

# Adapting Environmental Law to the impacts of climate change

– Analysis, development and innovation of legal instruments –

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by:

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## **Summary**

## I. Project aim

Climate change will be felt in Europe, and so in Germany, too: flooding, storms, droughts and heat waves are just some of the major effects of climate change to which man and the environment will be increasingly exposed and which will in future call for **more robust preventive measures**. The European Community's white and green papers on adapting to climate change in Europe and the German Strategy for Adaptation to Climate Change ("DAS"), adopted in late 2008, give initial overviews of the sectoral challenges and possible courses of action. The DAS, especially, has made clear that adaptation can in many ways be achieved and promoted, but also impeded, by legal instruments. The fields of **environmental and planning law**, in particular, are called on to take action to adapt their protection and land-use strategies to a changing, but also more dangerous and sensitive, environment.

The *Umweltbundesamt* (German Federal Environment Agency, FEA) has therefore commissioned the *Helmholtz-Zentrum für Umweltforschung - Department Umwelt- und Planungsrecht* (Helmholtz Centre for Environmental Research - Department of Environmental and Planning Law) to analyse the need for legal action in adapting to climate change. To that end, this study:

- sets out the special **structural challenges** facing politicians and lawmakers in the area of climate change adaptation
- analyses the **constitutional bases** for adaptation
- investigates the **most important areas of adaptation** to ascertain to what extent the existing law already provides for effective and efficient adaptive instruments and where there is room for improvement.<sup>1</sup>

The key findings are set out below as hypotheses.

## II. Strategic political and legal challenges

1. Adaptation to climate change in the area of environmental law means, above all, **tightening standards of protection and prevention**. The main impact of climate change will be a reduction in the environment's natural stress tolerance and thus a diminished capacity to cope with anthropogenic interference. The resulting need to intensify protection thus differs only slightly at first sight from what is otherwise required for environmental protection. The same applies to the "reverse" effect of climate change, i.e. the increasing environmental risks for humans, in particular those posed by flooding, droughts, storms and heat. Again, these are not new problems; rather, what is needed is a gradual increase in the level of prevention.

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<sup>1</sup> The central area of conservation law is not covered as the need for adaptation and the available options in this area are to be analysed in a separate research project commissioned by the *Bundesamt für Naturschutz* (Federal Conservation Agency).

2. Nevertheless, the challenges posed by adaptation to climate change entail **particular structural problems** which will inevitably have an impact on the roles potentially to be played by law and the strategies it may have to adopt, and which can be described by the keywords: variety, decentralisation, uncertainty, long term and dynamic.
3. Adaptation entails a **variety of problems** inasmuch as the various goods, stakeholders and regions are each affected by climate impact in a different way and to different degrees of intensity, so that sector-specific approaches to adaptation must be found for each one. There can be no cross-sector recipe solution to adaptation such as e.g. emissions trading to reduce pollution. In essence, the only reason for addressing the various problems in the single area of “adaptation” policy is that their common cause is climate change. It is, however, for that reason that action to drive on the analysis of regional climate (impact) trends is urgently needed throughout all sectors.
4. Adaptation is **decentralised** because it is required wherever climate change has an impact and must generally be based on the effects specific to the location and the basic local conditions. Appropriate adaptation policy therefore has to be not only sector-specific, but also decentralised to deal with varied problems, whilst the legal instruments must confer the requisite **planning freedom and scope for discretion** to ensure that adaptive measures appropriate to the location can be taken.
5. The high degree of **uncertainty** as to the nature, intensity and development over time of climate consequences, combined with the long term of the risk horizons, is perhaps the most characteristic and difficult of the overarching challenges faced in adapting to the climate. However, that even risks posed by mere possibilities can give rise to a need for action and justify preventive measures is familiar from the whole spectrum of law on **risk management**. The development of risk-management law also shows how uncertainties can be dealt with rationally by law, four aspects being likewise particularly relevant in the area of climate adaptation:
  - a. An adequate **risk analysis** appropriate to the degree of potential risk which is based on as many of the available data, methods and expert studies as possible and also identifies the possible courses of action and their **costs and benefits**.
  - b. An assessment of the risks and options for action and development of integrated action strategies **involving all relevant stakeholders** with a view to reaching a risk decision appropriate to the problem and capable of being accepted.
  - c. Preferably, the selection of “**no-regret**” **measures** which will prove beneficial, or at least harmless, (in particular with regard to the integrity of the protected assets concerned) even if the forecast risk does not occur.
  - d. A **regular review** and, if necessary, adjustment of the risk decisions to take account of new findings.
6. The new **dynamic** taken on by trends in framework environmental conditions as a result of climate change poses a particular challenge to the protective schemes or

environmental law, especially because, until today, these schemes have usually been based on relatively static reference conditions and instruments have, consequently, been designed to maintain static environmental quality and conservation objectives. As a result of the climate-related environmental changes, these instruments must now be adapted if they are to continue achieving their protection objectives. However, the protection objectives too may have to be reviewed to ascertain whether and to what extent they still correspond to the changed reference conditions.

7. Most impacts of climate change will not occur abruptly at short notice but **gradually unfold over decades and centuries**. From the regulatory point of view this poses the question whether to rather pursue an iterative, responsive approach to climate adaptation or to appraise and consider long term impacts, from the outset. In any case, the latter is needed for administrative decisions on the admissibility and configuration of large scale (infra-) structures, and should, hence, be provided for by the relevant planning and permit provisions.
8. An overall view of these special challenges makes clear that the legal measures accompanying climate adaptation must make particular use of **forward-looking and procedurally anchored control strategies** which must entail a thorough risk analysis, active risk communication, adequate scope to take account of regional particularities in determining the nature of any measures and regular reviews of the outcome with a view to making adjustments in the light of new findings. The analysis of the individual areas of action shows that initial steps in this direction are already being taken, but the measures are often still too underdeveloped to tackle the particular challenges posed by climate change.

### III. Constitutional framework

9. The constitutional framework for state measures for adapting to climate change is shaped chiefly by the general duty to protect the environment under Art. 20a *Grundgesetz* (Basic Law; "GG"), the duties to protect fundamental civil rights, the constitutional limits on state interference and also certain guarantees of subsistence flowing from the constitution.
10. In the context of climate adaptation, the most important implication of **Art. 20a GG** is that it confers constitutional status on environmental concerns and explicitly refers to protection of the environment for future generations. In Art. 20a GG, these public interest concerns are thus raised to the level of a restriction of fundamental civil rights which is inherent in the constitution, meaning that they carry great weight as compared to those fundamental rights serving the pursuit of current individual interests in self-development.
11. Protection against adverse climate effects is, in principle, a legitimate purpose capable of justifying state **interference in fundamental civil rights**. With respect to justification, the courts, as a rule, leave the legislature a wide margin of discretion in

terms of prognosis, standardisation and assessment, whilst the state objective set in Art. 20a GG places clear focus on the protected elements of “natural necessities of life” and “future generations”. Accordingly, reasonable adaptive measures should not be difficult to justify.

