Chapter 30
Normative Principles for Adaptation to Climate Change Policy Design and Governance

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Abstract A systemic approach on the elaboration of adaptation policy systems was begun in 2008 by the approval of the Report on Adaptation to Climate Change by the Latvian Government and a new task was put forward – to elaborate national strategy on adaptation. Several examples of sectoral adaptation policies and measures are already being implemented in Latvia (flood risk assessment and management, risk management and insurance in agriculture, coastal zone management, etc.) and research is being conducted on climate change impacts. A systemic approach is required for decision-making to solve such a huge, global, and unstructured problem as climate change impacts and risks. This involves facilitating work of different partners and stakeholders involved in decision-making to reach a common basis for efficient action, normative principles, and appropriate criteria (sustainability, and others subordinated to it – precautionary measures, solidarity and cooperation, dematerialization, sustainable resource use, triple bottom line, diversification, "polluter pays"). This paper analyses some key aspects integral to the development of a national system of adaptation to climate change, discusses practical considerations (policies and measures) already being implemented in Latvia, and proposes a new policy design approach for more efficient elaboration and implementation of adaptation policy.

Keywords Adaptation · Climate change · Latvia · Normative principles and criteria · Policy design · Sustainability · Systemic approach · Unstructured problem

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Introduction

The paper aims to describe theoretical considerations and practical approaches used in the preparation of Latvian adaptation to climate change policy. The cornerstones of the theoretical framework for policy design encompass a systemic approach in solving complex, unstructured problems and the design of appropriate normative criteria based on principles of sustainable development. An enhanced scheme for the policy development cycle is offered for the practical implementation of the proposed theoretical approach with particular emphasis on decision-making criteria in all stages of the cycle.

The first part of the paper describes the overall context and the adaptation to climate change policy development process in Latvia, pointing out the necessity of defining normative criteria for setting up a structured approach for policy design and governance.

The second part offers a methodological approach to be used for practical policy design, i.e. preparing Latvian national strategy for adaptation to climate change. Recent advances in overall development policy with a focus on climate change are listed in brief. Main principles declared fundamental in high level policy documents are also highlighted. Principles of sustainable development are further used to set up a framework for analysis of major issues raised by climate change in Latvia. Theoretical frameworks and analytical approaches, policy instruments, and normative criteria applicable for decision-making are proposed for each particular issue.

The third part includes detailed description of socio-economic consequences of climate change in Latvia, and characterizes the capacity of Latvian administrative and research institutions to provide reliable data for policy development.

The fourth part summarizes principles in the system of analytical approaches and decision-making criteria to be used in the policy cycle. Risk minimization and "polluter (user) pays" principles are chosen to be the most fundamental. Further information available on risks caused by climate change is provided, as well as costs and benefits arising from climate change impacts and policy response alternatives are considered.

In the final part, practical recommendations for the further development of adaptation to climate change policy are given.

Argumentation for Normative Principles and Criteria

As indicated in the United Nations (UN) Framework Convention on Climate Change (UNFCCC 1992),[1] Parties should take precautionary measures (according to sustainable development principles) to anticipate, prevent, or minimize the

[1]Adopted at the national level as "Law on the Framework Convention on Climate Change of the United Nations Organisation", by the national parliament of Latvia, Saeima, on 23 Feb 1995.

causes of climate change and mitigate its adverse effects. The Convention also specifies that the Parties should co-operate in preparing for adaptation to the impacts of climate change, develop appropriate and integrated plans for coastal zone management, water resources, and agricultural land, and for the protection and rehabilitation of areas affected by drought and floods. Establishment of funding, insurance, and transfer of technology are among the issues to be considered.

Similarly, impact assessment, formulated and determined nationally with a view to minimizing the potential adverse effects of adaptation projects on the economy, on public health, and on the quality of the environment, should be implemented to a feasible extent. At the same time, promotion of new innovative measures and development of technologies (including policy- and decision-making technologies), together with the adaptation measures already approved, are prescribed in the UN Decision 1/CP.10 regarding the Buenos Aires programme of work on adaptation and response processes (UNFCCC 2005).

Furthermore, as was stressed in the 2006 Nairobi UNFCCC conference, climate change is an issue directly related to the United Nations' Millennium Development Goals: starting from eradication of extreme poverty and hunger, ensuring environmental sustainability to the development of global partnerships for development (UNFCCC 2000). As said by the United Nation's Secretary-General: "We will have time to reach the Millennium Development Goals – worldwide and in most, or even all, individual countries – but only if we break with business-as-usual". The chair of the International Panel on Climate Change (IPCC), Rajendra K. Pachauri,[2] said on 25 March last year during a visit to the European Parliament: "We need policies to promote the development of new technologies or the employment of the existing ones. We [the IPCC] have clearly stated in our report that the technologies needed are already available or on the verge of being commercialized. These technologies will only be used if we have the right set of policies".[3]

But breaking with business-as-usual refers to the necessity for a radical new attitude (approach) to designing policy for such complicated and usually unstructured problems like climate change mitigation or adaptation to it; this new attitude requires a much more systemic approach if we want to find common points, borders, or parts – to take correct and, what is even more important, effective action.

One of the key conclusions from the EU project "Adaptation and Mitigation Strategies: Supporting European Climate Policy" (ADAM) stated: "Global climate policy beyond 2012 requires a strong, integrated governance architecture that involves both public and private actors and that provides a regulatory framework on both mitigation and adaptation. Highly fragmented global climate governance is likely to be more costly, less effective in terms of environmental goals, and less

[2]Dr. Rajendra K. Pachauri (born 1940) has been elected as Chairman of IPCC (Intergovernmental Panel on Climate Change) from 20 Apr 2002 onwards. He has been active in several international forums dealing with the subject of climate change and its policy dimensions.

[3]*Source*: http://www.europarl.europa.eu/news/public/story_page/064-24711-084-03-13-911-20080319STO24704-2008-24-03-2008/default_en.htm.

equitable regarding smaller countries, particularly in the global South" (Hulme et al. 2009). A conclusion on fragmented adaptation governance is also recognized in the European Union's White Paper on Adaptation: "Adaptation is already taking place but in a piecemeal manner" (Commission 2009, 2).

To ensure successful and systemic adaptation policy design, it is crucial to remember that the climate change issue is a part of sustainable development and, as already concluded in the report of the Bellagio project (International Institute for Sustainable Development 1997), regarding sustainable development practice, the entire process is normative. The same approach is required to solve such huge and problems like climate change risks and adaptation to them, and for that purpose all relevant principles and criteria in a full policy cycle need to be assessed.

