of the old transfer regime until the new regime is in full effect over a range of time. This sort of transition is different from the transition path suggested by a transfer formula in Spahn (2007: 199-200). Spahn intends to phase in the new fiscal regime while phasing out the old one. In his “grandfathering” formula the relation between the old and new variables is mutually exclusive. In Eq. (5.7) proposed in this study, however, the old socio-economic indicators and parameter values are still maintained. In this way, the introduction of the protected area occurs within the existing established structure of the general area indicator. Thus, except for the fact that the role of the general area indicator is increasingly reduced (compared to its present role), these indicators and their parameter values co-exist with those of the introduced ecological indicator and are subject to Eq. (5.8).

If the objective is to maintain the old and the new regimes concurrently over a transition period, then the implication is that a sort of transition transfer is required within this period. Such a transition transfer is fully achieved by allocating a general-purpose transfer such that:

$$DAU_{it} = \max \left\{ \left[BA_i + \left(\frac{FG_i^e t + FG_i^o (T-t)}{\sum_i^n FG_i^* T} \right) FG_t^p \right], DAU_{it-1} \right\} \quad (5.9)$$

Equations (5.7) and (5.9) may imply two further consequences (Spahn, 2007: 200). Both of these consequences are apparently related to the idea substantiated in Possibilities 3 and 4. The first consequence would be that the transition period requires jurisdictions

whose transfers are above the standard in the present fiscal year to reduce them below those of the previous fiscal year, unless an increase in FG_t^p (i.e., pool of fund available to finance fiscal gap) is secured in order to compensate this decrease.

The notion of *Possibility 3*, that is channeling funds resulting from an increase in net domestic revenue (PDN), seems to fit the big picture. The second consequence would be that the transition period requires an additional budget to fund the excess of transfers from the previous fiscal year. The idea of proposing an adjustment fund in *Possibility 4*, which ensures that a jurisdiction should receive no less than its previous transfer entitlement, is likely to provide a way out to mitigate the disheartening effects of introducing the new fiscal regime. This solution of an adjustment fund, however, in principle still requires an extra budget. Hence it may violate some efficiency conditions.

5.2.2.2 Spatial distribution of transfers

This section focuses on the spatial distribution of the proposed ecological fiscal transfers. In what follows, two maps with different scenarios of fiscal need calculations are presented. Figure 5.5 illustrates the results of *Scenario 90:10* (or DAU 1) and Figure 5.6 depicts the *Scenario 50:50* (or DAU 3). These two scenarios have been selected for the sake of example. Although some exceptions are also observed, the figures are suggestive of a number of general patterns in the spatial distribution from the introduction of a new general-purpose transfer regime that includes the indicator of protected areas.

Provinces on the inland of Papua (i.e., Papua and West Papua) would obviously benefit from the new fiscal transfer regime. An introduction of a 10 percent protected area proportion into the area indicator would make a 3 percent increase (West Papua) and a 4.7 percent increase (Papua) to their DAU transfers compared to what they received in 2007. As the proportion of protected area increases, from 10 to 50 percent, Papua would gain up to 24 percent, and more than its neighboring West Papua (around 15 percent). Provinces in Papua have a relatively large proportion of terrestrial protected areas which seem to outweigh the effects of their relatively small proportion of marine protected areas in the calculation of their fiscal need.

At the other end of the spectrum, most provinces in Java and Sulawesi and also those in Bali and Nusa Tenggara would have suffered transfer reductions from the new fiscal transfer regime. DAU transfers to virtually all provinces on these islands would be (up to) 0.5 percent less under *Scenario 90:10* than their original DAU. Provinces in the central and eastern part of Java (except Yogyakarta), West Sulawesi as well as East Nusa Tenggara, would lose more than their counterparts in the similar geographical region. Provinces in Maluku would experience a somewhat higher extent of decrease than the rest in this particular spatial grouping and lose between 1 to 5 percent.

Nevertheless, Java and Sulawesi seem to discern interesting counter observations as well. The provinces of (surprisingly) Jakarta and Banten – both in the western part of Java – as well as North Sulawesi would gain from the new fiscal transfer regime. Jakarta, the densely-populated capital of Indonesia whose proportion of the terrestrial protected areas is among the smallest of all provinces, benefits from the new transfer due to its comparatively large marine protected areas. Indeed, nation-wide Jakarta has the highest proportion of marine protected relative to its marine area, although a mere 25 percent of marine area used in the fiscal need formula seems to have prevented this province from gaining even more transfers. Its neighboring province, Banten, whose part of its land area belongs to a UNESCO world heritage site where endemic species live, secures positive transfers due to its large proportion of terrestrial protected area compared to its total area cover. The same reason apparently applies to North Sulawesi – the province with the second highest proportion of terrestrial nature conservation areas relative to its total area.

Let us turn now to Kalimantan and Sumatra. These geographic areas are parts of the lowland forest of the Sunda Shelf – the richest forest on Earth (Jepson *et al.*, 2001). Both Kalimantan and Sumatra show mixed patterns of winning and losing provinces. Kalimantan in particular has a disproportionate configuration. Whereas South Kalimantan would rank among the most winning provinces from the new transfer regime, East Kalimantan would be the most disadvantaged. South Kalimantan constitutes a province with the largest proportion of protected area (46 percent of its land area).

Figure 5.5. Spatial distribution of DAU 1 (with A = 90 % and PA = 10 %)

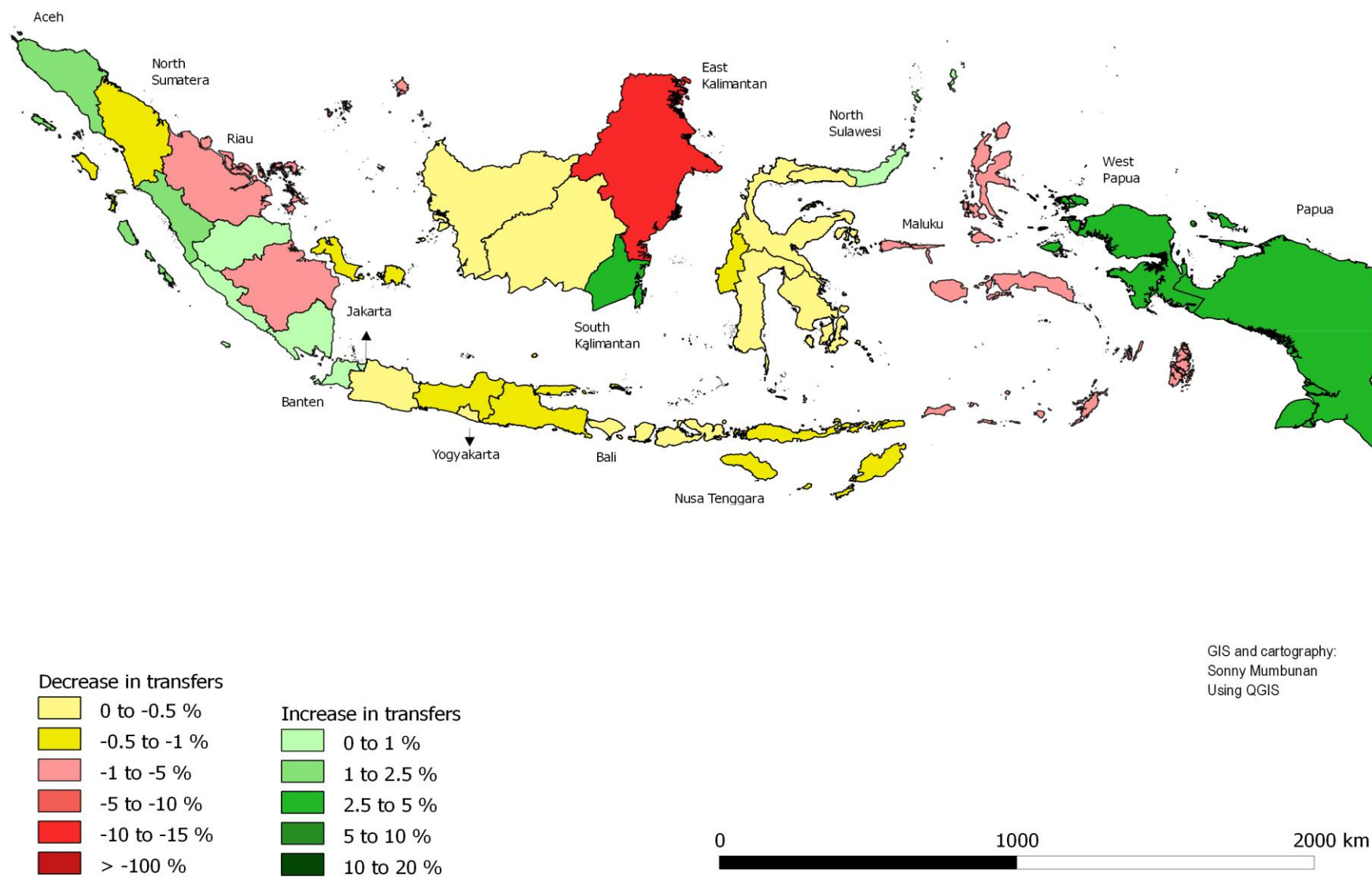
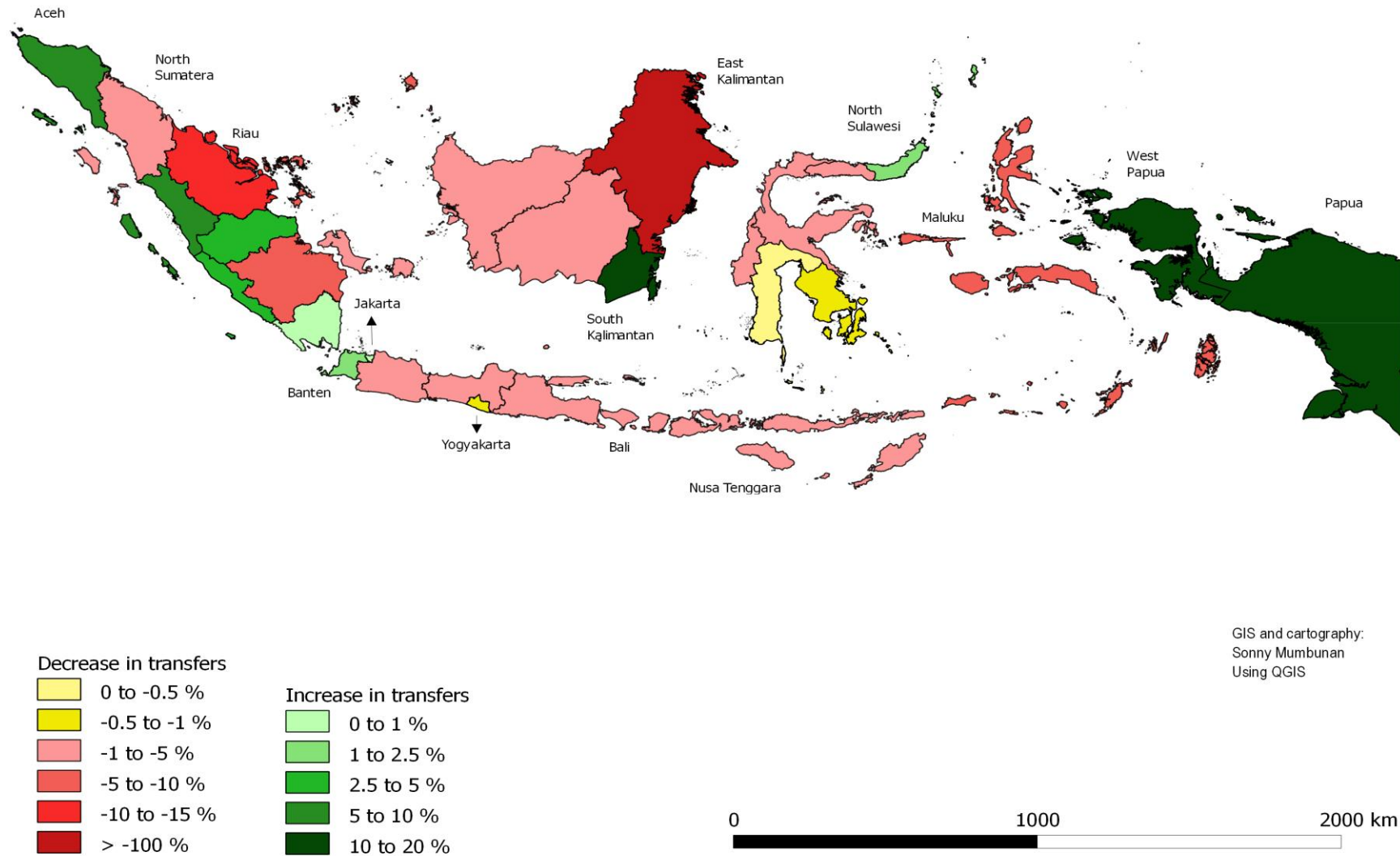


