ERC/08/5-Sup.1

May 2008

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منظمة الأغذية والزراعة للأمم المتحدة | 联合国粮食及农业组织 | Food and Agriculture Organization of the United Nations | Organisation des Nations Unies pour l'alimentation et l'agriculture | Продовольственная и сельскохозяйственная организация Объединенных Наций | Organización de las Naciones Unidas para la Agricultura y la Alimentación

TWENTY-SIXTH FAO REGIONAL CONFERENCE FOR EUROPE

Innsbruck, Austria, 26-27 June 2008

Agenda Item 10

FAO AND ADAPTATION TO CLIMATE CHANGE IN THE EUROPEAN REGION OPTIONS FOR FAO'S ROLE AND NOTES ON METHODOLOGY

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I. OPTIONS FOR FAO'S ROLE WITH REGARD TO ACTIVITIES RELATED TO CLIMATE CHANGE AND AGRICULTURE ADAPTATION IN THE EUROPEAN REGION

1. FAO, through its multidisciplinary expertise in agriculture, forestry and fisheries, aims at facilitating an integrated approach to climate change adaptation by farmers and policymakers. Adaptation measures and options where FAO has a comparative advantage include rural areas and household livelihoods; national policies in agriculture, forestry and fisheries, and national and regional assessments for food security.

2. FAO conducts a broad range of activities related to climate change adaptation. Focus is placed on the most affected regions, which are the economically less developed tropical and subtropical countries of Africa, Asia and Latin America. While the impact on European agriculture, forestry and fishery is potentially significant; the developed economies in this region may be better prepared to cope with climate change challenges. Some of FAO's principal activities include the following:

- FAO and its national and international partners organize regional workshops on climate change and adaptation needs and foster regional networks and cooperation on adaptation;
- FAO helps to heighten awareness about climate change and adaptation through technical assistance and funding via national programmes in agriculture, fisheries and forestry;
- FAO TCP projects in the region are specifically geared towards identification and development of adaptation mechanisms, and
- FAO serves as a broker in the identification and formulation of technical assistance and investment projects to mitigate climate change impact and attract investors to the region.

3. The FAO Interdepartmental Working Group on Climate Change has generated technical outputs in the following areas:

- Assessment of the potential and means for incorporating poverty alleviation into climate change mitigation strategies;
- Assistance in the preparation of IPCC studies and good practice guidelines, and provision of technical input to expert meetings organized by the IPCC and UNFCCC;
- Methodologies to promote the productive use of renewable energy;
- Observations of terrestrial carbon stocks and fluxes in the agriculture and rural sectors; methodologies and training with regard to the application of the Clean Development Mechanism in agriculture and forestry, including collaboration with the United Nations Environment Programme (UNEP) and The World Conservation Union (IUCN); preparation and diffusion of information regarding FAO's activities and approaches to climate change in agriculture, forestry and fisheries;
- Assessment of non-carbon dioxide greenhouse gas emissions and methodologies and models on carbon sequestration in soils, crops, grasslands and forest areas, and
- Harmonization of forest-related definitions for the use of different stakeholders.

4. Some areas for FAO action in the context of international negotiations can be highlighted:

- Promotion of agriculture as a player in the reduction of atmospheric greenhouse gases and promotion of practices that reduce greenhouse gas emissions or sequester carbon, while contributing to sustainable development;
- Increase the resilience of production systems against vagaries of the current climate and the threats of climate change, and improve adaptation capacities through conservation agriculture, afforestation, sustainable management and monitoring of forests and rangelands, soil storage of carbon, improved fertilizer use and ruminant digestion as well as with non-structural measures such as crop insurance and the careful promotion of bioenergy as a substitute for fossil fuels in climatically suitable areas;
- improved use of tools to assess the impact of atmospheric conditions on crops (forecasting), the use of weather and climate forecasts in farm-level decision-making, and the development of techniques, which optimize the use of climate resources;
- developing policies, legislation and activities in natural resource management that can lead to sustainable livelihood, mitigation and adaptations to climate change.