12. As far as the **states’ duties to actively protect fundamental human rights** (life, body and property) is concerned, protective and preventive instruments are already in place in all relevant fields of climate adaptation which can be employed, at least as a basis, to reduce risks increased as a result of climate change. Given that, in the area of environmental protection, the Federal Supreme Court generally sets the threshold above which the state is constitutionally required to take action very high, it is unlikely at present that this threshold might be relevant to adaptive measures.
13. Given the current conditions of basic provision, it is for the foreseeable future unlikely that it will be possible to justify a state duty to take particular precautions to guarantee a certain level supply, for example of water resources, on the basis of the primary **rights to social care**, which can only be derived from the welfare state principle for fundamental existential requirements.

#### IV. Flood risk management

14. Given that climate change will in all probability lead to a further continual increase in the number and intensity of floods in many river districts, there is a **need for improved flood control**. In addition to traditional technical means, i.e. in particular the construction and heightening of dykes, preventive flood-control measures such as keeping flood plains and retention areas free of development or the reclamation of such areas - which allow the flood to disperse and increase water retention across a wide area - will be of decisive importance. The initial step for all suitable individual measures must be a thorough calculation of the existing and future flood risk and a general plan which co-ordinates the preventive and technical flood-control measures, whilst having regard to all other relevant concerns. Following dynamic development in recent years, the existing legislation already meets these requirements to a large extent, but there are nevertheless areas in which it could still be optimised:
15. With respect, first of all, to the **calculation, assessment and presentation of flood risks**, Paragraphs 73 and 74 of the Federal Water Resources Act (Wasserhaushaltsgesetz – WHG), as amended, which implement Directive 2007/60/EC on the assessment and management of flood risks, lay down detailed requirements which seem apt to guarantee a thorough risk analysis. Of particular importance is the new duty to show low, medium and high level flood risks on hazard maps and potential damage on risk maps. Whilst not set out as clearly as desirable, it can nevertheless be deduced by interpretation that the hazard zones are (also) to be identified by way of forecasts taking account of any climate-related increase in risk. Moreover, the risk category allocated is to be reviewed at six-yearly intervals. As yet, there is no statutory duty to take note of and assess (for information purposes) the risk assumptions and

stipulations applicable to interfering planning measures, in particular those taken by spatial and development planning authorities or those planning water management and action.

16. The new scheme for **flood risk management planning** is designed to reduce the risks of at least one flood with an expected reoccurrence interval of 100 years by way of co-ordinated flood control and prevention measures which take account of the climate-induced risk increase. For this minimum protective objective too, it is again (only) through interpretation that a duty also to consider future risk development trends can be established. The responsibility for adopting and implementing suitable measures lies mainly with the relevant water authority and, for the most part, the authority dealing with overall spatial planning, which must impose the appropriate restrictions on use.
17. The existing law provides spatial and urban development planning authorities with suitable instruments, but since regional and local decision-makers' willingness to impose restrictions on use is limited, effective flood prevention will depend on the statutory restrictions on the use of **flood plains**, as provided by Paragraphs 76-78 WHG. According to these provisions, the protection of such plains covers two area types: those at risk of HQ<sub>100</sub> flooding and those used for retention and relief. Whilst use restrictions in the risk areas are primarily intended to prevent damage and ensure rapid runoff, the second category is instead intended "to give the river more space" and so prevent floods from occurring in the first place.
18. As far as the second category is concerned, a significant weakness of the future protection scheme is that it does not specify what areas are needed to protect and conserve **retention and relief areas** or what criteria are to be applied to determine them. Consequently, the central aim of creating more space for the river will largely be a matter for planning by the relevant ministries in the federal states (*Länder*).
19. Water retention in developed areas could be improved by imposing a standard **infiltration requirement** in Federal law, but in particular by a scheme of **waste-water management planning** binding on local authorities and oriented in statutory provisions towards, among other things, increasing levels of rainwater infiltration and grey water recycling.
20. Moreover, it is most important to improve water retention in **rural areas used for agriculture and forestry**. However, the considerable potential for such improvement in the field of agricultural soil-management practices cannot be harnessed effectively on the basis of the current law. Indeed, under existing law, agricultural drainage systems which are a major factor in accelerating runoff are even largely exempt from approval requirements. At least specific additions to the "cross compliance rules" of the Communities' Common Agricultural Policy and to the national best practice guidelines are needed. Furthermore, urgent consideration should be given to extending the spatial planning regime to agricultural and forested land and, thereby, establishing a legal basis on which location-specific standards for improved water retention could be

developed and enforced. Corresponding objectives and instruments could be incorporated into the landscape planning approach as provided by Paragraph 9 et seq. of the Federal Nature Conservation Act (Bundesnaturschutzgesetz – BNatSchG).

21. Such an enhanced landscape planning instrument could, in combination with other measures and requirements, also be used to plan and effectively promote the **renaturalisation of the small-scale hydrographic network**, which can perform a significant storage function.
22. For **damage prevention in risk areas**, it seems appropriate to limit the binding use restrictions to HQ<sub>100</sub> areas, even though this statistical flood value does not cover potentially higher future flood levels. Arguments against the binding statutory imposition of a higher level are the functional link with the state of the art in technical flood control, which is widely based on HQ<sub>100</sub>, and the fact that the projected risk trends differ greatly between river basins.
23. To effectively guarantee compliance with / implementation of the use restrictions imposed on flood plains, a **right to bring a class action** should be introduced. In addition, more weight could be attached to the flood risk management plans as part of overall spatial planning by integrating them explicitly and more stringently into the substantive and procedural planning requirements.
24. So far, there are no statutory requirements to take **building measures to prevent** flood damage, but rather only the guidelines issued by the Ministry of Transport, Building and Housing. In view of the sums in compensation which must be paid again and again after major flooding events, also from public solidarity funds, the state of the art should be standardised nationwide.
25. As an alternative or in addition to provident requirements under administrative law, **mandatory insurance** against flood damage could be used to limit the risk that the public purse must come to the rescue.
26. To improve the **protection of water polluting substances** against the increasing flood risk, the disparate standards set under the laws of the various *Länder* should be replaced by nationwide standards.
27. Given the eminent importance of co-ordinated **reservoir management** across the board (in particular dams), a basis for flood control and drought prevention planning should be created within the legal framework for water management planning.

