The 2nd ATEAM Stakeholder Dialogue Workshop

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ATEAM

Advanced Terrestrial Ecosystem Assessment and Modelling

Environmental Vulnerability Assessment

EXECUTIVE SUMMARY

The 2nd ATEAM stakeholder dialogue took place in Potsdam, Germany, on 12th-13th September 2002. Twenty-two stakeholders including advisers to policy makers, environment resources managers, consultants to different sectors, sectoral representatives and academics, participated in the event. Eighteen ATEAM partners presented the project's stage of affairs in: i) land use scenarios, ii) ecological modelling, and iii) vulnerability assessment.

Stakeholders and ATEAM partners evaluated and discussed the development of land use scenarios and the vulnerability mapping methodology, as well as the usefulness of preliminary model outputs and indicators for ecosystem services. During a stimulating two-day workshop, stakeholders have provided very interesting comments and suggestions, which are currently being addressed by ATEAM researchers.

Key issues

- **ATEAM's goal:** Within ATEAM global change impacts on ecosystems are assessed in relation to the human sectors, which rely on ecosystem services. ATEAM is an ecological modelling assessment, which aims at elucidating how global change could affect ecosystem service provision, and to which extent this would influence the vulnerability of human sectors to global change. The ATEAM modelling framework produces indicators that assess the capacity of an area to provide ecosystem services. This capacity will then be combined with indicators of adaptive capacity to produce an indicator for vulnerability per sector. Vulnerability and its components will be mapped for each sector (spatial scale: Europe at 10' x 10' grid), time slice (2020, 2050, 2100) and each scenario (A1, A2, B1 and B2 following the INTERGOVERNMENTAL PANEL OF CLIMATE CHANGES [IPCC] publication of »Special Report on Emission Scenarios [SRES]« storylines). The current baseline for the vulnerability assessment is 1990. The project will not provide an economic assessment.
- **ATEAM's land use scenarios:** ATEAM produces scenarios for climate change, atmospheric composition, nitrogen deposition and land use change. The *land use scenarios* were discussed on the 1st day of the workshop. A three-step methodology based upon the identification of global, European and sectoral driving forces of change (socio-economic and environmental) is applied. The driving forces for each of these levels were discussed with stakeholders in break out-groups on each major land use type (urban, agricultural, forest and protected areas). The demands for different land uses overlap and compete across Europe, and vary greatly with time and space. To guide the decision rules and produce future scenarios of land use change, a hierarchy of different land uses has been designed. Different hierarchies, or prioritisation, in land use types per scenario are a means of reflecting trends within society (i.e. global versus local markets, sustainable versus profit maximised economy).

  There was an overall agreement on the usefulness of the land use scenarios, although it was pointed out that the *complexity* of the interactions across sectors and ecosystems *was not fully resolved*, and that feedback mechanisms between land use, climate and policy were not yet addressed. Ways to consider important drivers of change at European and local level (e.g. agro-industry, market dynamics) are being sought. However, it remains particularly difficult to include the potential effect of *surprises* or discontinuities in society.

- **ATEAM's terminology:** For each land use type and each sector, terminology, definitions and classification were carefully considered. Stakeholders requested that the terminology used within ATEAM *be clarified* further to enhance transparency.
- **ATEAM's vulnerability assessment**: Each sectoral break-out group evaluated current ATEAM indicators of ecosystem services, and the assumptions used in each model. Stakeholders suggested several new indicators. Some of these can be included within ATEAM assessment (e.g. pesticides, number of sunny days with snow security). Others cannot be produced at this stage, largely due to the absence of (monitoring) data to validate the models (e.g. on climate extremes, species distributions and past trends). It was noted that across Europe monitoring networks are being discontinued which jeopardises future scientific ability to improve current models. Finally, there was a call for an appropriate socio-economic assessment, which is also of great importance to stakeholders. Future work should aim at encouraging stakeholders or collaborating scientists to use ATEAM's indicators to produce economic evaluation.
- ATEAM believes that the **adaptive capacity** of human sectors is an essential dimension to consider in vulnerability assessments. To explore this, stakeholders and ATEAM partners have discussed coping strategies that allow them to adapt to a constantly changing environment. Based on these insights and further research ATEAM seeks at present to find socio-economic indicators of adaptive capacity that are spatially explicit and specific for each ATEAM scenario.
- **The most pressing research challenges are:**
  - to develop appropriate linkages to management schemes, legal frameworks, cost-effectiveness, rural development and rural uses;
  - to address more fully the interactions between land use, climate and policy; and,
  - to bridge the gap between the current modelling scales and the scales relevant to policy and decision-makers.
- **Future steps in the ATEAM stakeholder dialogue**:
  - The full report of the workshop will be loaded on ATEAM's webpage.
  - ATEAM will organise sectoral workshops (such as the Mountain Environment which took place in November 2002 in Zürich, Switzerland).
  - ATEAM will develop further the stakeholder network.
  - ATEAM will host a 3rd annual workshop (planned for winter 2003/2004) to evaluate and disseminate the final project results.