A. Adaptive Capacity and Adaptation Strategies in Agriculture (ERC/08/5 paras 25-32 refer)

5. Adaptation refers to adjustments in natural or human systems in response to actual or expected climate change, which moderates harm or exploits beneficial opportunities. Adaptive capacity reflects the potential to implement planned adaptation measures and is, therefore, related to deliberate human attempts to adapt to or cope with change (Reilly and Schimmelpfennig 2000). ‘Autonomous adaptation’ in contrast, does not constitute a conscious response (e.g. spontaneous ecological changes). However, in practice, it is difficult to distinguish between the two. For example, more heat resistant cultivars can be the result of autonomous technological development, but also of crop breeding programmes specifically developed to adapt to climate change. The concept of adaptive capacity was introduced in the IPCC Third Assessment Report (IPCC, 2001). Figure 5 provides a conceptual overview of components and determinants of adaptive capacity.

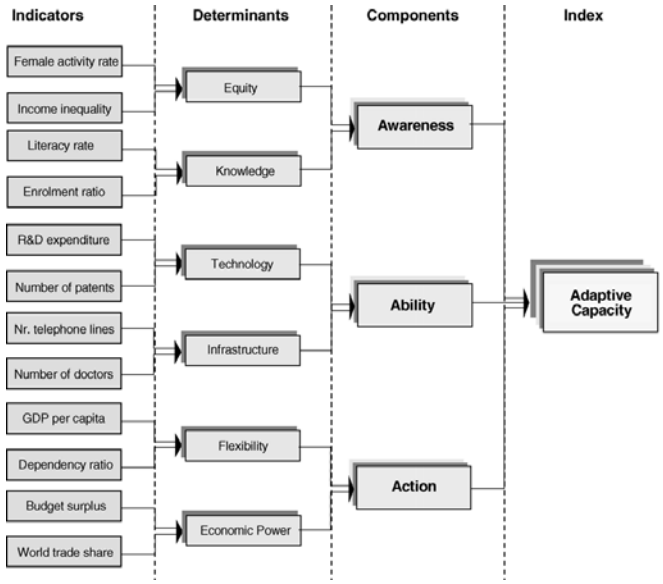

Figure 1. Conceptual framework of the components and determinants of adaptive capacity (Metzger et al. 2006).

6. Farmers have always adapted to prevailing, varying and changing conditions, and therefore adaptation is not new to the agricultural sector. However, climate change projections for the coming century suggest that the agricultural sector will face such challenging conditions that additional adaptation efforts will be required. In order to ensure food security and reduce the vulnerability of farmers and rural economies it is important to increase the resilience of farming systems and make them more robust to changes.

7. Future farm management depends largely on the present management tradition and on supporting government policies. There is a considerable variation in governance, socio-economic and agro-environmental conditions and farm types both within as well as between the three sub-regions. Efficient adaptation strategies will depend on this context and the exposure to climate change and climate variability. Decreased water availability is an issue in all regions, and adaptation measures such as the development of drought-resistant crop varieties seems appropriate. Here, national and international actors, e.g. governments and crop breeding companies play the key role. Adaptation strategies cannot be generalized across the sub-regions and even within the sub-regions consideration must be given to the local context.

8. Projections regarding technological development are highly uncertain. Ewert et al. (2005) analysed technologically induced productivity increases since 1960s to determine a plausible potential contribution of technology to productivity. However, the sub-regions in question have all experienced significant social and political unrest in the last decades. Such instability, if it would reoccur in the future, will certainly affect technology transfer. In addition, technological development necessitates supportive economic conditions, which may not be present in parts of some sub-regions.

9. Finally, it is important to note that broad scale modelling approaches to assess potential climate change impacts largely disregard farm management, which will affect the efficiency of future adaptation strategies (Reidsma 2007). Other important factors that are commonly not taken into consideration include extreme weather events (e.g. droughts, extreme rainfall), which are likely to occur more frequently in the future (IPCC 2007a), and increased stress from pests and diseases. It is important that these issues should be considered when addressing adaptation strategies.