Figure 5.6. Spatial distribution of DAU 3 (with A= 50% and PA= 50 %)



Conversely, East Kalimantan, which comes second to Jakarta in terms of the highest fiscal capacity, joins the group of provinces with the lowest proportion of protected areas. At the same time, DAU transfers for Central and West Kalimantan would be slightly lower under the new fiscal transfer regime.

Sumatra exhibits a rather complex configuration. Habitats of the world's distinct megafauna such as the Sumatran Rhinoceros, the Sumatran tiger and the Asian elephant in the western part of the island – West Sumatra and Bengkulu – tend to benefit from the new fiscal transfer scheme. Aceh in the north and Lampung in the south are also favored by the new scheme as is Jambi. An increase in the proportion of the ecological indicator in the mechanics of the fiscal need formula would benefit West Sumatra and Aceh more, as the map in Figure 5.6 illustrates. In contrast to these descriptions, the eastern side of the island – Riau, Kepulauan Riau, Bangka Belitung, and South Sumatra – along with that of North Sumatra would receive fewer transfers if the ecological indicator was introduced. Riau is particularly interesting as this province, a member of the highest fiscal capacity bracket, would receive comparatively even less if the proportion of the ecological indicator increases.

5.2.2.3 The equalization effect

In this section we turn to the equalization effect of the simulated transfers. The intent of equalization measures, as the term implies, in essence is to equalize the fiscal capacities of jurisdictions to finance their expenditures and to perform public functions. Table 5.4 below provides the descriptive statistics on the variation of per capita revenues from all provinces. The table shows that transfer is equalizing, as can be seen from the abrupt decrease in the maximum-minimum ratio between own source revenue (from around 4,200) and shared revenues (to around 40).¹²⁵ The ratio is further reduced to approximately 12 in the presence of the DAU transfer.

¹²⁵ The ratio is quite dramatic since the data of the minimum own source revenues (270 IDR per capita) in this comparison is that of West Papua – a newly established province. Taking the next minimum value, that is of North Maluku (19,103 IDR per capita), a comparatively more established province, the maximum-minimum ratio now turns out to be just around 60. This ratio is much less than the previous one

A further indication of equalization would be the coefficient of variation, a measurement of distribution defined by the ratio of the standard deviation to the mean. The coefficient of variation decreases from 1.77 to 1.63 in the existence of shared revenues. In addition, the variation of revenue distribution becomes even smaller due to the DAU transfer (to be around 0.7), confirming an equalizing effect on fiscal capacities.

Table 5.4. Variation in per capita revenue across provinces, 2007

	Maximum to minimum ratio	Coefficient of Variation
Own Source Revenues (OSR)	4,252.01	1.7713
OSR + Shared revenues from taxes (RS ^T)	43.59	1.8149
OSR + Shared revenues from natural resource (RS ^N)	40.94	1.6073
OSR + All shared revenues (RS ^T and RS ^N)	43.98	1.6340
OSR + DAU transfer 2007, without Basic Allocation	11.77	0.7080
OSR + DAU transfer 2007, with Basic Allocation	12.81	0.7077

Source: Own table and calculation.

Notes: (1) Data: From MOF with own source revenue (2004 data), shared revenues (2005) except for Bali and West Sulawesi (both 2006), basic allocation (2006), population (2006), and DAU (2007, based on Eq. 5.4). Fiscal capacity data (i.e., own source revenues and shared revenues) are unweighted. All data are in a per capita measure.

(2) DAU transfer is without the protected area.

(3) The coefficient of variation is unweighted.

Fiscal equalization bears close affinity to distributive or equity issues. In his examination of fiscal decentralization, Boadway (2006: 360) points out that equity between jurisdictions is likely to be influenced by two sources: first, differences in jurisdiction's capacity of public service provision given a comparable tax rate, and second, differences in fiscal policies such as different tax structures affecting people in

(4,200), yet definitely still higher than the ratio without a DAU transfer (12). The coefficient of variation is now smaller (1.7361).

different ways on the basis of income level. In such a unitary state such as Indonesia the consequence from the former source of inequity (i.e., suboptimal provision of ecological public functions) should appear rather more straightforward than that of the latter source because of the country's relatively similar tax structure between subnationals, despite for example the plausible differences of preference at the individual household level. If differences in the capacity for public service provision are a consideration to be taken into account, a policy objective in a decentralized country thus becomes one that ensures a degree of horizontal equity resulting from inequalities of fiscal decentralization (e.g., Boadway, 2006; Rao and Das-Gupta, 1995). In general, as we have seen in the previous Table 5.4, the DAU transfer has served to fulfill this function.

It is now of interest to investigate a causal relationship between fiscal capacity and fiscal transfer. More precisely, it is of interest here to go over the questions of how and to what extent the ecological dimension in the transfers plays a role in explaining fiscal equalization. To this end, Table 5.5 reports least square (OLS) regression estimates to explain DAU transfers with independent variables of GRP, the area in general and the protected area. All variables are measured in per capita terms and appear in a natural logarithmic form. The main explanatory variable is GRP (Gross Regional Product) which serves as a proxy for fiscal capacity. In the estimation model, the effects on DAU transfers are examined by testing different variables. Further, the effects are examined as well by omitting the provinces of DKI Jakarta and East Kalimantan – provinces referred to as “outliers” – from the observation.¹²⁶ In general, the estimation is undertaken with the intention of investigating the causal relationships between fiscal-related aspects such as fiscal capacity, on the one hand, and fiscal transfers when the protected areas indicator is incorporated into the transfers, on the other.

¹²⁶ In the actual calculation of fiscal need the MOF sets the GRP per capita of DKI Jakarta and East Kalimantan equal to that of Riau. These two provinces, i.e., DKI Jakarta and East Kalimantan, have a fiscal capacity that is greater than their fiscal need and their per capita GRP is very high relative to that of other provinces. Hill *et al.* (2008: 414), who have been examining Indonesian regional development dynamics since the 1970s, identify these two provinces as being very wealthy and, along with Riau, as “consistently wealthy” provinces in that their per capita non-mining GRP have been far above the national averages over time.