The national/state level (as a basic area for adaptation policy design and governance) is where overall political responsibility is located in all the stages involved in elaborating new policy during a complete policy cycle. At the state level, government sets policy-planning documents, formulates national positions on European Union (EU) legislative acts in its drafting stage, fosters national legislation and regulations, many of which directly or indirectly affect climate change risks the country and sectors are facing, or creates the incentives (or disincentives) for exploring climate change adaptation opportunities and advantages. This is also the main level for the coordination process of sectoral policies and branches, including many cross-cutting responsibilities and functions (e.g. risk assessment and management, the "polluter (user) pays" principle, the security dimension, integrated assessment, welfare, etc.), as well as providing the overall policy guiding framework within which lower levels (sectoral, municipal, communities) operate. The state also manages international (bilateral, multilateral) relations with other countries, climate change cross-border aspects, and international financing and co-operational mechanisms, participating in multilateral environmental agreements such as the United Nations Framework Convention on Climate Change (UNFCCC), and its Kyoto protocol, where political consensus could be reached only through successful policy dialogues and trade-offs between policy options.

The strong argument for talking about normative principles and criteria is the evidence of risks and losses from climate-related natural hazards increasing year by year (US$100 billion per annum in the last decade alone[4]). Thereby, climate change-related risk insurance is one of the policy instruments, being a strong complementary aspect of a wider adaptation framework that can, and should, provide financial security against natural disasters, such as floods, droughts, heat waves, forest fires and fires in peat bogs, windstorms, intense cold, snowstorms, etc.

On the global level, the Bali Action Plan, adopted by the UNFCCC Parties in Bali, Indonesia, December 2007, in this context calls for the "consideration of risk sharing and transfer mechanisms, such as insurance" to address loss and damage. To that end, talking about the post-2012 adaptation regime, the potential role of risk-pooling and risk-transfer systems must be firmly established (Bali Action Plan 2007).

[4]*Source*: Munich Climate Insurance Initiative.

The second extremely important policy planning document in the global context is the Hyogo Framework for Action 2005–2015[5] – "Building the Resilience of Nations and Communities to Disasters" – considers, inter alia, the integration of risk considerations into sustainable development and the development of institutions, mechanisms, and capacities at all levels to systematically build resilience to hazards. The Hyogo Framework specifically identifies the need to "promote the integration of risk reduction associated with existing climate variability and future climate change into strategies for the reduction of disaster risk and adaptation to climate change". The implementation of the Hyogo Framework therefore provides a powerful tool to support adaptation, through building resilience and reducing vulnerability to climate-related hazards. The Hyogo Framework sets out strategies for reducing disaster risks through the five priorities for action we need (1) ensure that disaster risk reduction is a national and a local priority with a strong institutional basis for implementation, (2) identify, assess, and monitor disaster risks and enhance early warning, (3) use knowledge, innovation, and education to build a culture of safety and resilience at all levels, (4) reduce the underlying risk factors, and (5) strengthen disaster preparedness for effective response[6] (UN 2005).

The best practices at the international level (Mills 2007) in the field of climate change risk are the Arkwright Mutual Insurance Company, examining climate change and trends in flooding (Zeng and Kelly 1997), the Insurance Australia Group[7] together with the University of Oklahoma working on high-resolution climate modelling, and Willis (a leading broker) collaborating with researchers in the UK and Japan on next-generation climate modelling, with greater resolution to enable the evaluation of changing typhoon risks and associated insurance implications (McLeod 2007). Swiss Re (2006) and the Association of British Insurers (Association of British Insurers 2005) have also coupled climate models with insurance loss models. Swiss Re projected an average increase in losses of 16–68% from European winter storms (and significantly higher for some individual countries) between 1975 and 2085, excluding the associated effects of storm surge

[5]Agreed at the World Conference on Disaster Reduction in Jan 2005 in Kobe, Japan, by 168 governments and endorsed by the United Nations General Assembly, the Hyogo Framework for Action 2005–2015: Building the resilience of nations and communities to disasters, provides the foundation for the global implementation of disaster risk reduction. See: http://www.unisdr.org/eng/hfa/hfa.htm.

[6]Disaster Risk Reduction Strategies and Risk management Practices: Critical Elements for Adaptation to Climate change. Submission to the UNFCCC Ad Hoc Working Group on Long-Term Cooperative Action by the Informal Task Force on Climate Change of the Inter-Agency Standing Committee 1 and The International Strategy for Disaster Reduction. 11 Nov 2008. This paper has been prepared as a submission to the UNFCCC Parties on the risk-related matters identified in the Bali Action Plan (1/CP.13, paragraph 1. (c)). The paper provides further background with respect to the submission to the AWG-LCA on 29 September 2008 from the International Strategy for Disaster Reduction (ISDR) titled "Proposals for the AWG-LCA Chair's Assembly Document on Enhanced Action on Adaptation", and it includes specific information from the humanitarian perspective.

[7]http://www.iag.com.au/.

and flooding and socio-economic factors (inflation, insurance penetration, settlement patterns) that would further compound losses (Swiss Re 2006). Munich Re, which has the leading role in insurance of natural catastrophes and is the world's largest re-insurer, is incorporating the physical effects of climate change into hurricane models (wind and storm surge), and associated economic effects such as the surge in demand (and prices) for construction materials following the events (Hoeppe ND). With support from AIG and Lloyds of London, Harvard University and the Insurance Information Institute are collaborating to better integrate climate change factors into insurance loss models.

As far as the adaptation issue in the EU Green Paper on Adaptation is concerned – when the first political notice regarding the necessity of adaptation to climate change was put on the EU policy agenda on 29 June 2007, Latvia realized separate sectoral adaptation policies (e.g. flood risk prevention with technical solutions, risk management and insurance in agriculture, rural development, coastal zone management, etc.) as well as research on narrow or specific themes of climate change impacts, vulnerability, and adaptation possibilities. A coordinated process on the elaboration of adaptation policy in a systemic manner started in 2008 upon acceptance of the Report on Adaptation to Climate Change by the Latvian government.

This Report deals with climate change impacts and vulnerabilities in different sectors, gives an overview of relevant research work at international and national level, and the most important policy initiatives, both global and at EU level, related to adaptation. The main finding was identification of the set of risks caused by climate change. The Report also describes the situation in Latvia until the beginning of 2008, presenting what has already been done concerning adaptation, and outlines recommendations for future adaptation policies and measures to be taken. It also identifies the need to prepare a national strategy on adaptation with scenarios on development, to be done within 1 year after the delivery of the White Paper on Adaptation by European Commission, i.e. up to 1 Apr 2010 (Ministry of the Environment of the Republic of Latvia 2008).

Methodological Approach for Design of Adaptation to Climate Change Policy

Unfortunately, sometimes it seems that we are forgetting the concept of dematerialization, which is fundamental for sustainable development, and means the decoupling of economic or welfare development and consumption of natural resources and waste (also GHG emissions) production. It can be resolved only by qualitative progress or development and clarification of how weak or strong our development is according to sustainability (sometimes recognizable as eco-efficiency) principles and criteria.

Such sustainable development principles as (1) solidarity and cooperation (intra-generational equity, inter-generational equity, international equity), (2) dematerialization, (3) precaution, (4) sustainable resource use, (5) "polluter (user) pays" or full-cost recovery, (6) triple bottom line (for societal or human plus social capital,[8] nature capital, man-made or economic capital), and (7) diversity (diversification) should be taken as a basis for adaptation to climate change policy design and implementation with clear conclusions from certain scientific studies, appropriate legislative acts, policy planning documents, public awareness campaigns, technologies, etc.