(i) Methods and resources to improve impact assessment

10. The priorities and resources required to improve climate change assessment may be grouped as follows:

1. Raise awareness in the agricultural sector and government
2. Discuss the issue with stakeholders across groups and institutions
3. Adopt a local approach
4. Devise regional scenarios
5. Improve baseline data and develop a meaningful aggregation framework
6. Ensure continued investment in scientific methods

11. *Raise awareness*. An initial impact assessment, based on simple methods and existing data could be carried out. For example, studies of shifts in relevant agro-ecological zones could be undertaken using standard techniques and available datasets (cf Fischer et al. 2005; Metzger et al. 2008;). If these assessments are conducted using a set of different GCMs, then common properties can be detected (e.g. precipitation increase in winter and droughts in the summer). Although such an assessment will not provide enough detail for designing specific adaptation strategies, it will help raise awareness among the agricultural sectors and other relevant stakeholders.

12. *Ensure discussion with stakeholders at all levels*. It is important to discuss climate change impact assessments with relevant stakeholders at different levels. Not only should farmers receive information in order to adjust their management strategies, they should also be involved in identifying efficient adaptation strategies. Farmers may not always be interested in the best-practice and often have experience with effects at farm level. Furthermore, regional and national government should be aware of the consequences climate change could have for the economy and for food security.

13. *Adopt a local approach*. Impacts of climate change depend to a great extent on farm management and adaptation. Therefore, assessing and identifying adaptation measures needs to be tailored to the specific context of local governance, socio-economic conditions, farm types, etc. In order to identify and test strategies it will be important to consult farmers, investigate current farming practices and test adaptation strategies in a variety of situations. When such case studies are chosen carefully, they can provide insights for similar regions elsewhere.

14. *Devise regional scenarios*. Alternative future scenarios should be explored from a regional context. Global scenarios are available, but these cannot capture the important regional conditions and changes. Some of the sub-regions are still undergoing rapid social and economic transformation. At the very least they would need to be interpreted for regional context, similar to the approach by Rounsevell et al. (2006) for the European Union. Involvement of local farmers and other stakeholders in the analysis would improve their understanding of the issue and their willingness to use the local scenarios (Patt et al., 2007). Such scenarios should incorporate projections for demand for agricultural products, technological development, dependence on food aid, investment in infrastructure, etc. The resulting scenarios, combined with regional insight into climate change, would allow for targeting adaptation strategies.

15. *Improve baseline data and develop an aggregation framework*. It is only possible to assess the impacts on the agricultural sector and on food security when sufficient baseline data is available, i.e. data on the types of agricultural activities, types of farms, their location, their productivity and their economic importance. This calls for investment in constructing a consistent dataset based on existing statistics and complementary surveys, preferably at a municipal or provincial level. In order to facilitate data collection and modelling and inference of adaptation strategies, it is recommended to construct an aggregation framework of regions and farms with

similar characteristics. For example, the EU SEAMLESS project has constructed an agri-environmental typology (Hazeu et al., 2006), which can be linked to a farm typology. While such classifications lose some of the local detail, they place local observations (e.g. survey data or results from adaptation experiments) in a wider context and can thus help in synthesizing the results.

16. *Continued investment in scientific methods*. Farmers continuously adapt to changes, which affects the current situation as well as future impacts. The separation of potential impacts and adaptive capacity is theoretically a useful concept, but cannot be quantified for practical situations. Therefore, adaptation should no longer be seen as a last step in a vulnerability assessment, but as an integral part of the models used to simulate crop yields, farmers' income and other indicators related to agricultural performance (Reidsma, 2007).

B. Options for FAO's role in supporting adaptation to climate change in the region - Forestry

17.