## V. Coastal protection

28. According to the most recent estimates, **sea levels** can on a global average be expected to rise by **18 to 150 cm** by the end of this century. The rise on Europe's coasts is likely to exceed that global average. This will go hand in hand with an

increase in the risks of flooding, erosion, salination and waterlogging in coastal areas and, in particular, river mouth areas, where additional inland floods may also increase.

29. For Germany's coastal regions, there is still a lack of differentiated and, especially, up-to-date scenarios. Particularly in the recent past, however, there have been increased indications that the regional rise in sea level might be even higher than anticipated until before. More and more, therefore, **options for a structured retreat** from areas which no longer can be protected technically and economically sensible must be considered in addition to the measures improving technical coastline protection.
30. The obligation to draw up **hazard and risk maps and risk management plans** for coastal areas too has led to a considerably better analysis of adaptation needs and options. It remains to be seen whether these obligation will be observed conscientiously or whether they will need to be flanked by legislation to improve enforcement. As far as the protection of coastal regions is concerned, there is room for improvement in so far as the risk analysis programme, which is primarily aimed at inland flood control, does not guarantee that the need for retreat in the long term and options for an area-wide coastal protection will be identified at an early stage and evaluated in terms of costs and benefits.
31. As in the case for inland flood control, in the field of coastal protection, the statutory legal mechanisms for flood control, supra-local planning as well as town and country planning provide largely suitable forms, procedures and, in particular, **means of specifying permissible land use designations** which make it possible to keep areas free for the purposes of both technical coastline and coastal area protection.
32. A stringent nationwide minimum level of requisite prevention in **dyke design** adapted to rising sea levels would not only help to guarantee a minimum level of protection for citizens and ensure that the *Länder* could link up their measures, but also provide stakeholders with information on costs in good time.
33. To promote the timely setting of land management criteria for cost-efficient flexible coastal protection, **better subsidy possibilities** must be made available, namely in the *Gesetz über die Gemeinschaftsaufgabe "Verbesserung der Agrarstruktur und des Küstenschutzes* (Federal Act on improving agricultural structure and coastal protection). In addition, those areas which lie below a certain future sea level could, comparable with the protection of flood plains, be secured by designations as "priority areas for coastal protection" including restrictions for long-term land use.
34. Another possible way of solving the conflict arising in coastal protection co-operatively and in advance of any legal specifications is the **Integrated Coastal Zone Management (ICZM)** scheme. It would therefore seem advisable to exploit ICZM in managing coastal zones, in particular by way of European and national structural aid programmes, but also by obligations of consultation as a part in the sectoral planning. Nevertheless, the ICZM can only ever support, but never replace, formal control mechanisms.

## VI. Water protection

35. Climate change will have a **growing impact on water quality**. Higher temperatures, lower oxygen content, increased eutrophication, periods of extremely low water levels with higher concentrations of pollutants are some of the most serious effects which will expose aquatic fauna and flora to ever increasing stress levels. A widespread effect will be a considerable reduction in water resilience and alteration of the physical, chemical and biological conditions even in unpolluted waters. As “secondary” climate effects, there will also be local interference with measures for adaptation purposes or to cut greenhouse gases, e.g. measures to improve flood control, maintain the navigability of waterways or exploit hydro-electric power.
36. There is still considerable uncertainty as to what form all these potential climate-related changes will take in each individual case. Accordingly, the action most urgently needed is an **improvement of basic knowledge**. More must be done to investigate the specific climate effects on water, in particular the negative impact on water conditions, changes in stress tolerance and ways of increasing resilience and adaptability.
37. Despite the considerable uncertainty, it can be regarded as almost certain that a **continued reduction in the most serious forms of water pollution** will be needed to increase water adaptability and resilience. This applies in particular to building interference and the influx of nutrients from agriculture. Measures to further reduce such pollution will in any event help to improve water quality considerably and are therefore needed irrespective of any climatic impact to comply with the general quality objectives under the Water Framework Directive and the specific status objectives for individual bodies of water derived from it.
38. The quality-oriented **management scheme under the Water Framework Directive** and the related national implementing legislation are currently the central framework for organising water protection. On entry into force of the revised Federal Water Resources Act (Wasserhaushaltsgesetz - WHG), the entire water management scheme will in future be governed i.a. by the principle of “prevention of potential detrimental impacts of climate change” laid down in Paragraph 6(1) No. 5 WHG (as amended). This new principle sends an important signal in terms of the future orientation of water management. However, whether the central needs for action will be met effectively will depend to a large extent on the specific structure of the management instruments.
39. As far as the **identification and assessment of specific climate effects** is concerned, it follows from the link between management law and the quality objective and, since recently, also from the principle of prevention of detrimental climate impacts (see thesis No. 38) that appropriate investigations are essential in principle. However, to guarantee that such investigations are conducted to a stringent uniform standard, that current findings are processed and options for co-operation between river-basin areas are exploited, the applicable specific statutory requirements must be made much more specific than is currently the case. This could be done, in particular, by adding a

module for a **climate impact assessment** and laying down minimum substantive, formal and procedural standards.

40. More specific requirements have now been outlined by the EU water directorates in a comprehensive **Guide to the “Common Implementation Strategy”** for the Water Framework Directive. However, non-binding guidelines are unlikely to suffice as an adequate guarantee that the additional analytical work will be performed across the board. In any event, national implementation legislation should lay down minimum formal requirements to ensure that sufficient staff and financial resources are allocated to implementation.
41. As far as adjustment of individual stress levels to the reduced water resilience is concerned, the **quality-oriented approach** would appear, in principle, to guarantee that additional stress reduction measures will be taken where this proves necessary to meet the quality goals. In addition, the cyclical structure of management and action planning, requiring a review and updating at six-yearly intervals, guarantees that relevant adaptation requirements will be reviewed in the mid term and additional measures taken where necessary. However, there is no guarantee that, in addition to such “concurrent” adaptation, a long-term view will be taken as ought to be the case with regard to the long-term investment and infrastructures. A formal planning module for climate impact assessments would therefore be an advantage in this respect.
42. Moreover, whether the management system will prove fit to achieve climate adaptation will depend greatly on the availability of **effective implementation instruments** and on guarantees that they will also be used. The central approval scheme under water law appears suitable for adaptation purposes, in principle, because it allows for flexible adaptation to new findings and needs for prevention as a result of the link to management objectives and the low level of protection required for existing rights. However, it is clear from the outset that two central challenges posed by stress level adjustment cannot be overcome under the current approval scheme.
43. Firstly, the current management instruments do not apply to by far the most serious causes of anthropogenic water pollution, namely **agriculture** and the related fertilisation practice, which is responsible for the high level of nutrient pollution. However, in the conditions arising as a result of climate change, considerably stricter measures will have to be applied to tackle problems arising from agricultural practices. To achieve further reductions in nutrient emissions, more stringent standards must be imposed within the framework of cross compliance and best practice. The introduction of an approval requirement for agricultural land use could also be expected to make a major contribution. This could be used to provide farmers with advice on prevention, to identify and enforce the reductions needed in specific cases and to target subsidies accordingly.
44. Secondly, the management instruments are not fit to serve as a means of **optimising the location of land use** where, as a result of climate change, only few locations have sufficient capacity to bear the stress resulting from a particular use. With a view also to