PART 1: SUMMARY OF THE DISCUSSION

ATEAM is an ecological modelling framework, which aims to assess the vulnerability of human sectors to global change impacts on ecosystem service provision. Feedback and interaction with stakeholders are encouraged at different phases of the ATEAM process, including: i) development of land use scenarios, ii) identification of ecosystem services, iii) evaluation of indicators of ecosystem service provision, iv) discussion on sectors' perception of possible global change impacts, v) discussion on sectoral management and adaptation strategies, vi) methodology for vulnerability mapping, and vii) evaluation of the usefulness of the vulnerability maps.

1 Day 1: Land use scenario development[1]

Scenarios of global change are the first step in the ATEAM assessment, and are inputs to the ecosystem modelling framework. Land use scenarios couple climate and socio-economic (e.g. population and wealth) changes and produces plausible trends for land use distribution and change. The modelling baseline is 1990, and the scenarios are produced till 2100. All scenarios are produced following a three-step methodology which considers global, European and sectoral driving forces of change. Current limitations of the scenarios include: i) a single hierarchy of land use across different scenarios; ii) the decision rules are deterministic and cannot accommodate for stochastic changes (e.g. surprises such as new technology or sudden diseases); iii) Europe follows the same trends as the rest of the world; iv) feedback mechanisms between climate, land use, policy and management are not addressed.

The discussion considered the terminology used, the scenario methodology and the hierarchy of land uses proposed. It was noted that land use prioritisation differed across Europe with time due to socio-economic, cultural and policy trends.

ATEAM's take home message:

- ATEAM's terminology needs to be further clarified.
- Different land use hierarchies would be useful.
- Including feedback mechanisms between climate, policy and land use into our land use models remains an important long-term goal.

1.1 Protected areas land use

Protected areas within ATEAM are areas, which are under a specific conservation designation. The land use scenarios are constructed from assumptions on the impact of economic globalisation and cultural regionalisation on tourism and recreation activities, which translate into estimates of demand for and supply of protected areas. There are two important consequences to consider: (1) changes in the number of protected sites, and (2) changes in the size of the area under protection status. Each trend will have different ecological implications. For example, in the A1 scenario, tourists who can travel far to reach their preferred destinations may have a weaker sense of regional belonging and thus a lesser need for local/regional protection policy. There is no simple relationship between location, size of protected areas and the scenarios.

[1] For more detail on ATEAM land use scenario methodology, please consult the flyer available at: http://www.pik-potsdam.de/ateam/stakeholderweb/ateam_stakeholderstart.html

The definition and criteria used to determine protected areas were discussed as well as the diversity in European designation statuses and associated levels of protection. The data availability for protected areas for different networks was considered as well as their limitations (e.g. World Conservation and Monitoring Centre, countries and networks). Definitions for tourism and outdoor recreation activities were discussed and the decision rules and indicators (e.g. travel distance) underlying the trends in these activities commented upon. For example, what determines decreases in tourism and increases in recreation? What are the interactions between both trends?

It was noted that current trends in protection policy included increasing decentralisation and the emergence of conservation networks and agro-environmental schemes. These trends may help to cope with landscape fragmentation. Future protection strategies may either focus on the most threatened areas or the least pressurised ones.

ATEAM's take home message:

- Even though the ATEAM categories for protected land are valid, they cannot capture the whole diversity of protected land in Europe.
- European bio-geographical zones were judged more useful than national boundaries.
- Care needs to be taken to avoid double counting of areas that have a number of protection designations.
- There are virtually no unprotected areas in Europe. Even managed ecosystems benefit from a certain level of protection.
- We need to consider land uses within protected areas (i.e. there are very few protected areas where no economic use is permitted).
- The size and/or number of protected areas could be a valuable indicator for land use pressure within a region.
- Transport availability and efficiency are important factors in tourists' choice of destinations.
- We should link our approach with current research on social, economic, demographic and cultural drivers of changes in tourism.