- The current effort for reducing emissions from deforestation and degradation in developing countries also includes the options of offering incentives to increasing carbon stocks in the existing forests through carbon accrual by forest increment, or deliberate carbon accumulation through forest management. Countries in the region stand to gain little from incentives for reducing deforestation, but could benefit from adaptive actions that increase carbon stocks in their forests. Countries of the region could join forces at the negotiating table under the UNFCCC with FAO technical assistance;
- FAO could follow the United Nations call for its agencies to become carbon neutral by offsetting some of its own emissions through forestry projects in the region;
- FAO through its programme "Support for National Forest Assessments" assists countries in the region to develop and implement efficient forest monitoring and inventory systems for management planning and monitoring climate change impacts and vulnerability. Such a system is also a prerequisite for simplified forestry Coordinated Resource Management (CRM) and projects, and
- FAO helps create forestry-specific tools for assessing impacts of, and vulnerability and adaptation to, climate change and facilitates their application in the region.

18. With respect to forestry, FAO is closely involved with the UNFCCC's efforts to reduce emissions from deforestation in developing countries. While this might be seen as primarily aimed at mitigating climate change, it also has the adaptive component of preserving species richness and sustaining the continuity of forest ecosystems and their resilience. It is envisaged that adverse climate change impacts will contribute to the destruction of forests and thereby promote the emission of greenhouse gases, which in turn will enhance global warming. A further list of reports and publications is provided in Section III of this Annex.

C. Options for FAO's role in supporting adaptation to climate change in the region – Fisheries and Aquaculture

19.

- FAO will continue to support the development and practice of resilient and adaptive fishery management systems and fisheries as part of the implementation of the FAO Code of Conduct for Responsible Fisheries and ecosystem approaches to fisheries. The impact of long-term trends in climate change, in particular with relation to global warming, is less well understood in fisheries but the topic is beginning to receive attention. FAO is monitoring and participating in this work and has developed expertise and experience in the rapid appraisal of the impacts of disasters on local fishing communities and aquatic ecosystems, and with regard to the immediate and longer-term remedial action required. Long-term climate change has important feedback loops to

global ocean circulation patterns, sea level rise and changes in ocean salinity that all affect the biological properties and distribution of species, and

- FAO is giving priority to an Ecosystem Approach to Fisheries which necessitates addressing impacts of the wider environment in order to manage fishery resources and the ecosystems on which they depend. The Organization monitors developments in these areas by participating in the Scientific Steering Committee of the Global Ocean Ecosystem Dynamics (GLOBEC) programme of the International Geosphere-Biosphere Programme (IGBP). Interaction with these structures, among others, could lead to better science-based guidance to countries.

II. SELECTED RESEARCH AND NOTES ON METHODOLOGY

A. Estimates of the Effect of Climate Change on GDP and Food Security (ERC/08/5 paras 22-24 refer)

20. The most comprehensive information on the effect of climate change on agricultural GDP, which covers nine regions of the world, is provided by Tol (2002), drawing on previous studies between 1992 and 1995, that estimate the impact of climate change on gross agricultural product on a regional basis (these studies include: Kane et al (1992), Tsigas et al., (1996), Darwin et al., (1995), Reilly et al., (1995) and Fischer et al., (1993)). The results of these five studies are manipulated so that they conform to similar regions and are scaled to a common global mean temperature change (+2.5^{o}C). All cases include CO_2-fertilization effects. The results are presented in Table 1 of Tol (2002, p. 51). The five study results are then averaged and a standard deviation is calculated for two scenarios: (i) without adaptation, and (ii) with adaptation. This is presented as Table II in Tol (2002, p. 53) and is the table reproduced in the base FAO (2007) paper. Tol (2002) remains the best source for this type of information despite the fact that it is based on early 1990s data.