avoiding ecologically damaging competition between locations, such precarious uses should be allocated to the most suitable location by way of a supra-regional management instrument. Today already, such management is needed for power stations and industrial plants requiring large volumes of cooling water, as the levels of thermal pollution and river-water consumption has in many areas reached, or even exceeded, the tolerance threshold. Optimum locations should be allocated by way of a statutory planning instrument guaranteeing, firstly, an adequate investigation of the technical bases – in the case of the supply of cooling water, this would include forward-looking planning with regard to water consumption and thermal pollution – and, secondly, the binding designation of suitable locations by authorities responsible for land management planning.

45. In other areas too, closer co-ordination of water management and **overall land use planning** is needed to ensure that plans are communicated interactively, that the planning needs are confronted with the requirements of water use, compatible with the climate impact at an early stage and that the various interests are weighed up in coherent land-use planning strategies. Current legislation already includes a substantive requirement that the various interests be co-ordinated and, where necessary, that the outcome be observed, but there is still a lack of provision for effective procedures and forms guaranteeing that this co-ordination task is actually performed in practice.
46. Even if the primary aim of all the mechanisms and possible enhancements set out above must at all times be adaptation by reducing pollution, it will be impossible in the long term to avoid **reviewing the reference conditions** for water protection in the light of (climate-related) changes and, where necessary, **adjusting the specific targets** based on the abstract objectives. Given the non-pollution-related changes arising from the changes in climatic framework conditions, it will be impossible in the long term always to keep to the objectives and the specific targets laid down in the management plans for this current, first management cycle on the basis of current reference conditions for “very good status” and the management objective of “good status” derived from them.
47. It is already possible in theory to adjust the reference conditions and specific objectives retrospectively by way of cyclic revision of the basic assessment according to Article 5 WFD and the management plans according to Article 13 WFD. However, in view of climate change, its dynamics and the particular uncertainties involved in identifying causes, this entails an increased risk that adverse developments in water conditions which cannot be clearly attributed to permanent climate changes will nevertheless be prematurely classified as such and, perhaps for economic reasons, legitimised by “lowering” reference and target conditions and objectives. In this connection, it should first of all be stressed that, based on current observations and climate prognoses, **it is not expected that sufficiently significant permanent changes in the reference conditions which can be proved to be attributable to climate change will arise by**

**the absolute deadline for implementation of the Water Framework Directive in 2027.**

48. However, in order to ensure that, in the event of any exceptions and also for after 2027, neither the reference conditions nor the potentially relevant exceptional rules serve as a gateway for lowering the standards of proof that the relevant changes in conditions are attributable to permanent consequences of climate change and not (other) anthropogenic effects, **stringent substantive and procedural requirements** must be imposed at an early stage.
49. Moreover, the authorities responsible for management planning should be obliged to explore, in a formal module for **assessing compatibility with climate change impact**, the long-term trend in reference conditions and the resulting long-term prospects for water use in order to prevent any development in the wrong direction and identify no-regret options for cases in which current status objectives cannot be maintained in the far future.

## VII. Prevention of water shortages

50. As a result of climate change, there will be a major shift in the distribution of precipitation to the winter months. Consequently, there may be an increase in droughts and **water shortages** during the summer. This applies equally to the otherwise water-abundant central European area. The regions affected will, above all, be those which already have a drier summer climate; in Germany, therefore, the south-west and central parts of the east.
51. The **effects of dry periods** and low water levels may include, in particular, losses for agricultural and forestry, soil degradation, shortages in the public water supply and cooling water provision and restrictions on inland waterway transport. However, there is still considerable uncertainty as to specific local risks of drought, how they will increase in future and their specific implications.
52. As in all other areas of adaptation, the **most important need for action** is first and foremost to investigate more thoroughly the regional risks, vulnerabilities and adaptation options and to present the results transparently. Depending on the local risks, suitable and adequate measures must then be taken to prevent shortages. These include, in particular, measures to retain and store water, direct restrictions on intensive uses and preventive measures to reduce water consumption and guarantee the public water supply.
53. It will also be necessary as part of an efficient mechanism for preventing shortages to co-ordinate individual measures with each other and with the land-use plans affected. In particular, **integrated water consumption management** is required, with a view to achieving a balance between water supply and demand which can be sustained in the face of the climatic framework conditions.

54. The legal basis for managing water consumption is also to be found primarily in the water management scheme laid down in the Water Framework Directive and the WHG. However, a fundamental problem is posed by the fact that this management scheme is **oriented towards protecting water quality**. It thus lacks a suitable planning framework for the more and more urgently needed consumption management.
55. An inevitable consequence of the low importance attached to preserving water volumes in the legal management scheme is that **no definite duties and requirements** to identify and take account of scarcity risks are imposed. Logically there are no specific requirements with respect to the planning of measures in this respect.
56. To guarantee that risks of shortages are thoroughly investigated in future as part of water management planning and that consumption management is integrated into the process, it would be useful to specify shortage prevention more clearly as a management objective, of equal importance to water quality, and to supplement the water management scheme with a **consumption management planning module** laying down specific standards for both risk analysis and action planning. Given that water supply infrastructure requires very long-term investment, it should also be required that such planning be based on a long-term development perspective.
57. To what extent such integrated consumption management planning can succeed in tackling scarcity problems and risks then depends greatly on whether there are **effective implementation instruments** enabling the authorities to apply the above preventive measures and restrictions on use as required.
58. As far as the potentially necessary limitation of direct water withdrawals is concerned, the approval scheme essentially constitutes an appropriate and very flexible regulatory instrument. The same applies here to consumption management as to water quality conservation, though the procedure for balancing interests provided for in Paragraph 22 of the Water Management Act offers interesting possibilities for flexible trading of use rights.
59. However, as is the case for water quality conservation, the approval scheme does not offer consumption management an effective means of **specifying optimum locations**. This may, however, be required for such purposes too, again with regard, in particular, to the supply of cooling water provision, but also to hydro-power stations. An appropriate spatial use planning instrument thus appears desirable.
60. To increase **water retention** over large areas, essentially the same measures and instruments are needed as for flood control, which equally profits from water retention. Above all, it is essential to restrict agricultural practices promoting run-off and, in particular, agricultural *drainage* practices in a manner appropriate to location. A spatial planning instrument on the basis of which location-specific standards of agriculture practice could be developed, imposed and implemented would be very useful. Such an instrument could, where appropriate, also serve as a basis for adjusting agricultural *irrigation* practices to water shortages.
61. Also, such **planning for areas not within the scope of a specific spatial plan** could serve, in combination with water management planning, to renaturalise the small-scale

hydrographic network so that it can redevelop its natural storage potential. To facilitate this, relaxations of approval requirements should be explored.