1.2 Urban land use scenarios

The scenarios aim at determining the location of new urban development, thus the possible future trends in urban land use demand. Current trends include: a further concentration in large cities; a small increase in smaller cities, and strong urban pressure on the coastal zone. The urban driving forces considered in ATEAM are: population changes; economic factors (such as GDP, access); distance (between urban centres), and processes of urbanisation (which can follow diffusing or accreting trends, e.g. counter-urbanisation[2], sub-urbanisation, urban sprawl). The SRES storylines, current trends and driving forces are used to derive different internally consistent assumptions on urban land use change. Three indicators are used: the total percentage and density of, and fragmentation by urban land use. In the ATEAM scenarios, the possible future distribution of urban land use will be primarily driven by economic factors, rather than demographic ones. Using the current assumptions, different patterns will emerge but remain largely recognisable (e.g. no new large city will appear or disappear).

ATEAM's take home message:

- Future research should consider the preference of public vs. individual means of transport.
- We need to further elucidate the level of regulation governing urban development.

[2] Counter-urbanisation is defined as the movement from rural centres to rural areas. It is assumed that these rural areas remain rural.

1.3 Agricultural land use scenarios

The agricultural driving forces considered in ATEAM's agricultural land use models include: EU market intervention (e.g. fixed or unfixed land set-aside policy), rural development policy, environmental policy pressure, EU enlargement, world demand and supply (e.g. prices, consumer preferences, role of the World Trade Organisation). Estimates of changes in agricultural area are based on assumptions from SRES narratives, expert opinion (e.g. costs of fertiliser) and model outputs (e.g. crop yields). Basic assumptions, for example on farmer's motivations (e.g. profitability) or the continuance of a given agricultural policy through time, are necessary, although they may be too restrictive. Energy crop land is located based on rules including demand, maximum productivity, minimum distance to power plants/urban areas, and nature of the scenario (local vs. global).

ATEAM's take home message:

- There was an overall agreement that the ATEAM scenarios on agricultural land use are understood and useful, although a more detailed level of analysis following the avenues proposed in the following bullet points will be necessary when time and resources are available.
- Investigate dominant driving forces of change such as: market/price intervention (e.g. farm income and price regulations), crop technology (e.g. genetic modification), commercial pressure of the (agro)-industry and agro-genetic sector (which controls the costs from machinery to fuel), and other factors, which can potentially increase or decrease yields.
- How to include driving forces at local scale such as farm size and structure, crop rotation systems, water availability, land tenure, farmers' status and age, farmers' motivations (e.g. heritage) and changes in generations?
- How to tackle surprises (e.g. outbreak of diseases and pests)?
- Our indicators of food security (such as the frequency and magnitude of crop failure, crop quantity and quality and crop yield variability) were considered useful. However, how we define crop quality is as yet unclear. Individual consumers may be interested in a broad range of qualities, ranging from the colour of the fruit to its nitrate content.
- Important land management trends could include: agricultural land purchase for non-agricultural land uses, intensive versus extensive land farming and farm abandonment. Such trends have associated consequences for nitrogen deposition, carbon storage, biodiversity and landscape fragmentation that need to be considered.
- Assumptions on biomass energy crops and land use changes could include: prioritisation of biomass crops over other renewable energies, an open market for biomass crops, a larger role of biomass energy crops in future European strategies on energy security.

1.4 Forest land use scenarios

Forest land use scenario development is based on a number of premises: i) an increase in forest areas and growth for the past 50-100 years; ii) European forest policies are a central driving force; and iii) forest function has changed towards a post-industrial multi-purpose forest. The driving forces at EU level include: population development, economic growth, forest policy and other institutional factors, agricultural production, other land uses, and environmental factors. Considering these drivers, scenarios of forest composition and cover, trends in total protected forest area, and reallocation of new forest areas are developed. European countries were divided into 5 different groups, based on current forest situation, and trends in forest cover and policies. These groups are (1) Austria, Finland, Norway, Sweden (Highly dependent countries), (2) Belgium, the Netherlands (Deforestation) (3) Denmark, Ireland, Switzerland, UK (Reforestation), (4) Greece, Italy, Portugal, Spain (Fire-prone), and (5) France, Germany (Highly efficient, but small forest sector).