21. A study by Fischer et al. (2005) provides both regional and global results although the study focuses more on sub-Saharan Africa and does not specifically examine the western or eastern European regions. Changes in land area, cultivated land, and food security are given by region (the regions are different from those used by Tol (2002)). Global cereal production is estimated to increase from 1.8 billion metric tonnes to between 3.7 and 4.8 billion metric tonnes in 2080 and would be sufficient to feed the projected 9 billion population. Agricultural price changes are projected to be modest and range between 2% and 20% in the short to medium term. Impacts from climate change on global agricultural GDP up to 2080 are also projected to be moderate and range between -1.5% to +2.6%. The results indicate that the comparative advantage of producing cereals shifts towards developed countries and that the net imports of developing countries increase by 25% (to between 90 and 110 million tonnes). In terms of food security, the model estimates that by 2080, 768 million people would be undernourished – about the same number as in 1999 (776 million as estimated by FAO (2003))[1]

B. World Bank Studies and Incorporation of Environmental Concerns into World Bank and FAO Projects (ERC/08/5 paras 22-24 refer)

22. International Financial Institutions (IFIs) and specialized United Nations agencies such as FAO incorporate environmental concerns into project design and formulation. The World Bank initiated several country studies, mainly in Africa and Latin America, on measuring the economic impact of climate change on agriculture (Deressa (2007); Molua and Lambi (2007)). These studies examine the impact of climate change on crop farming using a cross-section approach to measure the relationship between climate and net revenue from crops based on farm-level survey data. Various climate scenarios were examined to identify how agriculture responds. However,

[1] See also the Overseas Development Institute (ODI) paper by Ludi et al., (2007) which is based on Fischer et al., (2005) and provides sections on Policy Implications and Policy Recommendations.

the World Bank studies do not take into consideration the carbon fertilization effect nor is farmer adaptation considered (i.e. the role of technological and policy change).

23. Studies of this nature for the developing countries in the FAO European and Central Asian region could provide a valuable input into climate change-induced and impact mitigation policy. The studies could be based on various available modeling methods but would include impacts from policy changes, farmer adaptation and carbon fertilization crop-responses. These studies would assess the impact of different farmer adaptations and government policies on both climate change and other foreseen changes occurring in agriculture and rural development. This would then lead to specific country policy recommendations. In turn recommendations would be formulated in terms of specific private and public support to research and development, extension and agricultural services, market development, and rural infrastructure. Further proposals could be made for support for safety net and social protection programmes. Such studies would also provide good background information for the FAO National Medium-Term Priority Frameworks prioritization process.

24. In the FAO Investment Centre's project preparation work through International Financial Institutions (IFIs), most notably with the World Bank and the International Fund for Agricultural Development (IFAD), close attention is given to environmental issues when designing projects. Environmental assessment is one of the "Safe Guards" of the World Bank and the recipient country must undertake an environmental impact assessment of the project which is usually done by outside consultants. IFAD also requires an "Environmental Scoping Note" for projects that have environmental concerns and also examines the impact of a proposed project on the environment. Both the Safe Guards and the Scoping Note provide suggestions to the project preparation team on changes to the project that conform with good practice environmental standards. In some cases, projects are not allowed to proceed unless the Safe Guards and the Scoping Note objections are dealt with. While the environmental evaluation process may provide suggestions for project preparation that fall within the realm of "assisting adaptation to climate change", this is not the expressed purpose of either the World Bank Safe Guards or the IFAD Scoping Note. Supporting adaptation to climate change is undertaken in projects that have this as part of their specific objective.

C. General Circulation Models (GCMs) (ERC/08/5 paras 11-13 refer)

25. The GCMs are computer models, developed by climate scientists, that calculate future climate based on CO_2 concentrations and a numeric representation of the climate system. There are several research groups around the world that have developed GCMs, following analogous, but slightly different approaches. There is considerable spatial and seasonal variation in the projected changes in temperature and precipitation. In addition, there is disagreement between the GCMs in relation to projected regional climate patterns and the magnitude of change (Ruosteenoja et al. 2003). Nevertheless, there is general agreement among the models' outputs. The Climate Research Unit of the University of East Anglia has constructed a consistent dataset that includes climate scenarios for four different GCMs at a 0.5° spatial resolution. The Hadley Centre Coupled Model version 3 is a coupled atmosphere-ocean general circulation model developed at the Hadley Centre in the United Kingdom. It was used in the IPCC Third Assessment Report.