62. To promote the harnessing of **potential savings in industrial plants**, operator duties to reduce emissions could be supplemented with a requirement to save water, to be given its rightful place next to the requirements to avoid and recycle waste and to ensure energy efficiency. Other incentives to be economical with water could be provided by a greater orientation of the certification scheme to this area.
63. In the **products area**, the potential for savings could be realised by way of labelling requirements and efficiency standards, specifically by accordingly widening the scope of an ecodesign regulation such as that as already announced by the EU Commission.
64. Finally, significant savings and potential for retention could be realised in the field of **waste water management in local authority areas** if there were a systematic drive towards seepage of precipitation and decentralised recycling of grey water. This too could be promoted by way of statutory planning duties and objectives.

## VIII. Soil protection

65. The **impact of climate change** on soil can scarcely be predicted at present. The only certain thing is that soil will undoubtedly be affected by the change in temperatures and precipitation and the intensity and frequency of extreme weather events. It is assumed that, in particular, current soil protection problems will intensify. These include soil erosion, loss of humus, increased propensity to consolidate, changes in ground water resources, mobilisation of nutrients and pollutants stored in soil and changes in soil biocoenosis. For now, adapting to climate change therefore means, above all, tackling current problems to reduce the soil's vulnerability and increase its resistance to climate impact.
66. **Action is needed primarily** in agricultural and forestry areas, which make up around 85% of Germany's area. Soil risks such as erosion, humus loss and loss of pollutants and nutrients arise mainly in arable areas, whereas consolidation can also be a problem in permanent grasslands and forests. Large-scale drainage of agricultural and forestry areas and the decrease in infiltration in those areas increases the risk of floods and erratic inflows of various substances into water and could have an adverse effect on the groundwater supply and water availability in the event of an increase in summer droughts.
67. As a result of the significant changes in the economic conditions of agriculture and forestry since the 20th century, the **self-interest of farmers and foresters** in protecting the soil has greatly decreased and the lower sustainability thresholds are often not reached. Given the social importance of soil in guaranteeing vital ecosystem effects such as, for example, carbon storage or water retention and filtering, its cannot be left solely to those managing it. The regulation of agriculture and forestry is thus of central importance in the context of adapting to climate change.
68. The following **"no-regret" measures** are particularly suitable for adapting soil protection to climate change in agricultural and forestry areas: conserving mulch treatment of soil,

intercropping, ecological farming, conversion of arable areas to perennial cultures in especially endangered areas and reduction of drainage in agricultural and forestry areas. These measures serve not only adaptation to climate change, but also protection against its effects: they reduce the flood risk and the pollution of surface water with nutrients and pollutants; improve the water supply and formation of new ground water; and increase biodiversity in worked areas.

69. The legal measures to adapt soil protection to climate change are not restricted only to the **soil protection legislation**, which comprises the Federal Soil Protection Act (“BBodSchG”), the Federal Regulation on Soil Protection (“BBodSchV”) and the laws passed by the Länder, but extend, in particular, to the sectoral law applicable to agriculture, including the **cross compliance requirements for direct payments, the *Flurbereinigungsgesetz* (Land Reorganisation Act), forestry law and conservation law**. At present, adaptation to climate change is not an explicit objective or task in any of those areas of law. Environmental quality objectives such as the “good agriculture and environmental condition“ prescribed by EU Regulation No. 73/2009 will have a greater role to play in future in protecting soil for climate protection and adaptation reasons.
70. Currently, **climatic risks and changes are identified and taken into account**, without being expressly given prominence, in devising general measures to tackle and prevent risks. Both soil protection and conservation law require the authorities to include climatic changes in soil risks in their environmental observations. There is room for improvement in the monitoring and investigation duties of soil managers, nationwide standardisation and co-ordination of the authorities’ various monitoring programmes and incorporation of the findings in legislation. In particular, there is a lack of legal procedures for adapting to new findings under the principles of best practice and land reorganisation.
71. **Planning instruments** are currently of little importance for qualitative soil protection in agricultural and forestry areas. However, they will gain in importance in the context of climate adaptation, since soil protection is highly relevant to local environmental conditions and land use and closely related to the other environmental compartments and socially important ecosystem effects. At present, the various planning instruments include only a limited range of requirements as to the nature of agricultural and forestry management. In the interests of protecting soil, nature and water and protection against climate effects, but also in farmers and foresters’ own interests, the planning authorities require more extensive means of developing and imposing location-specific management requirements. The legal instruments relevant in adapting to climate change are, above all, the soil protection areas, protected forests and land reorganisation plans, which are binding on third parties, as well as the landscape plans and forestry framework plans binding only on the affected stakeholders. The large-scale spatial and development planning schemes are, in their current form, less suitable. The “integrated rural development strategies” in the farming sector are merely an economic instrument for project-related assistance.
72. To protect especially endangered soil areas and adapt them to climate change, it is particularly advisable to define the **soil protection area** provided for in the Soil Protection Act clearly in terms of its function and the related powers and to add a category of

“especially endangered soil areas”. The **landscape and forest framework plans** would be a suitable means of designating especially endangered areas and recommending related management strategies and requirements. However, to achieve effective adaptation to climate change outside protected areas, the planning authorities require a legal means of controlling the nature of soil use according to location (particularly for agriculture and forestry). This could be achieved by expanding the landscape planning scheme to create a system of integrated ecological planning providing for the issue of binding specifications for certain areas or by expanding the development planning process to form a general scheme of **soil use planning** which also allows the authorities to specify the nature of non-construction uses.