Table 5.5. Ordinary least square estimates: fiscal capacity and area-related indicators (dependent variable: Log DAU transfer)

DAU transfer per capita	GRP per capita				General area per capita				Protected area per capita				Adjusted R2	
	All provinces		Without outliers		All provinces		Without outliers		All provinces		Without outliers		All	Without
	Coefficient	t-stat	Coefficient	t-stat	Coefficient	t-stat	Coefficient	t-stat	Coefficient	t-stat	Coefficient	t-stat		
Model 1: Transfer=f(grp, area, protected area, others)														
DAU 2007	-1.713	-2.46 **	-0.398	-1.42	1.112	4.44 ***	0.707	6.71 ***	-0.173	-0.92	-0.118	-1.66	0.558	0.703
DAU 1	-1.751	-2.49 **	-0.395	-1.39	1.093	4.32 ***	0.703	6.60 ***	-0.159	-0.84	-0.113	-1.56	0.542	0.698
DAU 2	-1.847	-2.56 **	-0.391	-1.35	1.050	4.05 ***	0.696	6.42 ***	0.131	-0.67	-0.104	-1.41	0.525	0.691
DAU 3	-3.195	-2.72 **	-0.385	-1.29	0.544	1.29	0.685	6.12 ***	0.143	0.45	-0.090	-1.19	0.271	0.678
DAU 4	-3.187	-2.71 **	-0.380	-1.23	0.534	1.27	0.674	5.82 ***	0.156	0.49	-0.077	-0.98	0.272	0.663
Model 2: Transfer=f(grp, area, others)														
DAU 2007	-1.731	-2.49 **	-0.431	-1.49	0.940	5.66 ***	0.576	8.02 ***					0.551	0.684
DAU 1	-1.767	-2.53 **	-0.426	-1.47	0.934	5.59 ***	0.578	8.00 ***					0.546	0.683
DAU 2	-1.861	-2.60 **	-0.420	-1.43	0.919	5.38 ***	0.581	7.95 ***					0.534	0.680
DAU 3	-3.180	-2.75 **	-0.410	-1.37	0.687	2.48 **	0.586	7.84 ***					0.291	0.673
DAU 4	-3.171	-2.73 **	-0.402	-1.30	0.690	2.49 **	0.589	7.68 ***					0.290	0.664
Model 3: Transfer=f(grp, protected area, others)														
DAU 2007	-1.968	-2.22 **	-0.525	-1.17					0.450	2.83 ***	0.241	3.17 ***	0.266	0.235
DAU 1	-2.002	-2.26 **	-0.521	-1.16					0.453	2.85 ***	0.245	3.22 ***	0.272	0.240
DAU 2	-2.088	-2.36 **	-0.516	-1.14					0.456	2.87 ***	0.250	3.29 ***	0.281	0.248
DAU 3	-3.320	-2.81 ***	-0.508	-1.12					0.448	2.11 **	0.258	3.38 ***	0.255	0.259
DAU 4	-3.310	-2.80 ***	-0.501	-1.10					0.455	2.14 **	0.266	3.46 ***	0.257	0.268
Model 4: Transfer=f(grp, others)														
DAU 2007	-2.094	-2.14 **	-0.481	-0.93									0.100	-0.004
DAU 1	-2.129	-2.17 **	-0.477	-0.92									0.104	-0.005
DAU 2	-2.216	-2.26 **	-0.471	-0.90									0.113	-0.006
DAU 3	-3.445	-2.77 ***	-0.461	-0.88									0.172	-0.008
DAU 4	-3.438	-2.76 ***	-0.453	-0.85									0.171	-0.009

Notes: (1) The stars next to the t-value indicate the following significance levels: * .05 < p < .10, ** .01 < p < .05, *** p < .01.

(2) A constant is included in the model but not reported in the table. All variables are in natural logarithm. If the fiscal gap of a province is negative (i.e., fiscal capacity is larger than fiscal need), the province receives zero DAU transfer (cf. Section 3.3.1.3). In the simulation, the DAU transfer for provinces with a negative fiscal gap becomes log (1+transfer). On the log treatment of a variable containing the value zero, see Wooldridge (2006: 199).

(3) Observations: $n = 33$ (all provinces) and $n = 31$ (without the outlier provinces of DKI Jakarta and East Kalimantan)

In this section, models with different specifications are presented. In each model, the DAU transfer is the dependent variable. The complete *Model 1* includes GRP, the area in general and the protected area. *Model 2* excludes the protected area, so only GRP and the area in general are in the model. In addition to including GRP, *Model 3* includes the protected area variable yet does not control the general area. In the last model, *Model 4*, GRP is the only explanatory variable.

In all models, the coefficients of GRP from different DAU transfer scenarios show the anticipated sign (i.e., negative), generally implying that all transfers in the simulations are equalizing.¹²⁷ In other terms, an increase in fiscal capacity means a decrease in the DAU transfer. Consider *Model 1* to gauge the magnitude of this effect. If an annual per capita fiscal capacity increases by 1 percent, the fiscal transfer falls by 1.7 percent (DAU 1) to 3.2 percent (DAU 4). The equalizing effect is higher if only GRP and the protected area are considered, as in *Model 3*. In this model, a 1 percent per capita fiscal capacity increase reduces per capita fiscal transfer by 2 percent (DAU 1) to 3.3 percent (DAU 4). The equalizing effect is statistically significant in those cases where the model takes account of all provinces, including those with the highest fiscal capacity.

The estimation results seem to support the intuition that both the magnitude and the statistical significance of an area variable decrease both in the presence of the protected area (*Model 1*) or when it is absent (*Model 2*). In *Scenario 50:50* (DAU 3) and *Scenario 25:75* (DAU 4) of *Model 1*, the per capita area becomes statistically not significant when all provinces are included.

What can be drawn from these estimation results in light of the introduced ecological indicator? In the case of the model with all provinces, it can be seen that a general purpose fiscal transfer decreases as the fiscal capacity of a province increases. Such an equalizing effect is higher if the proportion of the protected area in the fiscal

¹²⁷ The estimated model is $\log(T) = \alpha + \beta \log(c) + \mu$, whereby T denotes the transfer, α the intercept, c the independent variable, and μ an error term. The independent variable c represents fiscal capacity. Holding other variables fixed, a transfer is said to be equalizing if $\frac{\partial T}{\partial c} < 0$. This condition suggests that an increase in per capita fiscal capacity (as proxied by GRP) results in a decrease in the per capita DAU transfer.

need calculation increases, and all are statistically significant at the 5 percent level (for DAU 3 and DAU 4 in *Model 3*, significant at the 1 percent level). In *Model 3*, which controls protected area variable along with the fiscal capacity, an increase in the per capita protected area increases the per capita transfer that a province receives. This becomes particularly obvious when provinces with a very high fiscal capacity are excluded from the observation. In the case of all provinces, both the magnitude of increase in the fiscal transfer and their statistical significance are relatively lower if the proportion of protected area changes to become 50 percent (DAU 3) and 75 percent (DAU 4) of the proportion in the fiscal need calculation on the basis of the area indicator.

These findings bear some economic relevance. Regarding the role of the ecological dimension in fiscal transfer allocation, the introduction of the protected area indicator into the structure of the general-purpose transfer as well as the increased proportion of that indicator both contribute to the equalizing effect of the DAU transfers. This effect holds especially true when for provinces with very high fiscal capacity are controlled. A further relevant finding which is of considerable value to the study is related to the distributive aspect. Although the model does not make a clear distinction between vertical and horizontal fiscal imbalances (cf. Bird and Tarasov, 2004), especially given that the core of the fiscal gap approach relates rather to problems of vertical fiscal imbalance,¹²⁸ the results suggest that at a certain extent horizontal equalization is evident between the richest and the poorest provinces, as can be seen from the effect of transfers on the fiscal capacity of these provinces. Hence, for this particular matter the distributive rationale of DAU transfers could be justified.

The results also suggest that treating DAU transfers merely as a function of GRP may not be appropriate. *Model 4* shows that GRP explains little about the variation in DAU transfers, as exemplified by a very low R^2 value. Earlier empirical analysis of Indonesian intergovernmental fiscal transfers in which GRP exclusively serves as an

¹²⁸ Even if general-purpose transfer is theoretically geared towards tackling vertical fiscal imbalance, in the Indonesian case, as described in Chapter 3, the elements of the general-purpose transfer (DAU) also entail dimensions of horizontal fiscal equalization. This complicates any attempt to distinguish between the two kinds of fiscal imbalances.

explanatory variable can be found for example in Ahmad *et al.* (2002). In comparison to other model specifications, this also points out that adding (or omitting) relevant variables for fiscal transfers could affect the statistical explanatory power of the model.

5.3 Potential shortcomings of the simulation

The simulations of DAU-based ecological fiscal transfers undertaken in this study deserve some notes. This section evaluates the potential shortcomings of the simulation at both conceptual and technical levels.

The first potential shortcoming concerns the definition of a protected area. The definition refers to the Ministerial Decree (*Keputusan Menteri*) which excludes the possibility of emerging initiatives at provincial and local levels for protected areas especially post decentralization, such as that of *Daerah Perlindungan Laut* (Marine Protected Area), to be taken into account in the expenditure need of a given jurisdiction.¹²⁹ This understood, it is in no way a comprehensive representation of fiscal need and the results are likely to be a conservative estimation of the initiated fiscal transfers due to protected areas.

At this point, one might think about the proper consideration of the marine area. In the simulations presented – as in the MOF calculation – only 25 percent of the marine area is considered in the area indicator of fiscal need. An increase of the marine area proportion of up to 50 percent would still seem to be a conceivable range, given the importance of the marine ecosystems to the country's economy, ecological services and biodiversity.¹³⁰ Empirical evidence indicates that an increase in the size of the marine area tends to increase the number of species richness (e.g., Chittaro *et al.*, 2009). Additionally, the country's archipelagic characteristics may give rise to the importance

¹²⁹ On the emergence of district-based *Kawasan Konservasi Laut Daerah* (Regional Marine Conservation Areas) which in 2009 amount to 36 areas, covering a total area of 4.66 million Ha, see KKP (2009: 67-74).