D. Estimates of the Effect of Climate Change on Marine Fisheries: West Greenland Cod and Mediterranean Deep-Sea Shrimp (ERC/08/5 paras 44-50 refer)

26. The dramatic influence of rising and falling sea temperatures on the geographic distribution of fish populations has been well documented in relation to the cod stocks of West Greenland and Eastern Canada (Brander, 2005). Populations decreasing weight-at-age can be caused by climate changes (cold or warm) and this is a clear indication that the population has been subjected to stress resulting in reduced resilience and lower reproductive output. This is

frequently followed by a dramatic fall in biomass (as documented by the North Atlantic cod populations) since population projections of numbers are translated into catch limits using overestimates of weight-at-ages. Hence weight quotas result in a catch of more (lighter) fish than expected and therefore a higher-than-planned fishing mortality in addition to the factors mentioned above. Thus falling weight-at-age should be used as an indicator to initiate precautionary measures with regard to fishing mortality.

27. It is well documented that fishing can cause changes in population genetic structure. Such changes and loss of genotypes suggest that during conditions of changing climate, special protection should be extended to the populations at the edges of their ranges, where the first adverse impacts (due to increasing temperature, declining salinity etc.) are expected to occur. The decline in European cod stocks precipitated by over fishing has been aggravated by changes in plankton production at the southern borders of the cod abundance resulting from climate change.

28. Climate change may have a significant impact on the supply of organic matter through dense shelf water cascading (DSWC) - a type of current that is driven solely by seawater density contrast - to deep-sea ecosystems. A 2006 paper by Miquel Canals et al. on DSWC presents interesting findings on how DSWC can transport large amounts of water and nutrient rich sediment from estuarine areas to the deep-sea environment. Several of these phenomena occur in the Mediterranean Sea. One that was investigated transported, over a period of four months, from the Gulf of Lions to the deep Western Mediterranean, via the Cap de Creus canyon, an amount of water that equaled about twelve years of the water input from the river Rhone, or two years of the input from all the rivers draining into the Mediterranean. The deep-sea shrimp *Aristeus antennatus* (marketed as crevette rouge) is highly dependant on this flushing and a stabilization of the vertical layers due to climate change would most likely reduce its abundance.

Table 1: West Greenland during the period of warming from 1920

Changes in distribution and abundance	Fish species
Species previously absent, which appeared as from 1920	*Melanogrammus aeglefinus, Brosme brosme, Molva molva*
Rare species which became more common and extended their ranges	*Pollachius virens* (new records of spawning fish), *Salmo salar, Squalus acanthias*
Species which became abundant and extended their ranges poleward	*Gadus morhua, Clupea harengus* (new records of spawning fish)
Arctic species which no longer occurred in southern areas, but extended their northern limits	*Mallotus villosus, Gadus ogac, Reinhardtius hippoglossoides* (became much less common)

From Brander (2003) with permission from the author

E. Past and Current FAO Activities Related to Forest Adaptation in the European Region (ERC/08/5 paras 33-43 refer)

29. In the past adaptation of forests has received little attention in the implementation of the UNFCCC and the Kyoto Protocol. After analysing National Communications to the UNFCCC and finding very scant references to adapting forests, FAO published one of the first studies on this topic (Robledo and Forner, 2005). Simultaneously, FAO advocated forest adaptation in

contributions to workshops for national representatives in the European Climate Change Programme (Annexes I and II). Furthermore, FAO substantially contributed to a workshop in Graz, Austria, on land use related choices under the Kyoto Protocol and specifically organized for the participation of countries from Central and Eastern Europe and Central Asia. Currently, FAO is cooperating with the World Bank in the preparation of forestry Clean Development Mechanism (CDM) projects in Kyrgyzstan.

30. Table 2 lists other current FAO projects. On a more basic level, FAO contributed lead authors to AR-4 and to the IPCC Guidelines for measuring and reporting carbon emissions and removals by forests. It raised awareness for adaptation in and via forests in a special issue of its journal (Schone and Netto).