The essence of these principles has been postulated in the Delhi Ministerial Declaration on Climate Change and Sustainable Development: climate change could endanger future wellbeing, ecosystems and economic progress in all regions; in order to respond to the challenges faced now and in the future, climate change and its adverse effects should be addressed while meeting the requirements of sustainable development. Parties have a right to and should promote sustainable development (UNFCCC 2002).

The European Union declared sustainable development as the fundamental objective (see EU Sustainable Development Strategy or SDS). The EU's integrated climate and energy policy, an integrated approach to the sustainable management of natural resources, the protection of biodiversity and ecosystem services, and sustainable production and consumption are listed among the drivers for achieving objectives under both this strategy and the Lisbon strategy (Presidency 2007).

In Latvia, a reasonably used and preserved natural environment is listed as one of the preconditions for safe and stable development in the "National Development Plan 2007–2013" (Ministry of Regional Development and Local Government of the Republic of Latvia 2006); however, one of the tasks is the promotion of the assessment, reduction and monitoring of natural – including climate change – and industrial risks. Political objectives for reducing the adverse effects of global climate change have been already specified in the "National Environmental Policy Plan 2004–2008" (Ministry of the Environment of the Republic of Latvia 2004). At present, work on the development of "Environmental Policy Guidelines", in which the necessity for the policy of adaptation to climate changes is included in a separate section, devoted to climate change, is finalized by the Ministry of the Environment.

Preparation for the national strategy for adaptation to climate change is in line with strategic goals set in the long-term development strategy for Latvia, "Sustainable Development Strategy Latvia – 2030", which at the moment is in drafting stage. Experts from the Ministry of the Environment were involved in the preparation of parts of the strategy devoted to natural capital. Concerning environmental issues, this strategy proposes several goals for Latvia (1) to become a leading country in the EU in the preservation, enlarging and sustainable use of natural capital; (2) to retain its

[8]For principles used to introduce notions of three, four, or five capitals see Part II of "A framework for sustainable capitalism" in Porritt (2007), pp 137–212).

leading position in EU regarding the utilization of renewable energy resources and fully evolve the potential of "green economics", and (3) to make the living and natural environment attractive for people, to promote development in the entire country, as well as to strengthen development of the country and the entire Baltic Sea region. The Strategy proposes several directions for priority actions. First, management of natural capital, which should include (1) natural capital approach, (2) the Green Budget Reform, (3) nature preservation plan, and (4) the establishment of a nature restoration fund. Second, development of market-based instruments through (1) assessment of value of nature capital for land, (2) introduction of auctions for ecosystem services, (3) introduction of fees on natural capital, and (4) introduction of the programme of "eco-gifts". Third, capitalization of nature's activities, which means (1) establishment of the Investment Fund for Green Economy, (2) creation of networks for knowledge transfer, (3) establishment of the "green innovation programme", and (4) development of the programme for "digitalization of nature". Fourth, activities to support sustainable lifestyles with (1) environmental education programmes, promoting change, (2) introduction of "ecological footprint accounts", and (3) creation of the database for national heritage. Fifth, through wide use of renewable energy resources and innovation, e.g. promotion of the use of wind and solar energy, measures to promote energy-efficiency, diversification of rural economy, and maintenance and promotion of the spatial identity.

The principle of sustainability, which requires "a qualitative environment, balanced economic development, rational utilization of natural, human and material resources, development and preservation of the natural and cultural heritage for the present and next generations", as well as the task "to create pre-conditions for ensuring environmental quality and rational utilization of the territory, and the prevention of industrial and environmental risks", as specified in the "Spatial Planning Law" (2002), among other basic principles of sustainable development (Ministry of the Environment of the Republic of Latvia 2008).

With respect to practical policy design, the authors wish to clarify the definition and essence of adaptation or what is the subject of policy design. Although numerous definitions and explanatory articles on adaptation to climate change *anatomy* exist in policy design literature (UNFCCC 1992; Smit et al. 2000, etc.), the authors agree with the point of view that we have to talk about the adaptation issue, which is a problem for us, people, society, mankind, and therefore we, as human beings, are responsible for solving it to ensure wellbeing for ourselves and also to maintain balance on planet Earth overall. Nature has no problems, therefore we have to address adaptation to climate change from the social dimension, important policy options, or a response strategy concerning climate change (Frankhauser 1996; Smith 1996).

For this reason, the authors see adaptation to climate change as an issue which requires a logical set of policies and measures or PAMs, designed in a systemic way and by taking into consideration normative principles and appropriate criteria in all stages of the policy cycle, and making decisions. At the same time, this well-structured process is expected to be coordinated by state government, which would allow for proper cost-effective and responsible management of developments

in society, consumption of natural resources, and use of technology at all levels (state, regional, municipality, enterprise, individual) in order to prevent natural disasters and threats, or to use all opportunities and advantages climate change is providing. In case of threat or real damage caused by climate change, the appropriate technical, financial, or other assistance to the population, particular species, or ecosystems should be given, thereby promoting the system's (society's, community's, dwelling's) preservation or minimizing unacceptable consequences or, again, to take advantage of climate change impacts.

Unfortunately, to date too many policy evaluations at basic political strategic levels (globally, nationally) have been applied in an ad hoc and unsystematic way due to (1) uncertain knowledge, (2) disagreement about normative elements (e.g. values, norms, or objectives), and (3) disagreement about cognitive elements (e.g. research or information) (Hisschemöller and Hoppe 2001). We can see it in international negotiations, trying to prepare new political agreements (e.g. on financial architecture on adaptation to climate change, new market-based policy instruments, intellectual property in technology transfer, etc.) in the post-Kyoto period. Thus, it is an obvious necessity to design adaptation to climate change policy and to ensure solutions according to the full policy cycle (assessing ex ante and ex post phases in it), and every decision made, descending from one policy cycle stage to another, should be based on taking a note of a spectrum of normative principles and appropriate criteria.

There are three components we should take into account for every decision we are talking about (1) criteria – the standards by which decision-makers evaluate alternatives (sometimes referred to as "interests", after Fisher and William 1983); (2) alternatives – specific courses of action or options, being considered as positions, and (3) cause and effect beliefs – cognitions linking specific alternatives to specific criteria (Decision-making models, 2007). Criteria for choosing policy instruments in the certain policy development cycle stage can be (1) causal – as answers to the basic question, for example, does the policy instrument address the underlying economic failure or not; (2) efficiency, e.g. economic efficiency criteria includes costs and benefits, public opinion, etc.; (3) equity; (4) macro-economic; and (5) legal – this criterion concentrates on the issue of subsidiarity, i.e. where policy is located most effectively (there are three main criteria upon which level of subsidiarity can be assessed: gains from cooperation, gains from harmonization, gains from sustainability). Having a clear vision on the policy cycle, the main actors, principles, transparent criteria etc. should help resolve the aforementioned difficulties dealing with this complex, unstructured problem.