¹³⁰ However, although marine systems have their own ecological importance in comparison to terrestrial resource systems, to some degree the problems related to the conservation of marine ecosystems are also land-based, making a clearcut marine-terrestrial differentiation somewhat problematic. Siltation, pollution, or eutrophication, are common examples.

of archipelagoes for nature conservation, given for example unique assemblages and the evolution of species as well as habitat diversity (e.g., Ås *et al*, 1992: 207). With reference to the simulations, approximately two thirds of all provinces would benefit from an enlargement in the proportion of the marine area indicator.

Second, the data on protected areas are additive. A summation of all protected areas from different management categories becomes the total amount of protected area cover. Some part of the areas may occasionally straddle different management categories, leading to a double counting of the same area, as would be the case for a marine national park area which possibly covers both oceanic areas and a fraction of coastal and terrestrial areas. This issue calls for a more precise area account and the relevant method, for example based on a Geographical Information System (GIS), which helps to disaggregate converging layers of the same area yet pertaining to dissimilar management categories. Ring (2008b) provides a GIS application to demarcate borders of municipality as well as protected area in the allocation of fiscal transfers for nature conservation. Due to data availability this is not possible for the present study. In addition to a potential double counting as just mentioned, the problem of data operationalization may also exist. However, the exposure to more detailed data and categories may undermine the simplicity and transparency dimensions which are the requirements in the design of a formula-based lump sum general-purpose transfer.

Third, the area covered by protected areas defines the new DAU transfer that a jurisdiction will receive. In this way a general-purpose transfer is not a function of the magnitude, extent and quality of ecological public functions that such a jurisdiction will bear or perform. This, however, relates to the nature of the fiscal gap approach under the general-purpose transfer which seeks to maintain simplicity in determining the transfer. A specific-purpose transfer may in this respect more suitably satisfy the need for more articulated and complex criteria that are capable of incorporating the considerations beyond area cover.

Fourth, the reference of the DAU pool fund in this simulation is a certain proportion of domestic net revenue (PDN) in a particular fiscal year (2007). The plausibility of introducing a DAU-based ecological fiscal transfer indeed depends on this. The reason for this is that the annual PDN may increase (or decrease) and will affect the possible room for a “fiscal maneuvering” of such a policy option in that either

the number of winning provinces may increase, or the number of losing provinces decrease, to the extent that revenue changes in PDN will proportionally allow. This is imperative, especially if an expected DAU increase is to be the prime incentive factor for the preference of a jurisdiction. Dependency on the annual revenue realization of PDN, however, may violate another theoretical dimension of an appropriate intergovernmental fiscal transfer mechanism, namely the independency of the time period (Section 2.2.1.4).

The last potential limitation of the simulation concerns data availability. At the time of writing, in contrast to fiscal data, the data on protected areas at the levels of the municipality and district are scattered and inaccessible. Protected area data is only accessible for the provincial level with relatively limited observations, as the data employed in this simulation. This has prevented further and more robust econometric examinations with respect to the potential fiscal effects of intergovernmental transfers and their determinants – both fiscal and ecological.

CHAPTER 6

Conclusions and perspectives for further research

Positive environmental externalities from public provision, such as the benefits yielded by the public measure of nature conservation, are often not internalized. A potential sub-optimal provision in the public sector can be expected from such a condition, leading to inefficiency, if the benefits created on a greater territorial scale are not acknowledged. This holds particularly true for intergovernmental fiscal relations in a decentralizing multi-tiered governmental system. Fiscal transfers have been proposed as instruments to acknowledge the positive externalities from public goods provision. In consequence, the question that has to be raised here is what kind of reasonable fiscal transfers incorporating ecological dimensions are to be proposed.

The overall aim of this work is the study of ecological fiscal transfers in Indonesia. The choice of a country case is intended to empirically enrich the discussions on fiscal transfer policy for ecological purposes. The reason why Indonesia has been chosen as the context for the study is threefold. Firstly, Indonesia is a country of particular ecological relevance. At the moment, for instance, it is the world's largest CO₂ emitter from deforestation and yet it belongs to the hottest biodiversity hotspots on earth. Secondly, this large country has also been decentralizing in fundamental ways. After decades of centralization, Indonesia embarked on a wide-ranging decentralization in 2001, including the areas of intergovernmental fiscal relations, during which numerous assignments of responsibilities and public functions have been devolved to subnational and local governments as part of the regional autonomy process. Thirdly, as is the case for most developing countries, Indonesia has restrained fiscal capacities to perform its measures of ecological public functions and its fiscal needs for these functions often appear to outweigh its fiscal capacities. These reasons imply that although the study represents a country case it can be an inspiring source of scientific interest and of policy relevance at a much larger scope. Particularly, since research at the interface of the economic theory of fiscal federalism, the sustainability concept, and policies related to conservation and the environment is still very much in its infancy (Ring, 2001).

There are two further specific objectives which are pursued in this study. The *first* specific objective is to assess the current state of intergovernmental fiscal transfers for ecological purposes in Indonesia's existing and functioning fiscal system. The *second* specific objective concerns the investigation of possible policy options which could work in the existing fiscal institution. More specifically, it seeks to find plausible fiscal transfer mechanisms allocated on the basis of ecological consideration in Indonesia.

Three major contributions are made by this study in order to improve our understanding of ecological fiscal transfers in general and their applications in Indonesia in particular. *First*, it is the first study that reviews the Indonesian intergovernmental fiscal transfer system by directly considering the ecological dimension in the fiscal transfer system. *Second*, it constitutes the first study to offer an extensive evaluation of the policy options for ecological fiscal transfers based on the public finance analysis of the existing intergovernmental fiscal system in Indonesia. In this respect, by deriving from the assessment of the literature on ecological fiscal transfers, the policy options also contribute to the expansion of approaches in the allocation of fiscal resources for ecological purposes. The *third* contribution is the introduction of an explicit ecological indicator into the structure of the fiscal need calculation of a general-purpose transfer. The innovative character of this contribution lies in its empirical assessments in that it shows for the first time the transfer distributions and fiscal equalization effects if an ecological indicator is introduced. Furthermore, given the results of the calculation (especially concerning the equalization effects) and the similarities between the basic mechanisms of the proposed transfer allocation and the existing one, the Indonesian authorities are now able to introduce the ecological indicator into their general-purpose transfers.

The remainder of this final chapter is organized as follows. Section 6.1 is devoted to the conclusions in which the findings related to the intergovernmental fiscal transfer system and ecological issues, policy options for ecological fiscal transfers, as well as the distribution of fiscal transfers and fiscal equalization effects are discussed. Section 6.2 derives the perspectives for future research.

6.1 Conclusions

The intergovernmental fiscal transfer system and ecological issues

This study reviews the Indonesian intergovernmental fiscal transfers by directly considering the ecological dimension in the fiscal transfer system. It begins by tracing the developments of Indonesia's intergovernmental fiscal transfer system before and after decentralization. The latter period is a relatively recent development after the transition period from centralization, which was officially started in 2001.

A connection is then established between intergovernmental fiscal transfers and ecological issues. It has been shown that in these systems there are elements of both continuity and change. On the one hand, Indonesia's intergovernmental fiscal system maintains a number of facets reflecting continuity. This can be seen, for example, in the continued utilization of an area-based approach in the system of fiscal resource allocation. In Indonesia, this approach has been in use in various ways under the specific and general-purpose transfers as well as in the revenue-sharing arrangement both before and after decentralization. In general, given the lack of own source revenues, transfer remains the most important source in the revenue structure of subnational and local governments either before or after decentralization. In terms of environmental considerations, although they are subject to some restructuring, forest-related conservation has been a pivotal part of the transfer system through time.

On the other hand, numerous changes are introduced. In general, important changes include setting a clearer definition and differentiation between specific-purpose transfers and general-purpose transfers. Another change is the introduction of a more precise formula-based allocation for general-purpose transfers. In particular, with respect to ecological fiscal transfers, changes have occurred in terms of forest conservation and the revenue-sharing arrangements from natural resources. Under decentralization, intergovernmental fiscal transfers involving explicit ecological dimensions are organized separately. First, under the instrument of specific-purpose transfers for the environment (DAK Environment). Second, under the instrument of a revenue-sharing scheme for forest and land-related conservation and restoration, the GERHAN program. The source of fund for the latter is derived from *dana reboisasi* (reforestation fund), a shared-

revenue from the polluter-pays-principle type of fund paid by logging companies extracting timber resources. Prior to decentralization, these two instruments were under a single specific-purpose transfer allocated to both provincial and local governments. In addition to the changes described above, another important development after decentralization is the introduction of a fraction of marine area (along with the terrestrial area) as part of the area indicator in the fiscal need formula of a general-purpose transfer.

The identification of how ecological dimensions have been incorporated into fiscal transfers is connected to the possibilities of policy options for ecological fiscal transfers.

Policy options for ecological fiscal transfers

The second contribution is related to the policy options for ecological fiscal transfers based on the public finance analysis of the existing intergovernmental fiscal system in Indonesia. At present, fiscal transfers that directly consider ecological issues in the intergovernmental fiscal transfer system in Indonesia take two broad forms. Firstly, in the form of the specific-purpose fund for the environment (DAK Environment), directed towards measures mainly concerning water quality and pollution control. Secondly, in the form of a revenue-sharing arrangement under the reforestation fund. The evaluation of these instruments shows that the existing specific-purpose transfers for the environment tend to address mainly the “end-of-the-pipe” functions and are therefore less conservation-oriented. Specific-purpose transfers for pollution control and water resource protection under the DAK Environment are mainly directed towards the provision of physical facilities. Consequently, both the scope and measures for ecological public functions covered in this instrument are basically limited. As for the revenue-sharing arranged for ecological purposes, the possibilities provided by other instruments of shared revenues from natural resources have not been explored in Indonesia in terms of their potential for explicit ecological considerations, beyond the instruments of the reforestation fund and in the forestry-related sector.