73. The existing **regulatory requirements** for soil protection under national law must also be regarded as deficient with regard to soil use in agriculture and forestry. The substantive and formal legal requirements must therefore be improved to ensure successful adaptation to climate change, with respect both to their structure and concretisation in terms of content and to their legal enforceability.
74. **Substantive requirements** to be met by proper agricultural and forestry soil use in Germany are imposed in the **cross compliance requirements** for European direct payments to farmers and in the **best practice principles** laid down in national environmental and agricultural legislation, although these principles are spread across several laws and, for the most part, have the effect of mere exhortations. With respect to climate adaptation, improved and standardised regulation of the substantive requirements to be met by proper management, would enable authorities to exert much more effective and targeted control. To improve the resilience of soil areas in the face of climate change, the standards to be met by soil use should be raised above regulation and concretisation at the level of cross compliance and, in particular, should include the following substantive elements:
  - Classification in categories of endangerment according to prevention and risk values
  - Differing requirements as to preventive action or measures to tackle risks for each of the various categories and for areas designated as especially endangered
  - Regular assessment of land by the farmer or forester to identify erosion, humus content, nutrient and pollutant content and consolidation
  - Inclusion of substantive duties in the catalogue of regulatory offences and competence of authorities to make enforcement orders.
75. **Effective enforcement** of the substantive requirements in practice requires formal rules enabling the authorities to subject **approval** of land use to compliance with them and/or improve their implementation by offering **advice**. At present, forestry law lays down approval requirements only in relation to certain uses, whereas agricultural soil use is largely exempt from approval. Accordingly, there are deficits in the implementation of environmental law in general and soil protection in particular, especially in the agricultural sector. These deficits

increase soil vulnerability to climate change. To reduce that vulnerability, the following improvements are recommended:

- Introduction of integrated and mandatory consultation at regular intervals with regard to all operations
- Introduction of a general duty under conservation law to offset and compensate for the interferences in soil use for agriculture, forestry and fishing permitted under Paragraph 14(2) of the Federal Nature Conservation Act (BNatSchG, as amended) in the form of a minimum share for operations in landscape structures and extensive areas
- Introduction of an integrated procedure for approval of all operations for a period of several years, placing particular focus on those farmers and foresters whose turnover exceeds the maximum for small-sized enterprises.

## IX. Installation safety

76. Climate change also poses a risk to the **safety of industrial and commercial installations**, specifically in the form of extreme weather events such as heavy precipitation, storms, tornados, storm floods or flooding. In addition, there may be an increase in risks associated with locations where installations are built on slopes, in areas which have swellable soils and an impact on groundwater, in flood risk areas or in former underground or open-cast mining areas.
77. Even under the law currently in force, the operator of an installation subject to approval under the Federal Pollution Control Act (“BlmSchG”) is **obliged to guarantee the installation’s safety**, also with regard to the risks entailed by the surrounding area. He must also take account of the risks for the safety of the installation operations which arise from the future impact which climate change is expected to have on its location. The duty imposed on the organisation under Paragraph 52a BlmSchG serves as an additional procedural safeguard for compliance. However, neither the basic obligations under Paragraph 5(1) BlmSchG, nor the corresponding duty of the organisation under Paragraph 52a BlmSchG expressly refers to the need to take account of climate change, so that it is to be feared that neither the installation operator nor the supervisory authority will adequately comply with this aspect of the obligations. Adjustments to the secondary legislation could ensure the requisite transparency. For the conduct of the approval procedure under pollution control law, provision should be made in Paragraph 4a(1) No 2 of the **Regulation on approval procedures** (9<sup>th</sup> Federal Pollution Control Regulation; “BlmSchV”) for submission by the applicant of “details of the risks entailed by the surrounding area as a result of the impact of climate change”. Given that far more than **60 000 approved installations** are in operation in Germany (see (a) above), an amendment of the 9<sup>th</sup> BlmSchV alone will not suffice to overcome the problem. Rather, the **authorisation to adopt regulations conferred in Paragraph 7(1) No 1 BlmSchG** should be used to guarantee adjustment of the

analysis of installation safety to include a requirement for adaptation to climate change. To satisfy the principle of proportionality, **priorities** should be set and varying requirement levels established. In light of the need to protect humans and the environment, an area of particularly urgent action concerns existing installations which are subject to the Integrated Pollution and Prevention Control Directive and are to be classed as “column 1 installations” within the meaning of the annex to the 4<sup>th</sup> BImSchV.

78. Under the current law, operators of businesses subject to the Federal Faults Regulation (Störfall-VO) have special **duties of investigation and documentation**. In principle, these duties include the need to tackle the special risks to installation safety which may arise from climate change. However, the Faults Regulation likewise lacks an express reference to the inclusion of climate-related risks so that there are likely to be deficits in implementation. Here, too, consideration should be given to increasing the transparency of the duties of investigation, assessment and documentation, be it through express inclusion in the 12<sup>th</sup> BImSchV or in relevant administrative provisions.
79. Investigations and assessments depend on enforceable standards. Specific standards are set, in particular, by **developing technical rules** in response to the anticipated climate change. According to the findings set out in the UBA study by Warm/Köppke (UBA text 42/07), there appear to be deficits in the adoption of such rules at present. An appropriate drafting process should be initiated, for example by commissioning the Installations Safety Committee (Paragraph 51a BImSchG). Where appropriate the outcomes could be given binding effect in regulations adopted under Paragraph 7(1) No 1 BImSchG, in addition to the – still non-binding – publication in the Federal Gazette.
80. The **environmental impact assessment** (EIA) provides a means of including the changes in environmental conditions expected to arise from climate change in impact assessments and of taking them into account when deciding on the permissibility of projects. The EIA interest in findings is, however, restricted to the identification and assessment of the effects of a specific project on humans and the environment; it does not supply a basis for an assessment from the opposite perspective, i.e. of the effects which the environment – as altered by climate change – has or may have on the planned project in future. The EIA is designed to protect humans and the environment, not the project. Accordingly, it cannot serve as a general examination of compatibility with climate impact. With respect to installation safety, there is much to suggest that the specific safety requirements should be addressed through the applicable sectoral law (and not the EIA legislation). The effectiveness of the EIA is dependent on a general spatial assessment of climate impact and requires knowledge of the risks specific to the area and the processing of such knowledge, e.g. in maps of “vulnerable areas” in sectoral plans or overall spatial management plans. Where such knowledge is available, scoping especially can be used to steer the analysis towards analysing the impact of the specific project. Additions to the administrative regulations adopted under the EIA Act could also be used to guide the conduct of authorities (retrospectively), which might raise their awareness of the need for adaptation.