Consequences of Climate Change Impacts in Latvia and Data Providers

Latvia's territory is 64,589 km^2, it has 2.3 million inhabitants, and a flat surface topography – 57% of Latvia's territory is below 100 m above sea level. The climate is mainly humid (mean precipitation ranges from 600 to 850 mm per year) and

comparatively cold – mean annual air temperature in Latvia is +5.8°C (in 2008 +7.6°C!). Latvia is rich in waters and forest – mean density of the river network is 588 m per km^2, but forests cover ~54% of territory (Klavins et al. 2007).

Coastal zones are sensitive to erosion – approximately 67% from the coastal line of Latvia (496 km long) is exposed to washing away during storms. During the last 70 years, Latvia has lost one thousand hectares in storms, where a 50–200 m wide area of the basic coast has been washed away (Eberhards and Lapinskis 2008).

Over the last century, the average air temperature has increased by 0.5°C in Latvia on the whole, and by 1°C in the capital, Riga. The process of global warming and related changes in atmospheric circulation have led to higher air temperatures and greater cloudiness, which have led to lower sunshine durability and greater precipitation (higher values are observed in the western part of Latvia). It is found that the variability of annual mean temperatures of the Baltic Sea region is about five times larger than the variability of global mean temperatures.

The Climate Change Vulnerability Index for Latvia is determined at 26.0–30.0 in an average score between 0 and 100. As defined in the Stern Review, "vulnerability to climate change can be classified as *exposure* to changes in the climate, *sensitivity* – the degree to which a system is affected by or responsive to climate stimuli, and *adaptive capacity* – the ability to prepare for, respond to and tackle the effects of climate change" (Stern 2007). This index reflects exposure more than vulnerability.[9]

Eastern Europe is highly vulnerable to flood risks. In many of the newer EU member states (Poland, Romania, Bulgaria, Slovakia, Lithuania), annualized flood risk has exceeded one per cent of GDP. In some events, national authorities have had severe fiscal problems in financing the recovery process (Hulme et al. 2009). Latvia is among those flood-prone countries, and it is as risky, regarding the great fiscal deficit and possibilities for realization of efficient adaptation policy actions.

In the last 20 years, the water discharge of rivers in central and eastern Latvia has increased by ~4% and in the western part of the country by ~6%. The ice-cover period has been decreasing – the reduction of the ice-cover period for the last 30 years is 2.8 down to 5.1 days every 10 years. The change in the river breakup towards earlier dates can explain the increase of winter runoff of rivers in Latvia (Klavins et al. 2007).

Spring and summer phases in Latvia have occurred on average 4 days earlier over the past 50 years; the most recent changes were observed for early spring phases (the most significant shift has happened in the last 15 years). The flowering phase has advanced by 1.6 days per decade for the bird cherry (*Padus racemosa*) and 0.9 days per decade for the linden (*Tilia cordata*). The autumn phases in Latvia are starting earlier by 2.8 days per decade in contrast to Europe, where autumn

[9]Choice of individual indicators included in the CC vulnerability index is determined by: (a) change in population affected by river floods, (b) population in areas below 5 m, (c) potential drought hazard, and (d) vulnerability of fisheries, agriculture and tourism to changes in temperature and precipitation. We have to note, for example, that economic benefits of climate change, ecological effects, or effects on health are not included in this indicator.

phases start later. The length of the growing season, determined by the vegetation of birch and maple species, has increased by 9.8 days (3.3 days per decade) for the birch (*Betula pendula*) and 18.5 days (6.2 days per decade) for the maple (*Acer platanoides*) (Grisule and Briede 2007).

The scale of the economic losses of climate change is well characterized by compensations for the damages caused by agro-climatic conditions in agriculture, which were 630,080 lats in 2000; compensations for damages caused by natural phenomena and accidents (in storm, flood, fire) to persons engaged in fishing in coastal and internal waters or fish farming were 19,101.24 lats in 2001; the total compensation for the damages caused by agro-climatic conditions was 221,908 lats in 2004, and 440,641.94 lats in 2005 (including compensation for animals which died from gnat bites – 131,091.50 lats, for covering of material losses caused by floods –309,550.44 lats).[10]

Due to unfavourable agro-climatic conditions in 2006, more substantial losses were inflicted to agricultural producers. In order to ensure the disbursement of compensations for the losses caused by drought in agriculture and forestry, the Cabinet granted additional financing of 25.8 million lats to the subsidy programme on the basis of the information notice "Emergency Situation in Agriculture", approved on 19 Sept 2006. The following support costs in relation to the losses caused by the drought were made in 2006 (1) financing of 18.81 million lats was disbursed in the field of crop farming, (2) 5.76 million lats in the field of agriculture, and (3) 0.48 million lats in forestry.[11]

Excessive drought and strong winds strongly increase the possibility of forest combustibility or the outbreak of fire, for example, the largest number of forest fires in the state – 1,929 (the total calculated loss from forest fires was 1.96 million lats) – was registered in 2006, one of the most critical years in protection against forest fire. Artificially restored forest plantations suffer due to extreme natural conditions – fire destroyed 564 ha of young forest stands in 2006[12]; the spring drought and summer heat of 2006 were the main reasons for the replanting of approximately 25% of plantations planted in that year.[13]

The storm of Jan 2005 affected not only Latvia but also all of northern Europe and caused great damage. According to the EU criteria defined in Council Regulation (EC) No. 2012/2002 of 11 Nov 2002 establishing the European Union Solidarity Fund[14] or ESF, the total losses inflicted to Latvia were assessed to be approximately €192 million (the ESF granted €9.487 million), to Estonia €48 million (the ESF granted €1.29 million), to Lithuania approximately €15 million (the ESF granted

[10]*Source*: Rural Support Service.

[11]Publication of the Ministry of Agriculture of the Republic of Latvia (2007a, b) "Agriculture and Fields of Latvia" (in Latvian).

[12]*Source*: State Forestry Service.

[13]*Source*: JSC "Latvia's State Forests".

[14]OJ C 283, 20.11.2002.

€0.379 million). Particularly large damage was inflicted in Sweden – their evaluation amounted to almost €2.3 billion (the ESF granted €81.725 million).

In the informative report "Damage Inflicted by the Storm According to the Public, Local Government and Private Sectors on 8–9 Jan 2005", developed by the Ministry of Finance and approved by the Cabinet of Ministers of Latvia, in 2005 total losses amounted to 154.2 million lats (Ministry of Finance of the Republic of Latvia 2005). The total damage inflicted by the storm, including the damage to the public sector, was indicated in this report. The costs for the liquidation of the consequences of the storm were itemized, and the resources for immediate restoration of infrastructure and facilities for energy, water supply and sewerage, telecommunication, transport, health care, and education were indicated. The financing necessary for the provision of shelter to residents who had suffered, provision of activities for the responsible rescue services, immediate restoration of the protective infrastructure, immediate rescue of cultural heritage, and immediate clean-up of the territories polluted by the natural disaster were clarified as well.

