



SUSTAINABLE LAND MANAGEMENT

PIONEERS IN CENTRAL VIETNAM





Pineapple plantation after harvest in the district of Dai Loc, Quang Nam province.

- Vietnam is considered to be one of the Asian tiger economies due to the fact that its economy has been booming non-stop for years. However, this economic boom has brought about certain disadvantages for the landscape and for nature. For this reason German and Vietnamese researchers have decided to develop strategies for sustainable land and water uses in Central Vietnam. These are urgently required, because there is a strong resources pressure on the region and it might additionally suffer from the impacts of climate change.**

Blood-sucking leaches, annoying mosquitoes, high temperatures and largely inaccessible areas – research in the montane forests of Central Vietnam is a sweltering undertaking and not everybody's cup of tea and yet the PhD graduate biologist Claudia Rädig loves her job. She is a scientist from the Cologne University of Applied Sciences and won't let anything stop her from ploughing her way through montane and mangrove forests to identify different tree species.

»The mountainous regions of Vietnam belong to some of the most species-rich regions of the world and yet data is still lacking for the region«, says the scientist.

Where are certain tree species found? What is the height and diameter of the trees? How often do individual tree species occur? Dr. Rädig intends to close this knowledge with her investigations along with scientists from the Hue University for land



Land conversion to flooded rice fields in the highland district of Tay Giang in the Quang Nam province.

and forestry as well as local rangers in the project region of approx. 12,000 square kilometers (an area 14 times the size of Berlin). Claudia Rädig is not the only German researcher currently working on the narrow Central Vietnamese land strip that wants to unravel the secrets of nature here. »Land Use and Climate Change interactions in central Vietnam« (in short LUCCi) is the research project, for which a German-Vietnamese team of researchers has formed a cooperation in the catchment area of the two rivers Vu Gia and Thu Bon. The scientists come from a wide range of disciplines, ranging from agro-forestry, climate research, hydrology and water management to social and political sciences.

»We want to develop systems for sustainable use for the region that balance social, economic and ecological requirements.«

They have until June 2015 to come up with some strategies as to how Central Vietnam can prepare itself in terms of land, forest and water management against the potential impacts of climate change. The Federal Ministry of Research is funding them with four million Euros in the form of a five-year project.

The project is headed by Lars Ribbe, Professor for Integrated Land and Water Resources Management



Final operations on the dam Song Tranh 2 in 2011 in the district of Bac Tra My, Quang Nam province.

at the Cologne University of Applied Sciences Institute for Technology and Resources Management in the Tropics and Subtropic, ITT. His goal: »We want to develop strategies for the sustainable use of water and land resources for the region that balance social, economic and ecological requirements« he says.

The research results are urgently required in Vietnam because unlike in Germany, where climate change still seems so far away and so abstract for many people, the dangers are very imminent for this Southeast Asian country. Vietnam ranks among those countries of the world that could suffer enormously from the impacts of global warming according to projections by the Vietnamese Ministry of Natural Resources and Environment (MONRE).

»The sea level could rise by 40 centimeters by the year 2050.«

It is thought that the annual average temperature will rise by approx. 1.5 degrees by the year 2020, the amount of precipitation during the monsoon will increase by up to 19 per cent by 2070, and during the dry season the ministry expects a clear increase in droughts. Danger also looms from the sea: according to the statistics from MONRE, the sea level could rise by 40 centimeters by the year 2050. But in order to compute scientific models and



Slash and burn to clear more land for agriculture in the Dong Giang district, Quang Nam province.

scenarios and consequently develop strategies, first and foremost it is scientific groundwork that is required.

Basic data, like that for example which Claudia Rädig is laboriously collecting on trees, is either missing for this region or does not comply with the standards that the international researcher community is used to working with. While the south and north of Vietnam have been relatively well investigated, the middle of the country has not yet been in the spotlight of global science. In this respect, the researchers working in the LUCCi project are regarded as pioneers in this area.

Climate change is noticeable

One of the scientists in the LUCCi team is the climatologist Patrick Laux. He is a graduate PhD scientist from the Karlsruhe Institute of Technology who conducts research on climate change. Together with his colleagues he has analyzed data among other things from climate events between the years 1980 and 2009 in the investigation area. His findings: precipitation has increased over the entire period, in particular along the coast. »This trend is particularly noticeable during the winter months«, says Laux, who associates it with an intensification of the rainy season in Central Vietnam. With respect to overall temperature changes, an increase can also be observed that the climate researcher interprets to be another impact of climate change. »There is no scientific certainty however because the database for the station is still insufficient«, says Laux. It is



Land used for agriculture in front of the Viet An reservoir in the Hiep Duc district, Quang Nam province.

hoped that the results from the Steinbuch Centre for Computing (SCC) in Karlsruhe that is running high-resolution regional climate simulations will clarify matters.