In this research study, three policy options for ecological fiscal transfers are proposed. These options should not be mutually-exclusive but complementary, seen as each instrument among the options has its own purpose. The first option is the

incorporation of an ecological indicator into the general-purpose transfer (DAU). In this option, an ecological indicator is introduced into the existing area approach in the structure of the fiscal need calculation. The ecological indicator is proxied by protected areas of terrestrial and marine areas, the choice of which is driven by the simplicity of the protected area indicator and its ability to signal the ecological needs of a jurisdiction under the requirement of a general-purpose transfer. As it is demonstrated in Section 2.3.2, the conceptual foundation in the utilization of a protected area as an ecological indicator in the mechanism to allocate fiscal transfers has been instigated in Brazil and Portugal and proposed in other hypothetical cases for Germany and India. The major advantage of this option is that it considers the fiscal need for ecological expenditure of a region and its fiscal capacity to deliver ecological public functions. Basing itself on a general-purpose transfer instrument, this option is also relatively better in terms of fiscal equalization. Finally, the use of a formula-based allocation enhances transparency in the allocation of fiscal resources. One of the major limitations of this option is that it is a lump-sum transfer. Lower level governments will decide on the final use of this transfer and may (or may not) spend the allocated general purpose grant they receive for ecological purposes. Data availability is another concern, particularly in developing countries. Moreover, there is the problem of incentive dilution that is inherent in any formula-based transfer through which with the constant slot of fund, the average transfer may decrease as the protected areas expand.

The second option is concerned with the inclusion of ecological issues in revenue-sharing schemes. This option involves two sub-options. One is intended to assign shared revenues from taxes (DBH Pajak) on the basis of the ecological indicator. The other one aims at earmarking shared revenues from natural resources (DBH SDA) for environmental purposes. In the first sub-option, to finance the ecological purposes, the possible source of funds from shared tax revenues include the proportion of (i) taxes which are associated with the environmental externality related to the source of tax, such as taxes from land and building; (ii) or taxes which provide the largest shared tax revenues to the lower tier of government, such as the property tax. The advantages of this sub-option may include the relative stable and predictable stream of revenues, enabling subnational and local governments to plan and design sustained ecological public functions. In addition, this sub-option might provide jurisdictions of ecological

importance, which are not rich in natural resources, the incentives to undertake ecological public functions such as nature and biodiversity conservation as exemplified by the Brazilian case from the revenue-sharing of value-added taxes. The limitations of this sub-option are related to the fact that the tax elasticity is relatively poor in response to economic changes such as prices and incomes, particularly in the case of developing countries, limiting the flexibility of subnational and local governments to increase the provision of ecological public goods. Additionally, transfers from revenue-sharing tend to be counter-equalizing which increases the discrepancies among jurisdictions. An underutilization of one's own tax base can also be expected as subnational and local governments prefer to count on the transfers from the central government. Another possible limitation is concerned with incentive dilution, the problem which is also encountered by the formula-based general-purpose transfer; the more protected areas that are registered, the less the average tax shared-revenues available to all jurisdictions tend to be.

In the second sub-option, earmarking the shared revenues are relatively more plausible due to the direct connection of this revenue-sharing instrument between externality-generating activities in the natural resource sectors and the associated environmental impact appears quite straightforward. In principle, earmarking shared revenues can be advanced in the revenue-sharing arrangements from the sectors of fisheries, general mining, oil and natural gas, and geothermal, in addition to the forestry sector which is already in place. The plausible source of funds to earmark includes (i) the revenue-sharing that provides the largest revenue, such as from oil and natural gas revenues; (ii) the share of the central government, because the externalities created from these sectors, which tend to be greater in scope than the jurisdiction of concern, suggest a centralized assignment of responsibility. The advantages of this sub-option include the direct acknowledgment of externalities from the sectors both extracting rents from natural resources and having an impact on the environment. This sub-option also better considers the notion of resource depletion and its effects on the economic development of a particular region. The limitations of this sub-option include the notion of the derivation principle, namely the sharing of revenues based on the place of origin. If the production or extraction of natural resources have come to an end, the ensuing costs remain such as those for the restoration of degraded habitats or sites. The principle of

derivation tends to overlook this. Revenue volatility is another well-known limitation depending on an unstable stream of revenues from natural resources. Finally, jurisdictions receiving a large portion of shared revenues from natural resources tend to ignore other possible sources of raising revenues.

The third option calls for an extension of the existing specific-purpose transfer for the environment (DAK Lingkungan). Such an extension would include wider measures and coverage of ecological public functions, including those related to the marine resource system. As already mentioned at the beginning of this section, both the scope and measures for ecological public functions covered in the existing specific-purpose transfers for the environment are principally limited. A number of advantages can be expected from the extension of the present specific-purpose transfers. These include the ability of a specific-purpose transfer to induce an optimal provision of certain ecological goods and services, thus helping to achieve allocative efficiency. This option is relatively better in terms of financing specific objectives with a prespecified expected level of outcome because the eligibility for receiving transfers of this kind is attached to certain prerequisites. In addition to increasing transparency, it ensures the provision of a minimum level for financing worthy ecological public functions which are considered priorities. There are limitations of a specific-purpose transfer. For instance, it tends to ignore the fiscal capacity of a given jurisdiction. It is also less superior in terms of distributive dimensions compared to the instruments of the general-purpose transfer or revenue-sharing. Another limitation is concerned with how externalities are defined. Whereas a specific-purpose transfer for the environment is better for internalizing a number of relevant costs in the provision of ecological public goods, other costs are simply ignored or shifted. This limitation can be expected to occur in a complex ecological system which interacts with a human system. One may think of such interactions in cases such as ozone depletion, climate change or loss of biodiversity. A specific-purpose transfer, while having the virtues of achieving a certain level of outcome and priorities, may not be effective if the preferences of local governments do not correspond to those of the central government.

Compared to other studies we could also demonstrate for the first time a number of options related to the international mobilization of global funds through REDD

(Reducing Emissions from Deforestation and Forest Degradation) schemes in the context of the Indonesian intergovernmental fiscal transfer system. Given Indonesia's global significance, the way in which its public finance in terms of ecological fiscal transfers is organized will not be immune, and should accordingly be adjusted to and likewise shape the current discourse on global climate change. Institutionally speaking, the international mobilization of funds under REDD-schemes should therefore take Indonesia's realities and developments into account. Plausible fiscal transfer instruments that may best achieve the purpose of REDD in terms of efficiency, effectiveness and equity, while at the same time proving to be institutionally adequate, include the following. *First*, setting up new specific-purpose transfers or extending the existing ones, both of which are targeted to relevant forest-dependent poor communities. *Second*, establishing a sectoral block grant for the environment geared towards REDD objectives but simultaneously leaving room for distributive measures relevant to REDD. *Third*, attaching a burden-sharing string to the disbursement mechanism of the specific-purpose fund for the environment in that local jurisdictions receiving REDD-based funds also contribute to the distributive public functions which are considered to serve the equity objectives of REDD. Co-financing funds can be mobilized from domestic sources such as from transfers of both general and specific purposes, shared-revenues or own-source revenues.

The fiscal equalization effects

The third major contribution of this study is the incorporation of the ecological indicator into the fiscal need formula of a general-purpose transfer, the DAU. It constitutes the first policy option proposed above which is now subject to further empirical examinations. It is argued that the choice of a general-purpose transfer is driven by its potential to internalize externalities more effectively, to consider the fiscal need of a given jurisdiction more thoroughly, to equalize fiscal imbalances, and to be in line with the subnational and local governments' demand for more autonomy in fiscal decision-making.

In this option, the existing area-based approach is extended by including terrestrial and marine protected areas to substantiate explicit ecological consideration in the approximation of ecological needs of a given jurisdiction. The proposed ecological

fiscal transfers are examined through simulations at the provincial level in Indonesia. In the simulations, the parameter values of land areas and protected areas are traded-off. This is because in the fiscal need calculation the sum of the parameter values is unity, implying a zero sum distribution of transfers. Underpinning both the fiscal and ecological implications of introducing an ecological indicator, the proposed new fiscal regime is assessed in terms of (i) transfer distributions and (ii) fiscal equalization effects.

In terms of transfer distributions, the simulations suggest the following findings. *First*, more provinces lose than gain. From Indonesia's 33 provinces, 22 provinces would receive less from the new ecological fiscal transfer than the level they received in 2007 – the baseline fiscal year for the simulation. The remaining 11 provinces would be better off. Looking at the individual provinces, East Kalimantan would lose the most, whereas South Sulawesi would experience the least decrease in its general-purpose transfer. By contrast, in the winning pool of provinces, Papua would gain the most, whereas DKI Jakarta would gain the least.

Second, it can be demonstrated that on average, the winning provinces obtain a higher level of transfer from the introduction of an ecological indicator in the fiscal need calculation. Furthermore, the extent of the average decrease in the losing provinces is lower compared to the extent of the average gain in their winning counterparts. All of these findings apply to both nominal and per capita changes, although in per capita changes the difference between the average decrease for losing provinces and the average increase for winning provinces is even larger. Our analysis also shows that the increase-decrease difference is larger in cases where the provinces with really high fiscal capacities are excluded from the comparison. These results are depicted in Figures 5.3 and 5.4.