On 11 Apr 2007, the Cabinet adopted the "Information Notice on Granting Resources from the State Budget to Local Governments for Liquidation of Consequences of the Storm of 14 and 15 Jan 2007 at Schools and Kindergartens, as well as Local Government Objects, which are Necessary for Provision of Execution of Significant Functions of Municipalities", developed by the Ministry of Regional Development and Local Government. It is mentioned therein that documents which confirmed the damage that occurred to local governments in 69 objects of infrastructure for the total amount of 836,330 lats (315,316 lats was granted), were received from municipalities until 16 Mar 2007 (Ministry of Regional Development and Local Government 2007).

In order to reduce scientific uncertainties regarding the effects of climate change and to find specific solutions for adaptation policy, several important international projects have taken or are taking place in the Baltic region: the "Sea Level Change Affecting the Spatial Development in the Baltic Sea Region" project (SEAREG, 2002–2005; Baltic Sea Region INTERREG IIIB Programme, 2000–2006); "Project of the Baltic Sea Region" (2005–2007), in which Finland, Germany, Estonia, Lithuania, Poland, Sweden, and Latvia participated; "Developing Policies and Adaptation Strategies to Climate Change in the Baltic Sea Region" (ASTRA) – a follow-up to the INTERREG IIIB project; SEAREG (Sea Level Change Affecting the Spatial Development of the Baltic Sea Region); an international project "Climate Impact Research Co-ordination for a Larger Europe" (CIRCLE ERA-NET) within the Sixth Framework Programme for Research and Technological Development of the European Commission. The new one – "Climate Change: Impacts, Costs and Adaptation in the Baltic sea region" (BaltCICA, 2009–2012) is running now, involving Finland, Estonia, Lithuania, Germany, Denmark, Norway, Sweden, and Latvia. Sea level changes and coastal vulnerability for Latvia are modelled and calculated by the Potsdam Institute for Climate Impact Research within the ASTRA project, but monthly average temperature changes up to 2100 are calculated within the Swedish Regional Climate Modelling Programme (SWECLIM).

Latvia is participating as an observer in the EU project CIRCLE ERA-NET, in EPA IG on adaptation, as well as in the European Environment Information Observation Network (EIONET) regarding climate change vulnerability and adaptation. Latvia had also prepared information (submissions) on national adaptation policies and measures to the Nairobi Work Programme on socio-economic aspects of impacts, vulnerability assessments, and adaptive capacity (2007), and to the Nairobi Work Programme on impacts, vulnerability, and adaptation to climate change (2009).

The main scientific authorities engaged in scientific research matters of climate change impacts and consequences in Latvia are: the researchers of the Faculty of Geography and Earth Sciences of the University of Latvia (research on climate change impacts), the Faculty of Biology of the University of Latvia,[15] the Institute of Biology of the University of Latvia,[16] the Latvian State Forest Research Institute "Silava",[17] Physical Energetic Institute (research on renewable energy or RES resources), Institute of Solid State Physics (hydrogen technologies), Riga Technical Institute (climate change technologies), and Agricultural University of Latvia.

In close cooperation with scientists and other stakeholders the National Research Programme "Impact of Climate Change on the Water Environment of Latvia" (KALME, 2006–2009) takes place for assistance in the development of the adaptation policy. The general goal of this programme is to assess short-, medium-, and long-term impacts of climate change on the environment and ecosystems of the inner waters of Latvia and the Baltic Sea, and to create a scientific basis for adaptation of environmental and sectoral policies of Latvia to climate change. Specific goals are (1) to create several mutually non-controversial scenarios of the regime – determining parameters; (2) to assess possible climate change impacts on the quality of inland waters of Latvia, their availability, flood and drought risk, to facilitate adaptation of the drainage basin management and secure protection and sustainable use of water resources; and (3) forecast possible climate change impacts on the physical regime, coastal dynamics, biogeochemical regime, and ecosystems of the Baltic Sea, as well as to facilitate protection of marine environmental quality, biological diversity, and sustainable use of its resources and services.

There are many institutions and informative modes providing network systems for the production and distribution of climate information and monitoring, covering the entire territory of Latvia, including big cities, locations in coastal zone areas, and near river estuaries, e.g. Riga (722,485 inhabitants in 2007), Liepaja

[15]Examples of research projects: "Biological Diversity of Swamp Woods under the Impact of Climate Change" (2006) and "Changes in the Growing of Trees under the Impact of Climate and Environmental Changes and Connection Thereof with Indicators of Biological Diversity" (2007).

[16]Examples of research projects: "Variability of Global Climate and Actions for Reduction of Impact Thereof in Latvia" (2005) and "National Adaptation Strategy for the Management of the Risk Caused by Variability of Climate: Extreme Climatic Phenomena and Effects Thereof" (2006).

[17]An example of a research project: "Impact Assessment of Extreme Wind Velocity on the Stability of Forest Stand, Development of System for Support of Decision Making" (2006).

(85,477 inhabitants, 2007), Ventspils (43,544 inhabitants, 2007), Jurmala (55,408 inhabitants, 2007) or Daugavpils city (108,091 inhabitants, 2007),[18] lying on the banks of river Daugava.

Primary data on direct climate change impacts (air temperature, precipitation, changes in river discharge, ice regime, wind regime, etc.), as well on GHG emissions, is gathered and distributed by the Latvian Environmental, Geological and Meteorological Agency (LEGMA); data on public and environmental health by the Public Health Agency; data on forests, including CO_2 removals, by the scientific research institute "Silava", monitoring of geological processes of sea coast by the University of Latvia, Faculty of Geography and Earth Science; geographic information systems, or GIS, maps of the surface of the territory of the state in different scales for modelling floods and other risks by the Latvian Geospatial Information Agency.

Responsibility for solving problems of common financing and institutional responsibility in a well-structured mechanism and regarding political requirements is stated in "Environmental Protection Law" (2007) and in Regulations of the Cabinet of Ministers of Latvia "A Programme for Environmental Monitoring 2009–2012" (2009). The aim of the Monitoring Programme is to ensure complete data and information for assessment of trends and perspectives, development of new environmental policy measures, and evaluation of the effectiveness of already existing measures (in policy cycle ex post stage). A cooperation criterion is taken into account in the financing mechanism for this environmental monitoring: financing from the state budget (including Latvian Environmental Protection Fund (LEPF), which is a separate state financial programme) *plus* financing from the European Reconstruction and Development Fund, or ERDF. For example, in 2009 the applicable financing is estimated at 2809.5 thousand lats (inter alia, 302.3 thousand lats from LEPF, 223.6 thousand lats other financing from state budget, and 1,267.1 thousand lats from ERDF).[19] The State Forest Monitoring Programme is exploring the impact of climate changes to forest ecosystems, forest biodiversity status and changes as well as to forest soils. Responsible institutions for this Programme are the Ministry of Agriculture, State Forest Service, and Latvian State Forestry Research Institute, "Silava".