The researcher for forest ecosystems Valerio Avitabile working as a post-doc in the chair for remote sensing at the University of Jena spends time regularly in the catchment area of the Vu Gia-Thu Bon. There he is responsible for closely investigating the development and distribution of forests – not least because forests have some very important functions: they store carbon, reduce precipitation and not lastly provide habitat for numerous rare plant and animal species.

For the results of his investigations the researcher has compiled maps showing agricultural and forestry land uses. According to these, the proportion of forest in the middle regions has increased – at least according to the official statistics. The real reason is that »acacia and rubber tree plantations intended for export to China have increased tremendously«, says the forest management expert. The statistics are very deceiving because these cultivated forests are of very little ecological value: their biodiversity and their ability to store carbon are considerably lower than natural forests. Natural rain forests are threatened because local communities require new land for settlements or for agriculture and the government also requires new land for translocations. Agricultural practices are unsustainable. »The land is used for five or six years before the soil is depleted and the land becomes fallow«, says Avitabile.



Za Hung dam used for hydroelectric power in a tributary of the Vu Gia river in the Dong Giang district, Quang Nam province.

The forests that grow thereafter are by no means as species-rich as a natural primary forest.

Dams create problems

The forest management expert is now modeling how certain factors will influence forest use in the future and how that could have an effect on biomass and the storage of carbon in trees and soils. »The future of the forests depends on several parameters«, Avitabile explains. For example, how the global demand for acacia and rubber trees will develop: if demand rises, farmers will establish even more plantations. The amount of forest that is cleared also depends on other factors such as how quickly the population expands in the region, the extent of land consumption and the government's economic and energy policies.

»Water stored in hydropower reservoirs during the dry season reduces the flow in the downstream lowlands and thus water availability for irrigation.«

Vietnam is banking on satisfying the steep increase in energy requirements with hydropower. A major consequence of this is that politicians are promoting the construction of hydropower reservoirs, wherever possible at higher elevations. Altogether the national government has planned nine dams in the Vu Gia Thu Bon catchment area, five of which have already been constructed. Their construction



Flooded early-stage rice paddy, directly sown in the Vu Gia and Thu Bon river delta close to Hoi On, in the Quang Nam province.

is disputed however because the dams change the water regime in the entire region. »Water stored in hydropower reservoirs during the dry season reduces the flow in the downstream lowlands and thus water availability for irrigation.«, says Alexandra Nauditt, who coordinates the LUCCi project at ITT. Even the rainy season from September until December is cause for concern for the local inhabitants: »The hydropower reservoirs with a maximum capacity of 330 million cubic meters are used solely for energy production and do not act as a retention zone for flood protection or provide water for irrigation in the dry season«, she says.

»Farmers often have to give up their second harvest in September.«

In the coastal areas there is an additional problem: in recent years farmers have been complaining about considerable harvest losses, because from March to August there has not been sufficient precipitation water from the courses of the river into the delta for irrigating the rice paddies. Due to the fact that the river water stored in the reservoirs cannot reach the delta, the salt water from the sea is pushed inland and gets into the rice irrigation channels. »It is mainly the second harvest in September that the farmers are forced to give up«, reports Nauditt. For this reason many farmers have left affected districts such as Dien Ban and moved to the cities.



Rice farmer with water buffaloes after the rice harvest in the lowlands of Tam Ky in the Quang Nam province.

Many of the current problems in Central Vietnam stem from the rapid development that the region and the entire country are being subjected to. This tiger economy has been booming for years but city populations also continue to rise. As a result, the requirements for energy, living space, infrastructure and agriculture also increase. This kind of situation can be quite exciting from a scientific perspective for the head of the LUCCi-project Lars Ribbe. »For us researchers such dynamic systems are a great challenge, because the conditions are constantly changing«, says Ribbe. Moreover, it is so practice-orientated: »Our goal is to conduct research that is very practice-orientated and not to measure our success by how many publications we produce, but rather by the extent to which our Vietnamese partners have actually implemented our recommendations and strategies«, he says.

Bridging the gap is not that easy

The fact that the project brings together researchers from the most diverse disciplines from Vietnam and Germany as well as numerous local participants from Central Vietnam such as authorities and enterprises to discuss sustainable land use issues is also one of the unique aspects of the project for Ribbe. »It is not always that easy to find a common language«, he says, especially when scientists from so many different disciplines are sat around a table. »Terms such as climate change and soil can have completely different connotations for scientists depending on which field they come from«, says Ribbe.