Table 2: Current FAO projects related to forest adaptation in member countries of the region.

Country name	Project title	Project dates		Budget (US$)
Croatia	Development of a sustainable charcoal industry	2006	2008	285 000
Serbia	Forest Sector Development in Serbia	2005	2008	1 554 728
Kyrgyzstan	Capacity-building for national forest and tree resource assessment and monitoring	2007	2009	318 000
Tajikistan	Preparation of a National Forest Programme	2007	2009	374 000
Uzbekistan	Support to the development of the National Forest Programme and forest legislation	2006	2008	350 000

F. Technical Options for Adaptive Management of Forests (ERC/08/5 paras 33-43 refer)

Technical Options for Adaptive Management of Forests[2]	
Phase	**Measure**
Regeneration	Adjust silvicultural system and/or regeneration technique
	Favour mixed stands
	Match species and provenance to present and future site and climate
	Consider proven introduced species
	Adapt natural regeneration to changing reproduction and competition patterns
	Rehabilitate degraded and eliminate off-site stands
	Consider nurse trees
	Consider artificial shading in planting dry, exposed sites
	Adjust planting densities
	Monitor competing vegetation
	Add nutrients likely to become deficient
	Under-plant high risk stands
	Treat for wind resistance starting systematically from establishment
	Reduce excessive game, rodent populations
Tending of stands	Adjust intensity and frequency of pre-commercial thinnings and stocking control
	Adjust stand structure and composition
	Phase out off-site stands
	Enhance monitoring for pathogens and insects
Harvesting	Avoid large clearcuts, edge effects, fragmentation
	Adjust harvest method and equipment, reduce the impact of skidding
	Consider converting to uneven-aged stands
Protecting forests	Intensify monitoring of risk and damage
	Eliminate added stresses (acid rain, game)
	Adjust fire management; use fire-smart landscapes
	Protect rare habitats and species, genetic stocks
Management, planning, and administration	Raise awareness and information of senior staff and field staff, owners
	Educate extension foresters
	Rewrite silvicultural and management guidelines
	Intensify or update site classification and mapping
	Provide adequate human resources; management and labour intensity likely to increase
	Plan and train for calamities and timber salvage, sales pools
	Integrate climate change into management plans
	Reconsider rotations and allowable cut
	Reconsider species choice and introduced species
	Update yield tables
	Carry out professional national and local vulnerability analysis
	Prioritize no-regret options
	Practice adaptive forest management
	Intensify and adapt variables in periodic national forest assessments
	Monitor for climate change impacts in protected areas

[2] Prepared by Dieter Schoene as an FAO contribution to the European Climate Change Programme.

G. Supportive framework for adaptation: the UNFCCC and the Kyoto Protocol (ERC/08/5 paras 33-43 refer)

31. Adapting the forests of the region effectively and efficiently calls for information, knowledge, experience, cooperation, innovative management and financial means. Support in various forms is available under the UNFCCC and the Kyoto Protocol, from the Global Environmental Fund (GEF), the EU and FAO.

32. The United Nations Framework Convention on Climate Change sets an overall framework for intergovernmental efforts to tackle the challenges posed by climate change. It recognizes that the climate system is a shared resource whose stability can be affected by industrial and other emissions of carbon dioxide and other greenhouse gases. The Convention entered into force on 21 March 1994. A number of nations have approved an addition to the treaty, entitled the Kyoto Protocol, which has more powerful (and legally binding) measures. The role of FAO is to help its member countries to reduce their vulnerability to climate change and improve their capacity to estimate amounts of – and reduce – greenhouse gas emissions. It disseminates information on climate change-related risks, assists members in fulfilling their international obligations under climate-related conventions and protocols, and seeks to ensure the reliability of climate change impact scenarios. FAO also aims at contributing to the net reduction of atmospheric carbon dioxide levels and emissions by promoting afforestation and alternative sources of energy. The FAO Interdepartmental Working Group on Climate Change assesses the influence of agricultural practices on climate change, and vice versa, and assists in the preparation of documents of the Intergovernmental Panel on Climate Change (IPCC) and other United Nations bodies related to climate change and its potential impact on agriculture.