The State Regional Development Agency of Latvia, among other functions, performs assessments and analyses of regional developments, including the preparation and publishing of analytical materials. One of the most recent studies has been devoted to socio-economic development tendencies of Latvian towns, including ecological footprint in the context of land use and land use change as a CO_2 sink, and energy consumption.

[18] *Source*: Central Statistical Bureau of Latvia.

[19] Regulations of the Cabinet of Ministers of Latvia No. 187 (11 Mar 2009) "A Programme for Environmental Monitoring 2009–2012" include a wide spectrum of indicator-reflected climate change impacts (air temperature, precipitation, wind strength, etc.).

Latvia has good experience in developing sustainable development indicator systems and assessing economy-wide natural resource flow, showing accounting schemes for natural material flows (direct and indirect flows, material accumulation, recycling, emissions, domestic extraction, exports, etc., Latvian Environmental 2004), reflecting sustainable development dematerialization principles. For example, the Latvian report "Report on Environmental Indicators in Latvia 2002" (LEA 2002) was compiled according to the causal chain principle, i.e. by grouping the data into five (driving force – pressure – state – impact – response) logical phases. In fact, all three sustainable development capitals were identified there, and indicators were connected in a unified cause–response chain, showing (a) what causes the environmental problem, (b) why it originated, (c) what effect it caused, and (d) how or with what instruments (tools, options) can a solution be found. In such a way, normative principles and criteria in the full policy cycle were taken into consideration.

The next step, mainstreaming development, which is not only essential for the state, but also for adapting and elaborating new methodological approaches for sustainable development evaluation in Latvia, was "Latvian Sustainable Development Indicators Report 2003" in which eco-efficiency indicators, among others, were like a central axis measuring decoupling and this level of dematerialization (Latvian Environmental 2003).

The project "Detection of Building and Coastal Erosion in the Protective Zone of Coastal Dunes of the Baltic Sea and the Gulf of Riga, Recorded in Orthophoto Maps" implemented by the survey and spatial planning company "Metrum 2007" (with the support of the LEPF) will facilitate planning, detecting the main risk zones of erosion, as well as problematic territories of building. The data obtained will be usable in the development of spatial plans and monitoring of the implementation thereof; specifically in protective zones and property boundaries, in the management of specially protected nature territories, in the planning of port development, for further monitoring of building changes, etc. Significant support in the formation of risk zoning could be provided also by the Latvian Geospatial Information Agency in developing a digital model of the surface of the territory of the state for modelling floods and other risks.

Risk Minimization and "Polluter Pays" Principles as Basis for Decision Criteria

When designing systems of analytical approaches and decision-making criteria to be used in the policy cycle, risk minimization – i.e. assessment and management – and "polluter (user) pays" principles are chosen to be the fundamental basis. For that reason, risks were identified in the Report on Adaptation in Latvia before starting work on the elaboration of the adaptation policy system, and the costs and benefits arising from climate change impacts and policy response alternatives were also considered.

1. For the damages and losses caused by negative climate change impacts the state may be forced to pay large compensations both to individual sectors (particularly in agriculture and forestry) and to residents for the damage caused by natural phenomena to their property, health, or even life. From a socio-economic perspective, such risks may distort the natural competition in the market economy and pose serious threats to individual sectors of the national economy or sub-sectors thereof (agriculture, forestry, fisheries, sea port sector).

   At the same time, the potential benefits in the energy sector (in relation to the installed generating powers), which would be initiated by such direct manifestations of climate changes as the increase of air temperature, and the increase of the average flow rate of water upon the increase of rainfall, should also be noted. It would affect the reduction of the consumption of energy resources for heating (in the context of measures of energy efficiency); increasing hydropower potential in rivers would ensure a higher generation of electricity and reduce dependence on imported energy resources.
   Criteria for biofuels sustainability have been determined in the directive on renewable energy sources (which means these criteria have to be implemented): (a) GHG saving at minimum of 35%, (b) no raw material from undisturbed forests, biodiverse grassland, nature protection areas (unless taken harmlessly), (c) no conversion of wetlands and continuously forested areas for biofuel production, and (d) all EU biofuels must meet "cross compliance" environmental rules. For providing that through monitoring and reporting requirements every 2 years, EU member states (including Latvia) will have to make analyses of land-use changes, commodity price changes and availability of foodstuff, cost–benefit analyses of different biofuels and import policy, and analyses of sustainable development issues.
   Positive effects from climate change impacts are related also to temperature changes and effects thereof on the biosphere: the increase in temperature will firstly affect the reduction of frost probability and cause significant increase of the length of the growing season; however, mortality of people from cold will decrease in temperate degrees of latitude due to a milder climate during winter months (Klavins et al. 2008).
   In Latvia, the first endeavour to develop policy in the direction of climate change risk insurance was done in agriculture. The first step was an adoption by the Cabinet of Ministers of Latvia of the "Conception on Risk Management Policy in Agriculture" (2007) with appropriate Regulations, which foresees administration and supervision of agricultural risk funds, and deals with the compensations' mechanism for damage inflicted by natural factors to producers (Regulations 2008), thereby reducing the direct state payments and involving farmers themselves in risk insurance and covering of losses.

2. Climate change may affect the distribution of invasive species and the migration of agricultural crop pests. In the field of public and environmental health, such changes may call forth the occurrence of diseases that are not typical to the region, such as malaria, and it is possible that the frequency and spread of

diseases carried by ticks will increase. The number of cases of health disorders related to the impact of excessive summer heat waves may increase, also promoting an increase in morbidity with cardiovascular diseases, chronic respiratory diseases for especially sensitive groups (chronic patients, children, and elderly people who are mainly also the poorest group) and the number of cases of death related to these factors may increase.

A warmer climate will strengthen eutrophication processes of waters not only in the Baltic Sea, but also in inland waters (one of the most negative forms is the "blossoming" of *cyanobacteria*), deteriorating the recreation potential of such waters (at first in relation to bathing waters). It is very hazardous for Latvia's inland waters – one of the most sensitive ecosystems.

3. Climate change has many impacts on biological diversity, which is very rich in Latvia. For example, as confirmed by the information in *A Climatic Atlas of European Breeding Birds* regarding the predicted reduction in the diversity of birds in Latvia in the twenty-first century (Huntley et al. 2007), many special protected nature territories are exposed directly to sea storm overflowing and wash-off and erosion processes. The huge diversity of species and natural biotypes is characteristic for Baltic Sea coastal zones (dunes, bluffs, coastal pools, etc.). Approximately 90% of coastal zones are made up of natural biotypes. Sandy beaches (Latvia also has gravel and pebble beaches, high boulder beaches, etc.) are the most typical beaches in Latvia. Their length is approximately 240 km (of 496.5 km total sea coast in Latvia).

   The aim of the "Protection Zone Law" (1997) has hitherto been "to decrease or eliminate the effects of the anthropogenic negative impact on the objects for which the protection zones have been determined". At present, an intermediate solution for reducing the effects of climate change is being introduced in relation to the protective zone of the Baltic Sea and the Gulf of Riga.

