Session 7. Biodiversity, conservation and protective functions of forests

Summary report

The following examples of recent changes in forests ecosystems and the forest sector that could be attributed to climate change were identified by the session participants.

- Bolivia is considered one of the richest countries in forest biodiversity yet one of the poorest economically. Deforestation and related CO_2 emissions continue to increase as forests are being converted to agriculture. Forest fires related to deforestation doubled over the period 2001-2006. Air quality is severely affected by forest fires.
- Across Europe, mountain forests are recognized to have protective functions to human communities from hazards such as avalanches, flooding debris flow, landslides and rockfalls. Past and present forest management is affecting soil and water properties that threaten the protective properties of mountain forests. Changing climate is thought to be worsening the risk of avalanche in managed mountain forests.
- The European Forest Institute (EFI) has summarized existing knowledge (literature survey) about the observed and projected impacts of climate change on forests in Europe.
- Mountain regions are expected to be affected by climate change at a greater magnitude than other regions. This has already been observed for the second half of the 20th century where temperature increase in the European Alps was two times higher than the European average.
- Landslides are very frequent in Indonesia.
- In India, deforested lands often remain wastelands. Soil and water processes are affected in a broad geographical area.
- Upward movement in elevation of beech in Spain has been documented.

Future impacts of climate change on forests as revealed through presentations and discussions include the following.

- If deforestation continues to increase in the tropical forests of Bolivia emissions will continue to increase on a national level and biodiversity will continue to decrease.
- Mountain forests that offer avalanche protection to human communities are highly susceptible to climate change. Risk maps developed to map current and future distribution of protection forests in alpine areas of Europe find a high degree of avalanche risk in European Alps (Norway spruce forests).
- An EFI project (see above) predicts a decrease in availability of some non-forest products; a shift in species affecting local biodiversity; and increasing phenotypic and genetic variations (local adaptation) as species are stressed by climate change. Future trends in forest growth are variable regionally across Europe.
- Forest fuelwoods provide about 40 percent of the energy needs of India. Deforestation is currently causing soil erosion, landslides and water shortages. Deforestation and climate change is contributing to the rapid recession of the largest Himalayan glacier. With rising costs of fossil fuels, deforestation is accelerating.
- Climate change impacts on the mountain forest ecosystems and forest goods and services demanded by society are likely to be more intensive compared to forests elsewhere.
- A vulnerability assessment of Argentinean forests using a climate change model and national forest inventory maps finds that biodiversity conservation under predicted climate change is most critical in the northwest of the country, particularly the mountain cloud forests.
- There is a strong link between high carbon sink forests and high biodiversity.

Participants discussed the future impacts of climate change on people and institutions.

- Socio-economic adaptations are constrained by old paradigms and resistance to changing current forest management practices.
- Boreal forests may have increased growth with climate change and have less biodiversity loss as a result.
- A model shows that predicted climate change scenarios will affect the distribution of life forms, its leaf area density as well as run off patterns across Mesoamerica.
- In Indonesia, increased landslide severity and frequency is expected with increased rainfall. Landslides are expected to cause damage to infrastructures, cost billions, and cause human mortality. Disaster prevention and hazard mitigation options should be developed from within the community.

A variety of potential adaptation measures or management actions were identified by session participants.

- In India, the use of biofuels is replacing wood fuels. More than a million hectares have been planted as Jatropha plantations which are proving to be an excellent source of biofuel and may have future environmental benefits particularly as protecting water resources.
- In Indonesia, can vegetation plantings be used to ameliorate the damage expected by landslides? It appears that a mix of tree species with deep roots and ground cover species with intense and strong fine roots will provide the highest slope stability in the area. This suggests that tree species selection could be an adaptation that reduces the landslide risk potentially exacerbated by climate change. Trees that have a high Index of Root Anchoring (IRA) and high Index Root Binding (IRB) tend to increase stability. Societal acceptance from local communities of the tree species proposed needs to be gauged in advance.
- In Argentina, using sensibility and adaptive criteria to protect biodiversity in areas identified as most at risk in vulnerability assessment.
- Literature summaries are excellent tools but how do we (research and managers) capture the knowledge not available from scientific literature? Expert knowledge and novel approaches to develop knowledge are needed to inform adaptive measures and processes.
- Water policies and their economic effects need to be institutionalized.
- In Sweden, forests owners can insure their forests against loss; with increased risk of extreme climate events (storms, etc.), the monetary cost is expected to increase. Owners may be less willing to apply costly adaptations if insurance is not available to protect their investment from losses.
- Areas such as Mediterranean forests on steep slopes have little economic value therefore result in limited potential for adaptation measures.
- Economically viable forests will more likely result in the implementation of adaptation measures in changing climates.
- A hindrance to adaptation measures is the societal orientation towards close nature forestry where nature is defined by historical views that may not be accurate in changing climate. Society's expectations of forest services and products will need to adapt to changing conditions.

Participants noted the following needs and policies that would be most effective in supporting adaptation of forests and the forest sector to climate change.

- Proposed land use change policy in Bolivia could result in 97 percent CO_2 abatement by reducing deforestation.
- There is an urgent need to systematically study the adaptive ability of different regions.

- Methodologies and tools for vulnerability assessments are lacking. These tools are a prerequisite for designing adaptive measures.
- Water policies need to be improved at local and country levels.
- Sensitive, rare and endangered species are unarguably at high risk under extreme climate variation scenarios. Who pays the cost of conservation of species or habitats especially when they occur on privately owned land? Conservation targets and monitoring are at one scale but conservation implementation is enforced at another scale.
- Conservation reserve networks in Europe are very rigid – if a conservation area is defined it remains in place in perpetuity. A more flexible system may be needed under changing climate. Compensating a land owner in 20 year terms may be better in changing climates as to be able to move protection to a more biological rich area while putting a less rich area back into active forest management. Additionally, attention to protecting forest processes needs to be made at landscape levels and for long terms.
- Policies and measures developed for adaptations should involve local communities.
- Setting priorities for areas to apply adaptation measures is particularly crucial in countries with little resources.