Rubber tree plantation in the district of Hiep Duc in the Quang Nam province.

The professor sees the project in a positive light: »We have had a good experience with the local decision makers and partners and were provided with the essential information for our work«, he says. Nguyen Dinh Hai, vice-president of the Irrigation Management Company (IMC) that controls the infrastructure of the irrigation and the pumping stations in the catchment area of the two rivers, confirms just how important it is to have a good international cooperation: »Due to the LUCCI-project a lot of knowledge is flowing into our region that we can directly transfer to the management of water courses«, says Hai. Researchers have been focusing on the influence of fluctuating climate patterns on water and agriculture. This is one aspect, says the vice-president that has not really been taken into account yet in Central Vietnam.

Policy recommendations

The results from the German-Vietnamese cooperation are to flow into scientific recommendations for policy. For example, how local authorities could tackle the issue of salt water intrusion. »We want to be able to say, where exactly salinization is occurring in the region and where weirs could be implemented to prevent further salt water intrusion«, says Ribbe. Further, with respect to land use for example, Ribbe and his researcher colleagues want to make predictions based on model calculations about the negative impacts that for instance acacia tree or palm oil plantations could have on the soil and water regime. »If we can understand the interactions

that are taking place here in Central Vietnam, then the methods that we develop can also be used in other areas of the world«, says Ribbe. In this respect a significant contribution could be made to sustainable land use.



Production systems investigated in the region are: Agricultural systems (industrial and extensive), forestry systems, Tourism, Rubber Production, Rice

■ LUCCI www.lucci-vietnam.info

■ Project head:

Cologne University of Applied Sciences Institute for Technology and Resources Management in the Tropics and Subtropics

Prof. Dr. Lars Ribbe

Phone: +49 (0) 221-8275-2773

E-mail: lars.ribbe@fh-koeln.de

■ Project coordination:

Cologne University of Applied Sciences Institute for Technology and Resources Management in the Tropics and Subtropics

Alexandra Nauditt

Phone: +49 (0) 221-8275-2125

E-mail: alexandra.nauditt@fh-koeln.de

■ Contacts on the study region:

Vietnam Academy for Water Resources,
Center for Training and International Cooperation (CTIC)

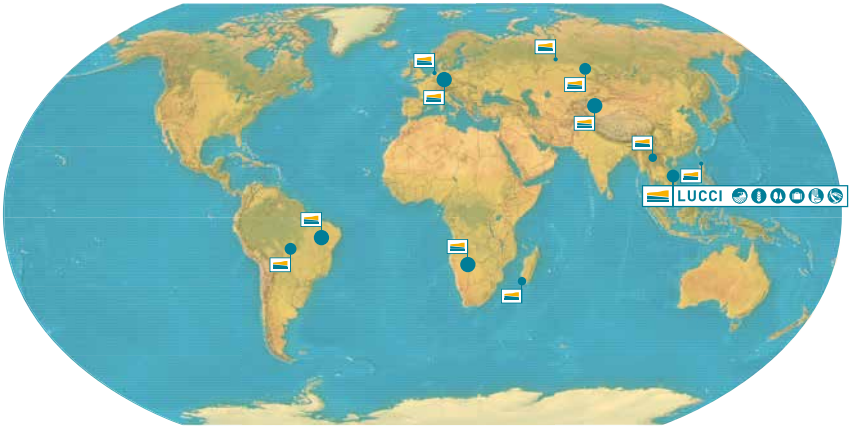
Ass. Prof. Dr. Nguyen Tung Phong

Phone: +84 (0) 0912278959

E-mail: phongicd@gmail.com

■ Funding: 4 million Euros

■ Funding period: July 2010 until August 2015



»LUCCI« is one of twelve regional projects funded by the Funding Measure »Sustainable Land Management« (Module A) provided by the Project Management Agency (PT-DLR) on behalf of the German Federal Ministry of Education and Research (BMBF).

Science portrait 3 appears in the context of the funding measure »Sustainable Land Management« of the Federal Ministry of Education and Research (BMBF).
www.sustainable-landmanagement.net

Publisher:

- Scientific coordination & synthesis (GLUES)
Helmholtz Centre for Environmental Research – UFZ
Department of Computational Landscape Ecology
Permoserstraße 15 | 04318 Leipzig

Editorship: Andreas Werntze, MSc.
E-mail: andreas.werntze@ufz.de

Author: Benjamin Haerdle, October 2012

English Translation:
Sarah Gwilym-Margianto, January 2013

Layout: Metronom | Agency for Communication
and Design GmbH, Leipzig

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