The presence of losing provinces in the distribution of DAU transfers, which is conceivable due to the inherent zero-sum nature of formula-based transfers, is not favorable for this policy option. In light of such an unfavorable configuration of DAU distribution, this study demonstrates in a formal way what the transition path for incorporating an ecological indicator in Indonesia should be. That is, the transition over time between a fiscal regime without an ecological indicator and one incorporating it. In this respect, the introduction of an ecological indicator by means of a general-purpose

transfer should take account of the incentives for jurisdictions which principally do not expect to experience any decrease in transfer receipts. To this end, a number of possible measures which can be undertaken over a transition period are in order: (i) The fiscal regime chooses the transfer scenario with the least sensitivity to change relative to the status quo fiscal regime; (ii) an increasing ecological proportion is increased step-by-step into the parameter value of the fiscal need indicator over a defined transition period; (iii) the new fiscal transfer regime with an ecological indicator is only introduced when the domestic revenues are on the rise, and when the rise is sufficient enough to offset the magnitude of the overall loss from transfers; and (iv) complementary instruments are established such as an adjustment fund to serve as a buffer for the transfer reduction of the losing provinces.

As for transfer distributions viewed from a spatial perspective, provinces on the island of Papua would benefit most from the new fiscal regime, while in general most provinces in Java and Sulawesi as well as those in Nusa Tenggara and Bali would suffer a transfer reduction. However, exceptions are reserved for instance for Jakarta and Banten (both on Java) and North Sulawesi (in Sulawesi). Meanwhile, Kalimantan and Sumatra appear to show a mixed pattern of both losing and winning provinces.

In terms of the fiscal equalization effects, namely the relationship between the fiscal capacity of a province on the one hand and the fiscal transfer involving the ecological indicator on the other, the simulations lead to the following important findings. *First*, in general the transfers are equalizing. This can be demonstrated by the decrease of fiscal transfer as the fiscal capacity of a province increases. It is statistically significant particularly when the observations include provinces with very high fiscal capacities.

Second, the increase in the proportion of protected areas in the fiscal need calculation contributes to the fiscal equalization effects. In other words, the more an ecological indicator is considered in the transfer allocation, the more equalizing the transfer would be in terms of fiscal capacity of the province concerned. The equalizing effects are increasing in both their magnitude (i.e., the amount of transfer reduction due to the increase in fiscal capacity) and their statistical significance.

The analysis in terms of fiscal distribution and fiscal equalization effects suggests a mixed degree of policy applicability. In the case of fiscal distribution, the presence of more losing provinces may render the option less applicable. In the case of fiscal equalization, the option to incorporate an ecological indicator into the general-purpose transfers is highly applicable given the results of the calculation. The similarities between the proposed mechanism and the status quo mechanism add to the applicability of this option since it becomes easier to adopt.

6.2 Perspectives for further research

In spite of the afore-mentioned discussions, not all aspects have been considered in this study. New perspectives are constantly emerging and the following issues can be recommended for future research.

First of all, the present discussions on policy options, especially on specific-purpose transfers, are based largely on the specific-purpose transfers that explicitly consider ecological issues. Future research should be devoted to investigating other instruments of specific-purpose transfers which are organized for other sectors such as those of infrastructure, agriculture, forestry, and marine systems, but also involving the explicit character of ecological public functions. Investigations of this kind may involve a comprehensive evaluation on the basis of subnational or local budgetary data.

Second, the fiscal capacity is a function of own source revenues and shared revenues. In the present study, however, shared revenues are treated as a separate, independent panel, not connected to the fiscal capacity, which determines the allocation of transfers in the panel of general-purpose transfers. As a result, a change in the level of general-purpose transfers is assumed not to be affected by the changes in shared revenues. If these two panels are dynamically connected, policy options by way of general-purpose transfers in turn will also be a function of revenue-sharing arrangements. If such a connection exists, the overall effect of this interdependency may become ambiguous. That is, a higher ecological fiscal need may not necessarily mean an

increase in the amount of general-purpose transfer that a jurisdiction receives. This connection is worth future empirical exploration.

Third, in contrast to the past system which focused on provincial governments, the present Indonesian fiscal decentralization puts more emphasis on local governments, that is at the municipal and district levels. The simulation run in this research for general-purpose transfers, however, is also possible at the provincial level, given data availability on protected areas. Extending the simulations by using the (larger) dataset at the local level can help explain more relevant aspects in terms of fiscal and ecological dimensions. It will enable us to derive statistical relationships between transfers with the ecological indicator and a number of relevant variables to be explained. Possible variables include the role of the terrestrial and marine area proportion of a jurisdiction, the revenue structure on the basis of industrial information (such as the share of mining and mineral sectors), or the effect of pooling jurisdictions given their proportion of shared revenues from natural resources in order to examine their fiscal positions relative to other jurisdictions with opposite characters.

Fourth, because some jurisdictions are winning and others losing, a number of possibilities are offered in this study to deal with such a configuration. Further investigation will be needed to examine these possibilities on the basis of empirical data in order to help design the incentive structure for losing jurisdictions so that they can accept the proposed ecological fiscal transfer without being worse-off. The investigation should look, for instance, at the effect of an increase in net domestic revenue – which affects the total sum of the pool fund available for a general-purpose transfer allocation – on the overall level of changes in DAU to prevent as many losing jurisdictions as possible from being disadvantaged due to the introduction of an ecological indicator. The research should also investigate the possibility of an adjustment fund in the transition period, particularly, with the purpose of defining the extent of “compensation” to losing jurisdictions and the length of the required transition period as the reform takes place. On the basis of such interests and inquiries, a future research project is also likely to examine the behavior of jurisdictions in response to incentives related to compensation and time period expectation.

Fifth, much of the global discourse on climate change has stressed the need for schemes to reduce emissions from deforestation and forest degradation (REDD). For this purpose, there is a need to investigate the institutional adjustments between global REDD schemes and the domestic fiscal institutions of the existing intergovernmental fiscal system in Indonesia. While at the same time the scheme should seek intelligent ways in order not to crowd-out the existing fiscal initiatives and innovative public functions on forest conservation and habitat restoration, the schemes should be adjusted to the country's functioning public finance and responsibility assignments which have emerged from the recent fiscal decentralization and democratization process.

Sixth, and finally, going beyond the technicalities related to fiscal transfer and reflecting back on the study, one rather apparent perspective concerns the appropriate role of intergovernmental fiscal transfers in terms of environmental governance in the public sector. In particular, about the role that a fiscal transfer might play in multi-layered governments if the ecological dimensions discussed in this study are viewed as part of a larger social-ecological system. In this respect, for example, the question of interest is on how issues regarding social and ecological connections in certain ecosystem types are addressed when assigning responsibilities. This question will address the assignment of responsibility in environmental governance in relation to decision-making, implementation and revenue or financing responsibilities and how they are aligned to the appropriate governmental levels. One of the consequences of this question may include the need for an extension of both the theoretical and practical definitions of ecological public function. Such definitions should be extended since, in terms of social-ecological linkages, a number of adaptive functions need to be adopted, among others. Public function for ecological resilience in resource management is a case in point (see e.g., Berkes and Folke, 1998; Ostrom, 1990). This perspective might also draw a further consequence. As various ecosystem types as well as social dimensions of cross-territorial ecosystem services are likely to add complexity to the notion of ecological fiscal transfer, additional rationale for distributive or efficiency criteria rather than the ones that are traditionally defined in the literature of fiscal federalism and environmental federalism, could be implied.

Annex

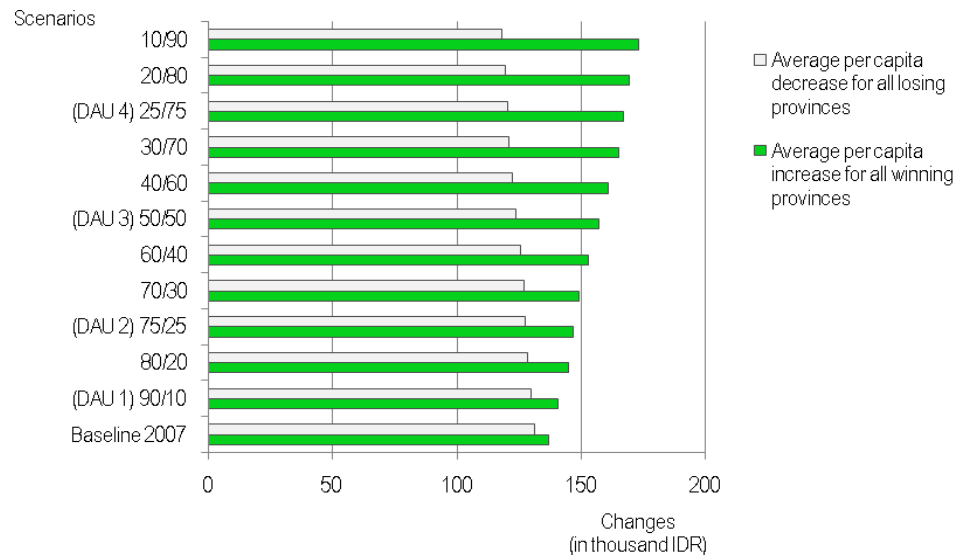
A.1. Notations used in the simulation of DAU