4. More frequent natural disasters (storms, floods) may cause industrial accidents, for example, discharge of dangerous chemical substances, which may cause a threat to the health of residents. Prevention of the risks caused by climate change is particularly urgent in the River Daugava because the Daugava hydropower plant, or HPP, cascade (Plavinas HPP, Kegums HPP, and Riga HPP) is recognized as a Flood Risk Territory of National Significance. Thus, an important factor in flood risk prevention is proper monitoring of hydrotechnical structures, technical maintenance, as well as strict observation of exploitation mode.

   According to the Latvian "Law on Environmental Impact Assessment" (it also includes Strategic Environmental Impact Assessment procedure), all risks should be forecast and assessed. The incompleteness derives from the fact that these procedures (according to appropriate EU directives) do not require natural disaster (including climate change impact) assessment. The positive trend is that in several cases in Latvia (in development programmes and plans), these risks already have been assessed.

The "Latvian Rural Development National Strategy Plan for 2007–2013" (2006) foresees risk management, including risks caused by climate change (flooding, drought and killing frost).

The 15 million euro financing of the National Programme for Acquisition of the European Regional Development Fund in the activity Reduction of Environmental Risk for the financial planning period 2007–2013 of the European Union is provided for measures to improve the infrastructure and establish new infrastructure for the prevention of flooding in increased flood risk territories of national significance.

Regarding specific flood risk management, the approach in relation to the water environment is integrated, adopting Directive 2007/60/EC of the European Parliament and of the Council of 23 Oct 2007 on the assessment and management of flood risks, which determines that the flood component should be included in intended plans for the management of river basins provided for in Directive 2000/60/EC of the European Parliament and of the Council of 23 Oct 2000 establishing a framework for Community action in the field of water policy (requirements thereof at a national level are included in the Water Management Law). The new directive provides for the performance of the initial risk assessment of flood throughout the state territory, specifying on the basis thereof the territories endangered by flooding, and for the preparation of a flood risk management plan for each river basin region.

According to these new requirements, all flood risk territories and criteria for these territories at a national level are defined in the "National Flood Risk Assessment and Management Programme for 2008–2015" (2007, based on two research studies). The programme deals with risk management, establishment of priority risk territories, prevention – real time schedule and financing, flood risk impact assessment (ex post), elaboration of maps for risk territories, plans' elaboration for risk territories, including CC risk management incorporation into existing protection plans for individual territories, etc. The programme also foresees three scenarios (with appropriate criteria and financing) (1) floods with a low likelihood of occurring, (2) mid-sized floods (possible recurrence period: 100 years or more), and (3) floods with high likelihood of occurring.

5. Conflicts regarding non-renewable resources will intensify under the general impact of climate change, particularly in locations where access to such resources is related to state policy. Great changes in global land territory may take place in this century, thus possibly causing more disputes regarding land and sea borders and other rights to the territory.

   "Conception on Coastal Zones of Baltic Sea and Gulf of Riga Registration in Land Register in the name of the State" (2008) foresees coastal zone systemic legal protection and management, avoiding ineffective management in a piecemeal manner (zoning of territories according to risk level criteria).

6. As adaptation to climate change is closely related to development and society's welfare (inter alia, energy security and independence), adaptation should be based on security concepts and risk management related to climate change.

> These socio-economic problems, which may be caused by the migration of residents from climatically unfavourable world regions (which are usually the poorest regions) to regions where the manifestations of climate change will not be so sudden or unfavourable, may arise.

The "National Security Concept" is a policy-planning document elaborated on the basis of the analysis of danger to the state, which determines the basic strategic principles, priorities, and measures for the prevention of danger (including climate change risks) to the state. Besides other threats (e.g. military), the National Security Concept predicts responses to react to environmental risks, including those caused by climate change, and asks for appropriate policy and elaboration of tools. The goal of the Concept is to take into account not only risks cause by anthropogenic actions, but also (at the same level) natural disasters, and predict those risks and adapt to them. National Civil Protection is a well-functioning sub-system, which aims to include measures and responsible institutions, and to provide preventive, readiness, and response measures intended for states of emergency, and measures for the elimination of the consequences of such situations, and determines the actions of the civil protection system also in the case of damage and risks caused by climate change (Ministry of Defence of the Republic of Latvia 2007).

Natural disasters, according to the risk level criteria and likelihood of damage criteria and actions, as well as the functions of institutions involved in the management of such disasters, are most completely described and defined in the "Civil Protection Law" (2006) and the "National Civil Protection Plan" (2007). All cities in Latvia have their own civil protection plans, where natural disasters and actions, as well as the functions of institutions concerning climate change risks and their management are defined. Pursuant to the requirements of the "Law on State Material Reserves" (2007), there is a duty to form and store state material reserves within the framework of the system of civil protection in order to use them in case of national threat.[20] It is important that the planning of material reserves is ensured by ministries (involving institutions subordinate thereto), local government institutions, and merchants.

The "polluter (user) pays" principle (or "full cost recovery" principle) at the national level is transposed into the "Law on Pollution", which determines how to prevent or reduce harm caused to human health, property, or to the environment caused by pollution. This law lays down conditions for greenhouse gas emissions, taking into account cost-effectiveness, and ensuring participation in the European Union emissions quota trading system. The overall conditions of the EU ETS[21] have been incorporated into the law, particularly the rights and responsibilities of

[20]State material reserves are to be understood as the aggregate of material and financial resources formed in accordance with the procedures specified in this Law, which is used by the institutions involved in the management of disasters when the resources at their disposal are insufficient for the implementation of measures.

[21]Conditions of the EU ETS are described in Directive 2004/101/EC of the European Parliament and Council of 27 Oct 2004 amending Directive 2003/87/EC establishing a scheme for greenhouse gas emission allowance trading within the Community, in respect of the Kyoto Protocol's project mechanisms.

state authorities and operators, the issuing of GHG emissions permits, the preparation of annual reports, procedures for the preparation and approval of a national allocation plan, the principles of allowance allocation, conditions for the creation and maintenance of a register of greenhouse gas emission units, operations with allowances, as well as conditions for the creation of an installations pool. The law lists those polluting activities for which GHG emissions permits are necessary, and thus are obliged to participate in the EU Emissions Trading Scheme. The law also prescribes the procedure for community involvement in decision-making on allowance allocation and the issuing of GHG emissions permits.

A new financial mechanism, also based on the "polluter pays" principle, has been developed in Latvia with regard to flexible mechanisms under Article 17 of the Kyoto Protocol. The Cabinet of Ministers made a decision on 12 Apr 2006 on participation in International Emissions Trading (IET) under Article 17 of the Kyoto Protocol. It gave the possibility to earmark 40 million AAUs to be potentially available during the first commitment period 2008–2012. A mandate to the Ministry of the Environment to design a legal institutional system of IET was given in November 2007. A Green Investment Options study completed the Financial Implementation of the Kyoto Protocol by Latvia. The "Law on Latvia's Participation in the Kyoto Protocol Flexible Mechanisms" (2007) foresees development of Climate Change Financial Instruments and strictly defines that every AAU sold will be used for *greening* purposes, including adaptation policy and measures.