33. Non-Annex I countries in the region that are Parties to the Protocol can host forestry carbon offset and renewable wood energy projects under the *Clean Development Mechanisms*. These projects often advantageously combine mitigation and adaptation, for example, if afforestation, besides carbon sequestration, also contributes to biodiversity conservation or corridors, rural livelihoods, or prevents erosion or flooding. Currently, Moldova hosts one of the first forestry CDM projects for soil conservation of degraded lands. Armenia, Georgia and Moldova host eight non-forestry projects. Overall, of 179 CDM projects currently in existence worldwide, only eight operate in the region, which in spite of ample opportunities, is drastically under-represented in the CDM.

34. Annex I countries of Central and Eastern Europe may host forestry *Joint Implementation* projects, which include not only afforestation and reforestation, but also forest management and renewable energy from forests, and can support adaptation. A forestry project under Joint Implementation (JI) has been initiated in Romania; Ukraine is currently acquiring experience in forestry pilot JI projects (13).

35. Besides market-driven adaptation projects, funding under the UNFCCC and the Kyoto Protocol is or will be available through the *Special Climate Change Fund* and the *Adaptation Fund*. Both are managed by the GEF.

36. Countries can assess impacts of, and vulnerability and adaptation to, climate change by means of several methods and tools developed under and collected in *compendium* form by the UNFCCC Secretariat. Some of these tools deal with terrestrial vegetation, but none is designed specifically for forests.

37. The five-year *Nairobi Work Programme* seeks to boost adaptation in countries, including adaptation in the forest sector. It incorporates workshops, expert meetings and published results. The programme specifically urges cooperation among countries and targeted contributions by international organizations.

GEF and EU Funding

38. The GEF offers funding for adaptation of forests under its climate change and biodiversity focal areas. A programme for adaptation supports capacity-building for National Communications and development of techniques for assessing climate change vulnerability. It also supports adaptation pilot projects (11).

39. The forestry components of the EU Common Agricultural Policy (CAP) provide support for afforestation, underplanting, tending of young stands, access roads and protection measures that can help adapt forests in EU countries of the region.

Annex I Countries

40. Many Annex I countries of the region have selected "forest management" as an eligible activity under Article 3.4 of the Kyoto Protocol. Thus, they gain carbon credits for any carbon stock increase in their existing forests, in addition to obligatory debits or credits from afforestation and deforestation. These countries also face the risk of considerable losses, should disturbances in maladapted forests lead to carbon losses. Therefore, they should have a strong interest in national forest adaptation to prevent such climate-induced disturbances. Few countries have decided if and how to distribute carbon income to forest owners, but conceivably these carbon revenues could go towards forest adaptation. Lobbying by the forest sector should facilitate such a solution.

Forestry reports and publications

41. With regard to forestry, several publications have been prepared and a number of meetings have taken place related to carbon trade mechanisms and potentials, bioenergy issues and policy implications. Some examples of these are:

- Climate Change and the Forestry Sector: Possible Legislative Responses for National and Subnational Governments. 2001. K.L. Rosenbaum. FAO Legal Papers. Online.
- Opportunities for fulfilling Joint Implementation projects in forestry in Ukraine. P.I. Lakyda, I.F. Buksha and V.P. Pasternak. Unasylva - No. 222 - Forests, Climate and Kyoto, 2005.
- The Joint United Nations Economic Commission for Europe (UNECE) Timber Committee and FAO European Forestry Commission Policy Forum organized a meeting on 10 October 2007 in Geneva concerning "Opportunities and Impacts of Bioenergy Policies and Targets on the Forest and Other Sectors"
- Zvolen 2006: European Forestry Commission. Cross Sectoral Approach to Forest Sector Issues: Wood Energy, Implications of the Kyoto Protocol; and Cooperation on Forest Fires.

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