Notation	Definition
DAU^p	Available DAU pool fund for all provinces
DAU_i	DAU transfer for province i
DAU_{it}	DAU transfer for province i at year t
DAU_{it-1}	DAU transfer for province i at year $t-1$
BA^p	Available basic allocation pool fund for all provinces
BA_i	Basic allocation for province i
FG^p	Fiscal gap for all provinces
FG_t^p	Fiscal gap of all provinces in year t
FG_i	Fiscal gap of province i
FG_i^e	Fiscal gap of province i , using ecological and socio-economic indicators
FG_i^o	Fiscal gap of province i , using socio-economic indicators
FC_i	Fiscal capacity of province i
FN_i	Fiscal need of province i
FN_i^{area}	Fiscal need of area-related indicators, of province i
OR_i	Own source revenue of province i
RS_i^T	Revenue-sharing from taxes of province i
RS_i^N	Revenue-sharing from natural resources of province i
Φ	Pre-determined weight for fiscal capacity
α	Parameter of fiscal need indicator
α_a	Parameter of area indicator
α_{pa}	Parameter of protected area indicator

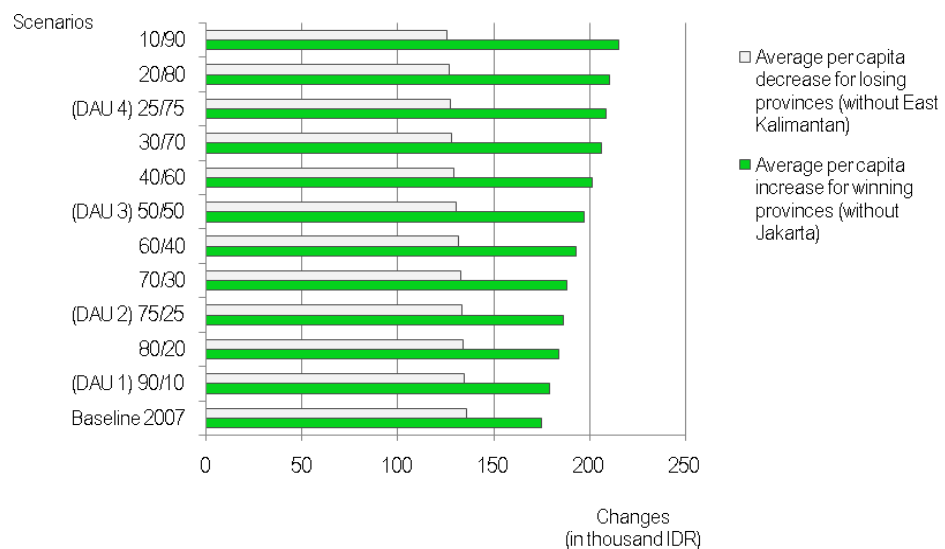
α_j^0	Parameters of fiscal need indicators
α_j^e	Parameters of fiscal need indicators, including ecological indicator
α_j^e	Parameters of fiscal need indicators, including ecological indicator
β_{ih}	Fiscal need indicator h for province i
β_h^*	Average value of fiscal need indicator h for province i
δ	The average expenditure of all provinces
A_i	Area indicator for province i
A_i^*	Average value of area indicator for province i
E_i	Ecological indicator for province i
E_i^*	Average value of ecological indicator for province i
i	Jurisdiction, in this case a given province
t	Time, in this case a given year
T	Total number of years required for transition period