The Latvian government is responsible for ensuring that all revenues are being earmarked for "greening" purposes, which means: (a) climate change mitigation and adaptation measures, (b) promotion of low carbon economic development by the application of innovative environmental technologies, (c) increasing renewable energy use and improving energy efficiency, (d) capacity building for climate change policy design and implementation.

Latvia is in the position to be a fast track provider of *greened* AAUs with low risk and low transaction costs. The market position of Latvia could be characterized by such comparative strengths as: low risk of non-delivery of AAUs; robust surplus estimates, advanced in compliance with Kyoto eligibility criteria; low reputational risk; solid legal background and strong political commitment to efficient, transparent, and accountable Green Investment Scheme; efficient institutions of the public and private sector; and terms tailored to buyer expectations. Comparative weaknesses of Latvia must also be specified: the relatively small size of tradeable headroom, and limited opportunities for greening with direct reductions of GHGs (Latvian Green Investment Scheme may need to include the relatively high share of the greening measures that do not generate immediate and easily measurable reductions in greenhouse gases[22]).

[22]ECSSD Sustainable Development Department and Carbon Finance Unit (2007), "Latvia's Participation in International Emissions Trading", Options Study, p. 136.

Key elements of the "Law on Latvia's Participation in the Kyoto Protocol Flexible Mechanisms" are postulated as (1) ownership of AAUs; (2) authorization of the Cabinet of Ministers to make decisions on each sale of AAUs, including the price and specific conditions; (3) authorization of the Ministry of Environment and Ministry of Finance to prepare and sign the sale of AAUs; (4) principles for using the revenues from the sale of AAUs, including a clear provision stating that all income from the sale of AAUs shall be earmarked for "greening" projects; (5) special budgetary arrangement defining that money from the sale of AAUs is transferred to a special account in the State Treasury, disbursements being organized under the budget programme climate change financial instrument from a special account in the State Treasury, while in the annual budget, the financing for the climate change financial instrument is ensured in the amount of received and unused proceeds from AAU sales in previous years; (6) principles for environmental and financial monitoring, verification, and reporting.

Latvia proposes a programmatic model for the Green Investment Scheme in which most programmes currently consist of a large number of small projects concerning energy-efficiency increasing in public buildings. Therefore, Latvia would propose to buyers "wholesale" greening programmes backed by a credible and accountable national mechanism to "retail" AAU revenues to multiple project owners. Latvia can offer a robust Green Investment Scheme implemented by competent national institutions that require only minor and targeted institutional strengthening.

The dematerialization principle of sustainable development underlies the Natural Resources Tax (NRT) (in our specific case – carbon tax as a component of the NRT system), which aims to reduce ineffective use of natural resources and pollution of the environment, reduce manufacturing and sale of environment-polluting substances (including GHGs), at the same time as promoting the implementation of new and improved technology with less pollution load, to increase energy efficiency and the share of renewable and local energy sources (wood, straw, and peat), thus reducing air pollution. The "Law on Natural Resource Tax" defines (from 1 July 2005) that a fee of 0.1 lats for each emitted tonne of CO_2 shall be paid by all combustion installations, except those using peat or renewable energy sources and those that are involved in the EU ETS. CO_2 tax increased to 0.3 lats per tonne of CO_2 after 1 July 2008. At any rate, this tax rate is low and extremely ineffective, and should be revised.

In Latvia, excise tax, besides other product categories, is applied to oil products that are imported, exported, produced, processed, stored, sold, received, or sent. A feed-in tariff support has been provided for electricity production from renewable energy resources (energy from small HPPs, biogas production, and wind power). However, the conditions for receiving the support have changed very often and are also not in correspondence with sustainable development criteria.

Recommendations

The attitude devoted and methodological approach applied to policy design for climate change adaptation should be perceived as of equal importance as the policy for mitigation of climate change. It is not an issue to be viewed separately, but should be solved as an integral part of sustainable development according to all principles and criteria on which sustainable development is based. It should thus be included in policy planning documents and sectoral policies with innovative approaches to the formulation and implementation of such policies, involving the most different partners at national and global level, as well as at the level of the European Union.

The national state level is the basic one on which the issue of adaptation to climate change (e.g. establishment of funding, insurance, and transfer of technology) should be designed in a full policy cycle and in all decision-making with particular criteria.

As risk minimization and "polluter (user) pays" principles are among the most important principles serving as a basis for decision-making criteria of sustainable development, in order to ensure preventive reduction of the potential risks to the business and national economy at large and to adapt rational economic activities, it must be a requirement that the private sector also develops measures for the prevention or reduction of such risks in cooperation with specialists of state administrative institutions, local governments, and foreign specialists, adapting technologies and planning the potential risks related to climate change. Although such management of risks will initially require certain investments, it will allow a reduction of the damages inflicted to undertakings or the national economy, and welfare overall, in the long term. It is intended to develop the potential forms of cooperation and development in the work groups referred to in the Protocol decision. Much attention should be paid to educating and informing the public about climate change, threats caused thereby, as well as the readiness to act in a situation of disaster or crises.

The regional level and level of local governments should be emphasized in relation to adaptation to climate change because the most accurate information regarding local nature and the living conditions of residents, as well as regarding conditions hindering or promoting environmental changes is available at these levels, and so an easier and more detailed assessment of the consequences caused by climate change and the foreseeable consequences is possible. This, in turn, gives an opportunity to develop measures for local-scale and spatial plans, which would ensure adaptation of the particular territories to climate change, as well as preparation for risks caused by climate change expected in the future. Spatial planning (including spatial plans of local governments), which determines the establishment of population structure, has a significant role, so it is essential to take into account the foreseeable effects and the potential risks of climate change to infrastructure and built-up areas in the process of spatial planning.

Exploration and management of the risks related to climate change, concurrently establishing or improving the necessary databases, an adequate monitoring system, regularly renewing maps of risk objects, and assessing the socio-economic effects from the point of view of a cost–benefit analysis would facilitate the process of identification and evaluation (including financial) of risks, improve the establishment of a system of different forecast and development models, including such systems which are related to the assessment of effects of climate change on different natural ecosystems and biological diversity, human health, and welfare overall.

It is important that the measures implemented for the reduction of the impacts of climate change (e.g. flood control, changes in agriculture or output of energy resources) at the same time would not harm ecosystems and biological diversity. It should be taken into account that natural biotopes (particularly forests and bogs) serve as carbon dioxide sinks. If such biotopes are significantly disturbed (even if it is done for the purpose of mitigation of climate change), the total benefit may not counterbalance the loss of the biotope as a carbon dioxide sink. The usefulness of biofuel and the impact of its production on ecosystems should be weighed with particular attention. It is necessary to organize scientific research and monitoring in order to trace the changes of biological diversity caused by climate change.

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