## X. Spatial planning

81. Adaptation to climate change will to a large extent entail adaptation of land uses. The most important cross-sector legal means of controlling land use is **spatial planning**. In Germany, it can be divided into regional spatial planning, governed by the Federal Spatial Planning Act (Raumordnungsgesetz – ROG), and local spatial planning (development planning), which is based on the Federal Building Code (Baugesetzbuch – BauGB).
82. Regional and local spatial planning offers a **variety of approaches** to taking measures to prevent potential climate change effects, but this requires that the planning authorities are already sensitive to the problem. Since this cannot be assumed to be the case across the board, much will depend on **the inclusion of active duties in spatial planning procedures** to ensure that planners recognise the need for adaptation and perform their obligations effectively. An analysis of the legal bases for spatial planning has shown that neither the Spatial Planning Act nor the Building Code has so far been adequately geared towards tackling the problem of adaptation.
83. Whilst adaptation has been explicitly included in the catalogue of principles in the **new 2008 Federal Spatial Planning Act** (Paragraph 2(2) No 6), so that planners have now been provided with important guidance, the revised legislation does not also enshrine adaptation in the mandatory requirements to be met by spatial planning measures (Paragraph 8(5)) or add it as an element of the investigation, assessment and updating processes. There are also deficits with regard to the co-ordination of planning measures and implementation of the planning specifications.
84. The central investigative instrument available to spatial planners with regard to the protection of man and the environment is the **Strategic Environmental Impact Assessment** (SEIA). However, it is not adequately tailored to the problem of the climate change impact and the associated adaptation requirements. An impact assessment instrument is needed which enables planners to regulate land use in such a way that it will remain eco-friendly in future, but which also provides them with the knowledge they need to safeguard existing or planned land uses against the likely impact of climate change. To that end, it would be very helpful to add a “climate proofing” module to the existing SEIA scheme or set up a separate tailored instrument.
85. An impact assessment which is required to consider climate change must necessarily use uncertain information and be subject to criteria for handling such information. In this regard, the SEIA legislation, and spatial planning law as a whole, can **learn from the law of risk management**, which means, in other words, developing criteria for applying the principle of prevention and retaining control over the assessment and resulting decision by monitoring and, if necessary, subsequent improvement. This requires provision for periodic review or, as the case may be, a review following a specific incident. Such a review is not required under current planning law. The duty of supervision required by the SEA provides an appropriate basis but, on the whole, this duty is insufficiently tailored to the peculiarities of the adaptation problem.

86. An instruments for coping with uncertainty, which will gain in importance for spatial planning in the face of climate change, is **risk mapping**, i.e. the cartographic illustration of vulnerable areas. Risk mapping serves to make the potential risks of climate change impact transparent, so that other (public) decision makers can take land-use decisions in the light of the knowledge that an area is vulnerable. The current law does not provide for such risk mapping. Indicative management by way of mapping would be a suitable instrument for spatial planning wherever regional planners are still unable to make a definitive decision on land use.
87. The challenges posed by adaptation to climate change require an **effective integration of overall spatial planning with sectoral planning** and project-specific planning. In addition to the SEIA, sectoral planning, such as in particular flood-risk management planning, fulfils an important function of generating knowledge of risks. Intensive co-ordination of these sectoral plans will be the key precondition for an early and effective resolution of (potential) conflicts. In this regard, the emergence of the adaptation problem is breathing new life into the old (Environmental Code (UGB)) idea of an integrated and comprehensive environmental planning scheme.
88. The ability in the context of spatial planning to designate "**priority areas**" (Paragraph 8 (7) No. 2 ROG ) and "**reserved areas**" (Paragraph 8(7) No. 1 ROG) and to give effect to such specifications as "spatial planning objectives" allows adaptation interests to be pursued in practice. However, the objectives have only limited binding effect; not even public planning authorities are strictly bound (Paragraph 5 of the Spatial Planning Act).
89. Legal bases for considering the need to adapt to climate change as part of the development planning process can be derived from the statutory tasks and principles of development planning (Paragraph 1 of the Building Code), the duties to investigate and assess (Paragraphs 2 and 2a) and the planning duty (Paragraph 1(3)). These apply equally to both comprehensive zonal ("F") planning and urban development ("B") planning. Other bases can be derived from the designation and specification options available in the F planning (Paragraph 5) and B planning (Paragraph 9) schemes. Unlike the Spatial Planning Act, the Building Code, as currently in force, still does not expressly provide for the inclusion of the need to adapt to climate change in the list of development planning tasks and principles. Whilst analysis showed that it can nevertheless be inferred from the majority of concerns to be considered by planning authorities that climate-related changes in the conditions pertaining in the surrounding area are to be identified and taken into account, the transparency-enhancing function of a statutory clarification to that effect should not be underestimated.
90. The law currently applicable to urban development planning provides for only limited means of reviewing plans for compatibility with the impact of climate change. A periodic review of F planning is no longer prescribed, even though precisely such a review would be extremely beneficial in view of the existing uncertainties as to the climate change. In addition to such a duty to review F plans, consideration should be given, in future legislation, to developing the SEIA supervision scheme under Paragraph 4c into an instrument for monitoring climate change and for preparatory decisions on remedial

measures. In this connection, substantive duties to take remedial action where a need has been identified could be laid down by statute. Moreover, it is recommended that the instrument of a “**temporary development right**” provided for in development planning law (Paragraph 9(2) of the Building Code) be exploited in future in the interests of climate change adaptation. It could serve as a suitable planning response to uncertainties regarding the impact of climate change.

91. Since climate change adaptation will to large extent require changes to existing urban development, an effective means of implementation will be required. For local authorities, the **instruments of special urban development law** will be particularly relevant in this regard, whilst, for state authorities, reactive rights of intervention will be especially relevant, although conventional building law, unlike modern environmental law, so far makes inadequate provision for such rights (meaning, above all, with the result of compensation).
92. The need for spatial planning authorities, for the purposes of flood control, water consumption management and soil protection, to **impose location-specific requirements** for environmentally-friendly climate-adapted soil and water management in rural areas (see theses 19, 59, 70) and in a form taking a balanced view of overall planning considerations cannot be met by the existing instruments of overall spatial planning. The F plan (comprehensive land use planning) is not detailed enough to allow for such location specific requirements and it is not binding on private landowners. The B Plan, (urban development planning) allows for detailed and binding land use restrictions. It is, however, confined to developed areas and constructional land use. To overcome this structural deficit, either urban development plans would have to be extended beyond the developed area to apply to general rural land use or an appropriate new environmental planning instrument would have to be introduced or landscape planning would have to be enhanced to form a kind of a rural soil management planning.
93. The current legislation applicable to **landscape planning** already offers committed planning authorities a solid basis for identifying and presenting spatial needs for prevention and adaptation and the associated measures, not only for species and biotope conservation but also for all relevant environmental compartments. However, the current law does not ensure that they can effectively influence the corresponding sectoral planning decisions, but rather much depends on the awareness and political will of the relevant decision makers.
94. As the law currently stands, the landscape planning scheme cannot be expected to take on the function of a central spatial **planning instrument for environmental prevention and adaptation** which not only provides the means of thoroughly analysing the relevant risks and needs for adaptation, ensuring interactive co-ordination with sectoral units of environmental administration and overall spatial planning authorities and developing integrated strategies for spatial environmental protection, but which also renders such action mandatory.