A.2. Average per capita DAU transfers

(a) For all provinces

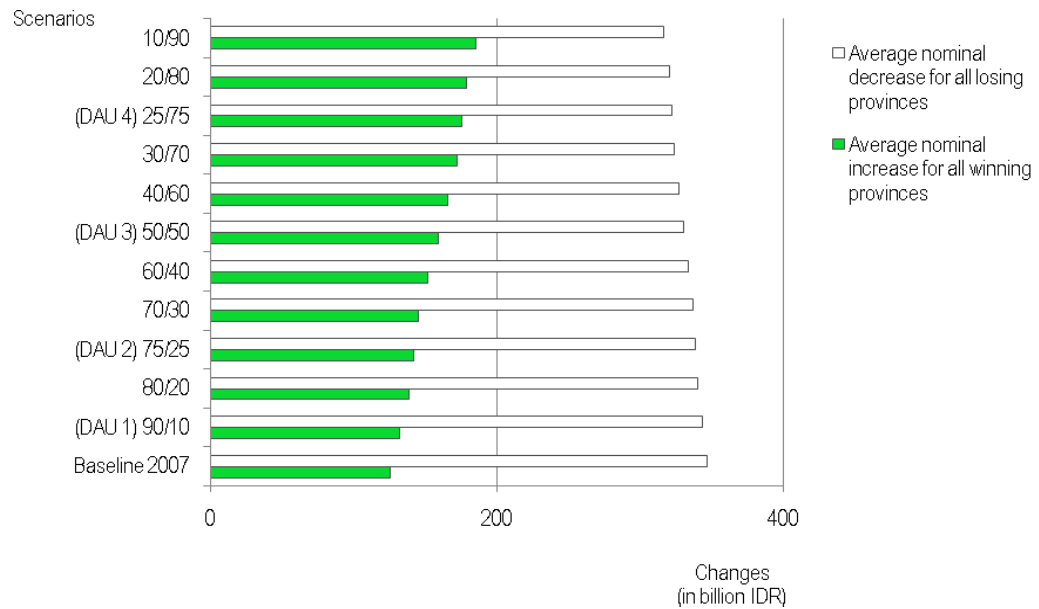


(b) Without outliers

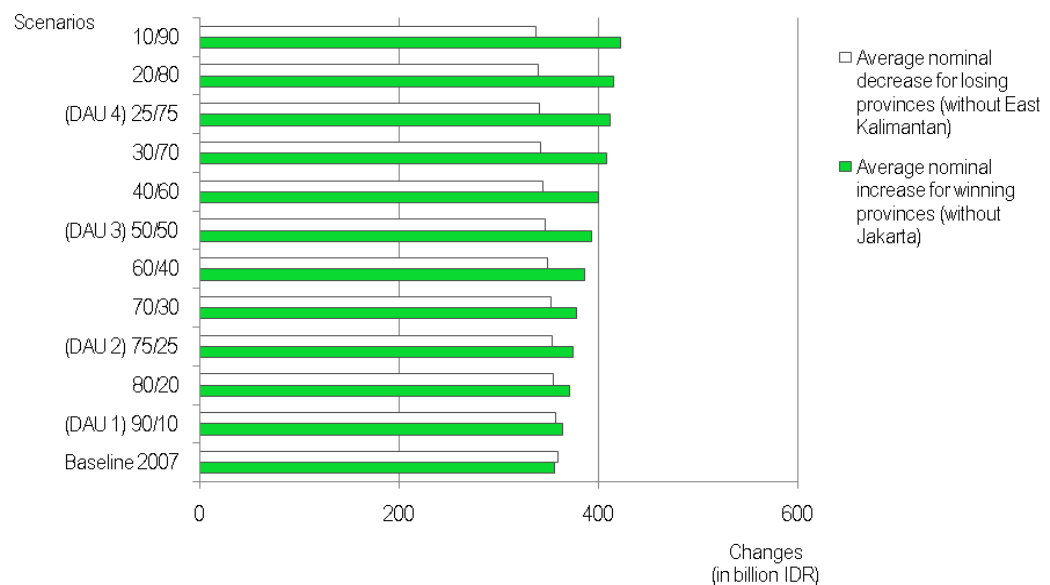


A.3. Average nominal DAU transfers

(a) For all provinces

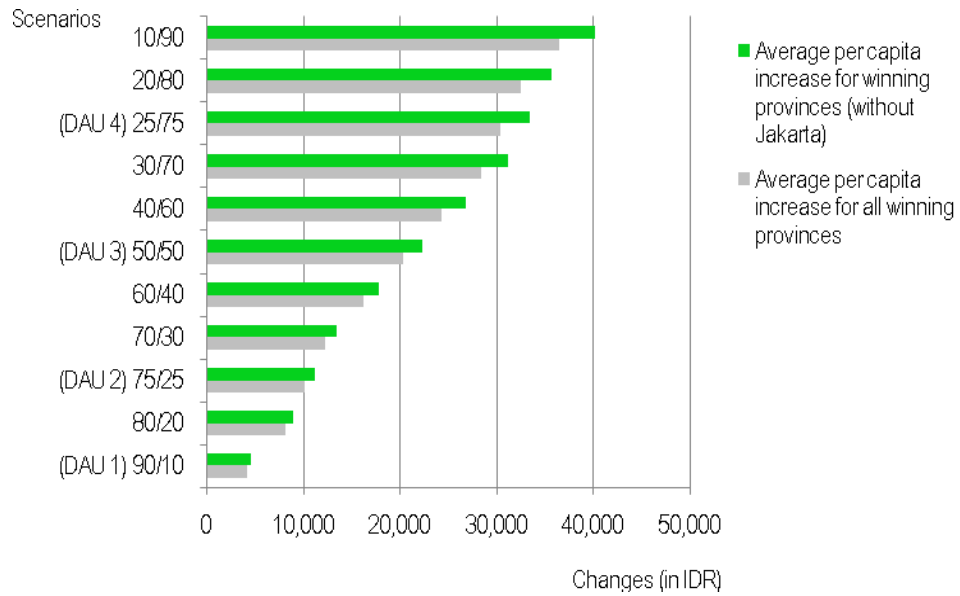


(b) Without outliers

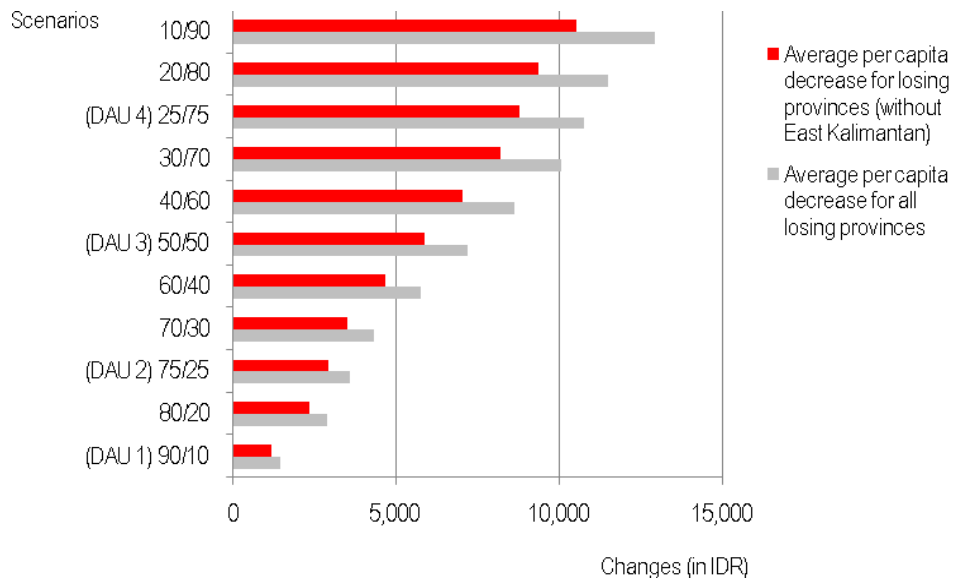


A.4. Average per capita comparison of DAU transfers

(a) Winning provinces

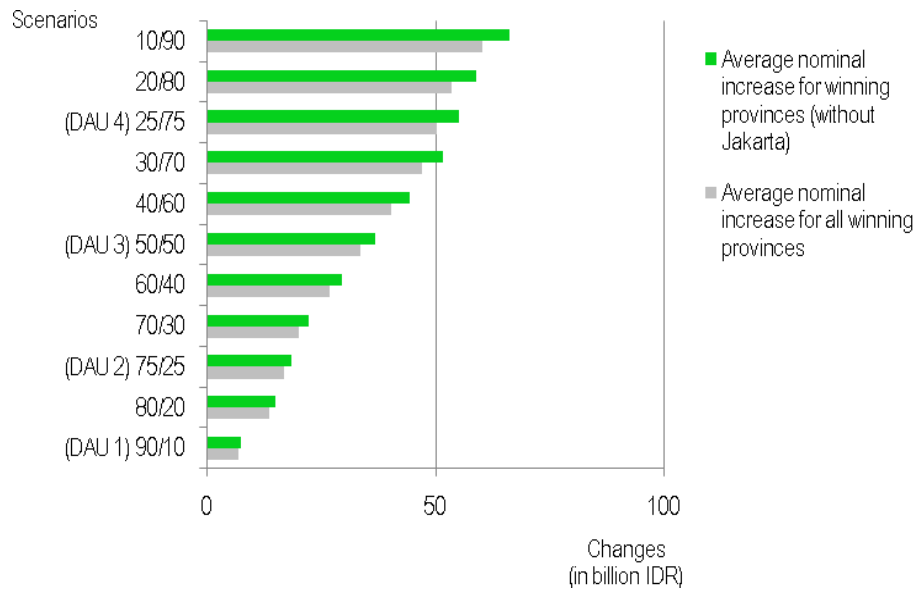


(b) Losing provinces

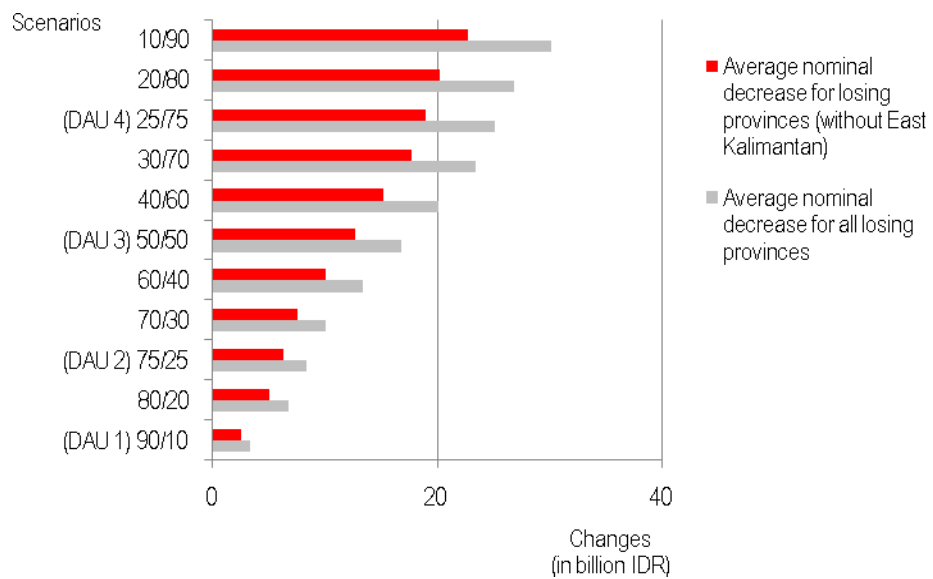


A.5. Average nominal comparison of DAU transfers

(a) Winning provinces

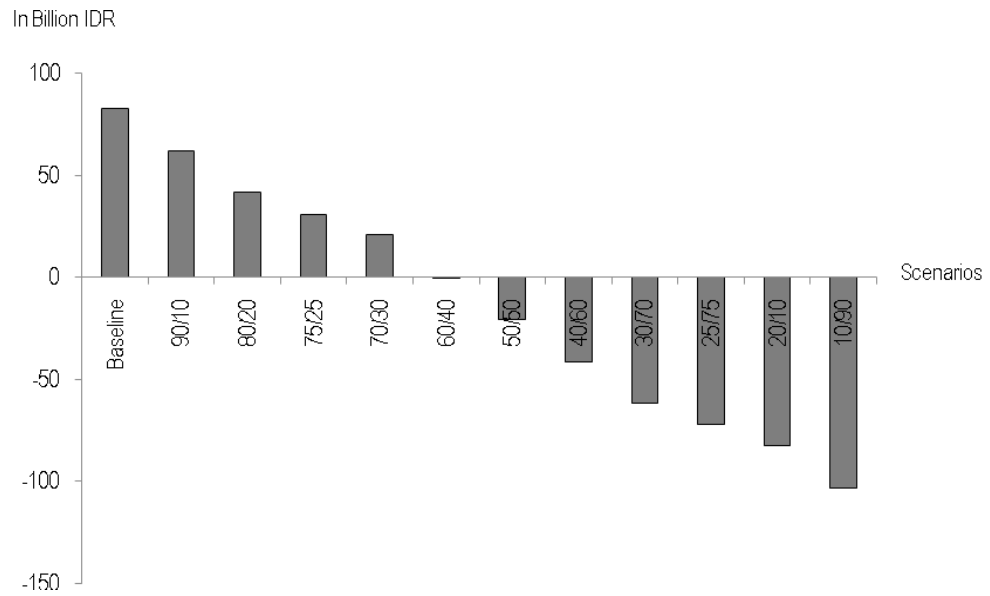


(b) Losing provinces

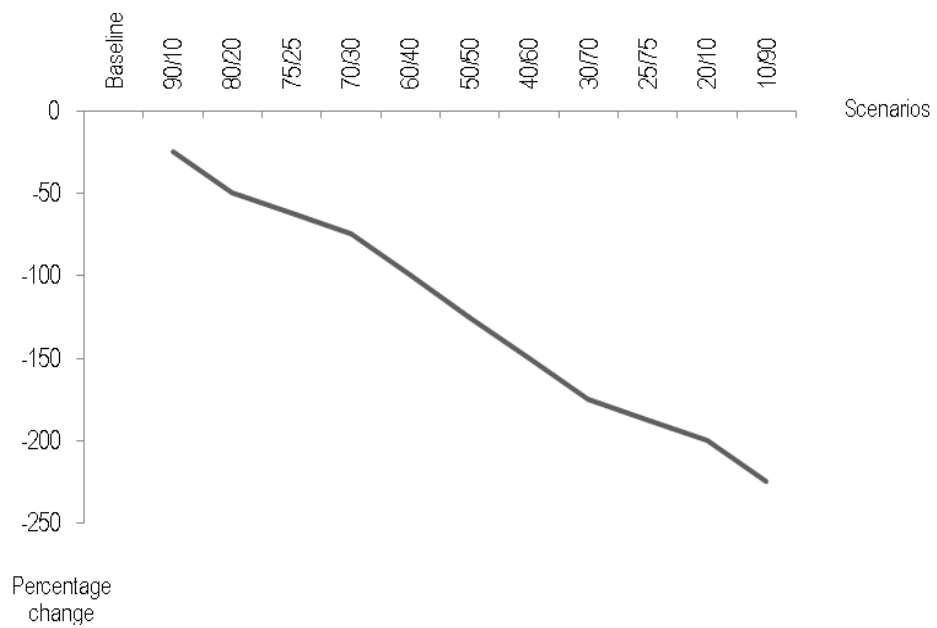


A.6. DAU transfers for East Kalimantan

(a) Nominal DAU transfers



(b) Percentage change of DAU transfers



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Selbständigkeitserklärung

Hiermit erkläre ich, die vorliegende Dissertation selbständig und ohne unzulässige fremde Hilfe, insbesondere ohne die Hilfe eines Promotions-beraters, angefertigt zu haben. Ich habe keine anderen als die angeführten Quellen und Hilfsmittel benutzt und sämtliche Textstellen, die wörtlich oder sinngemäß aus veröffentlichten oder unveröffentlichten Schriften entnommen wurden, und alle Angaben, die auf mündlichen Auskünften beruhen, als solche kenntlich gemacht. Ebenfalls sind alle von anderen Personen bereitgestellten Materialien oder erbrachten Dienstleistungen als solche gekennzeichnet.

Leipzig, den 22. Oktober 2010