95. Rather, this would require that landscape planning be **supplemented and concretised** accordingly in terms of its objectives and structure and of integration of its substantive, formal and procedural requirements into the sectoral environmental planning and overall spatial planning processes.
96. Moreover, landscape planning would have to be equipped with the ability to impose **binding specifications** as to uses compatible with nature, environment and climate impact in agricultural and forestry areas, so that it could fulfil the regulatory tasks increasingly required in this field and so close the current gap in management regulation.
97. Accordingly, the **tendency to weaken** the landscape planning scheme displayed during the most recent revision of the Federal Conservation Act must – having regard to the major future challenges posed by climate adaptation – be regarded as short-sighted and inappropriate. The legislature's reluctance to give landscape planning a stronger role in spatial planning also gives cause to contemplate a new, alternative instrument of climate compatibility planning.
98. Such **climate compatibility planning**, dealing with climate adaptation and protection needs and action together, would in view of the particular significance of these problems, as well as their special structure, which is characterised by variety, decentralisation, uncertainty and dynamics, undoubtedly be a suitable and necessary instrument of state action on risk prevention. A special planning scheme would, finally, have the advantage that it could give climate-impact provision a separate elevated status allowing for high-profile representation of the related concerns in relations with sectoral administrative units and citizens.

## XI. Environmental monitoring

99. In order to achieve adaptation, all sectoral environmental planning schemes and preventive strategies are to the same considerable extent dependent on **rich data as a basis for prognosis**. However, it will only be possible to obtain and evaluate the requisite data if environmental monitoring is structured in a highly synergetic, methodically coherent and efficient manner.
100. This cannot be achieved by the currently fragmented and deficient law applicable to environmental monitoring. The lack of a systemised scheme of environmental monitoring prevents a comprehensive and efficient assessment of the condition of natural resources and makes it more difficult to identify long-term trends. It would therefore seem advisable to establish a **standardised nationwide** structure and system for environmental monitoring. Given the importance of environmental monitoring for other areas of law, the creation of a separate law on environmental monitoring which co-ordinates and integrates the various monitoring and forecasting duties is recommended.

## XII. Structural challenges and strategic action priorities in terms of environmental and planning law

101. Climate change will, above all, require an **increase in the level of protection and prevention** in the areas of environmental law concerned. The law currently in force already offers a large arsenal of effective instruments but, as shown in the various sections of this study, could still be greatly improved in a number of specific respects. Irrespective of the numerous individual instruments which must ultimately be used to meet the need for enhanced protection, climate change will entail a series of cross-sector challenges for which environmental and planning law needs to be better equipped. Essentially, this will mean that sectoral environmental and planning law will have to be enhanced to a greater extent than at present by **forms of action familiar from risk-management law**, in order to guarantee the required forward-looking and concurrent adjustments to trends in environmental conditions and knowledge.
102. **Inclusion of climate adaptation in statutory objectives and application principles:** important environmental statutes, such as in particular the Federal Conservation Act, the Federal Pollution Control Act, the Federal Soil Protection Act and the Building Code, do not yet expressly refer to adaptation as a regulatory and application objective. This should change to heighten awareness of the task among enforcement authorities and afford adaptation the same status as the other, expressly cited, regulatory objectives.
103. **Legal integration and targeting of environmental monitoring:** in the current phase of climate change, much remains uncertain and much research is needed, so the generation of greater knowledge about the risks must have top priority. A prerequisite for this is an effective, well-coordinated system of environmental monitoring equipped with appropriate methods and measurement instruments (see hypotheses 99 and 100).
104. **Specific requirements to identify relevant climate effects as part of approval and planning schemes:** the extent to which climate adaptation needs can be effectively considered in developing land use in Germany will largely depend on how specific and stringent a form is given to the duties to identify climate effects in approval and planning procedures. Requirements as to the scope and thoroughness of investigations/forecasts, the form of presenting results and duties of regular review should be integrated into the applicable sectoral legislation. In addition, the rules applicable to the EIA and SEIA could expressly require the consideration of relevant climate effects and, if necessary, reinforce this requirement by specific standards as to the scope and thoroughness of assessment.
105. **Active planning duties and targeting of environmental and spatial planning schemes:** in the conditions arising from climate change, there will be increasing reliance on planning preparation, networking and support for administrative land-use decisions. Under the current law, formal bases are already provided, above all, by water management planning, flood risk management planning, spatial planning and landscape planning, but these could be extended, beyond the above-mentioned

inclusion requirements and adequate duties of investigation, and better tailored to the challenges posed by climate change, in particular by way of a formal planning module for long-term climate adaptation, stronger links between substantive and formal requirements, including synchronised revision cycles and the closing of the relevant gaps in environmental planning schemes. All these needs for legal adjustment could be met to a particularly large extent by integrated planning guided by environmental concerns.

106. **Effective regulatory instruments – in particular for adapting rural land use:** to ensure that activities with an environmental impact can be adapted to reduced tolerance levels and growing environmental risks, the environmental regulatory scheme must provide for appropriate requirements and bases for intervention. There are already broad regulatory possibilities in the field of land use for building, but there are strategic deficits with regard to managing rural land use for agriculture and forestry, despite the fact that such use must be focus of any action on flood control, water protection, prevention of water shortages, soil protection and conservation. The legislature is therefore advised to orient the existing approaches to control provided by the “best practice” requirements for fertilisation in plant protection law and the cross-compliance requirements under EU subsidies law more towards the need for adaptation than has been the case thus far. Moreover, it is recommended that the landscape planning scheme be equipped with the option of setting - in the form of localised best practice - specifications binding on third parties as to soil use which is appropriate to the location and compatible with the both the environment and climate impact.
107. **Assistance for private adaptation initiatives in the form of insurance and long-term planning:** where private property is endangered by climate change in the form of a rise in sea level, increased risks of flooding or other extreme weather conditions, it is for two reasons especially worthwhile to contemplate assistance for private initiatives to prevent damage: (1) state obligations and, if appropriate, offers to insure could create incentives for efficient private risk prevention measures and so relieve the public purse of the need to provide subsidiary assistance; (2) long-term objectives and specifications (e.g. through spatial planning) with regard to the adaptation of public protection and provision (in particular, flood control, coastal protection and water supply) could provide private stakeholders with an appropriate basis for their own planning and an adequate transitional period for implementing it.