Forest land use scenarios are developed separately for each of these groups, based on current trends up to 2020 (including all legal issues in forestry), and from 2020 to 2100 on the SRES storylines. Different scenarios will assume different effects on timber production, biodiversity, and recreational potential. For example, in an SRES A1 world (rapid economic growth, globalised market) more intensively managed forests, higher and more intensive agricultural land use, declining environmental conservation and biodiversity are assumed. It is acknowledged that the current assumptions do not adequately capture feedbacks and interactions between driving forces of changes at different scales, policy and management decisions and trends in managed and protected forests. Further, the current scenarios focus on forest product demand.

Different forest (and other land) uses may overlap and complete with each other (e.g. removal of biomass for energy purposes increase forest fire-proofing), or be incompatible (e.g. timber harvesting vs. carbon storage). Changes in focus in forest policy might thus imply significant changes in carbon storage potential. To fulfil Kyoto's commitments, European terrestrial sinks can be developed and become effective over the short term. However, a long-term strategy should be based on sustainable forest management and resource policy, efficient multi-use of forest productivity. In this context strategies could include transferring subsidies from the agriculture to the forestry sector. Moreover, the competitiveness of the wood sector needs to be taken into account, since high EU production costs would probably result in increased wood imports (thus increased CO_2 emissions) and decreased managed forest areas.

ATEAM's take home message:

- Definitions and classifications of forest land use should be developed with care. Our definition of protected forest needs to include more than natural park forests. The current estimates of protected forest areas may be too high.
- Timber is a restrictive term; wood products or forest products should be used instead.
- Stakeholders agreed that increased forest productivity has little effect on land-use (spatial extent) unless there is a substantial shift in the revenue obtained, and thus in forest area required to maintain or gain competitiveness. The trends in urbanisation and agriculture, which are land uses associated with higher economic returns, are more likely to be a significant driver of change in forest land use distribution.
- The impacts of extreme events on land use change are important, but will to a large extent depend on current demographic and economic trends (e.g. storms impacts in Switzerland and fire damages in Mediterranean settings will probably not lead to the abandonment of forest management).
- We need to consider more fully the wider driving forces, such as EU enlargement, governmental subsidies, public and policy pressure (e.g. to increase protection level and to prioritise urban and agricultural land use).
- We need to feedback results from our forestry models that consider the impact of management strategies on forest productivity (e.g. species rotation, species selection composition) to the forest land use scenario models.
- Future work should aim to link at state-of-the-art socio-economic modelling of forest product supply and demand and their impacts on economic viability of maintaining forests in the face of global change.

2 Day 2: Vulnerability modelling and mapping

2.1 Vulnerability mapping method

ATEAM models the vulnerability of a given human sector under a specific global change exposure. It is here defined as a function of three components: The *Full Capacity* and *Utilised Capacity* (which measure the potential ecosystem service provision versus the ecosystem services effectively used by human sectors), and to a certain extent the *Adaptive Capacity* of human sectors. The later component is obtained by combining a number of relevant socio-economic indicators describing the ability of a sector to adapt to global change impacts. Moreover, ATEAM models and land use scenarios have embedded a number of policy trends and their implications in terms of land use, land cover, ecosystem service provision and autonomous sectoral adaptation to global change.

ATEAM will map separately the three components of vulnerability per ecosystem service, per scenario. The maps will be produced for 3 time slices (2020, 2050 and 2100) and compared to the 1990 baseline. ATEAM assesses future trends in vulnerability compared to the 1990 baseline. Sectoral vulnerability will be explored via the aggregation of meaningful indicators for different ecosystem services. ATEAM will explore the probability of occurrence by comparing the model outputs across the multiple global change scenarios developed within ATEAM (resulting in a crude measure of risk). ATEAM does not include a full economic assessment of vulnerability and sectoral adaptation strategies.

ATEAM's take home message:

- Stakeholders agreed that the current ATEAM vulnerability maps could be of use in raising awareness. In particular, spatial comparisons between countries could be a political lever in negotiations within the EU (e.g. a country can state that its vulnerability is higher than another country's).
- Stakeholders further believed that adaptive capacity is an interesting concept, although it is important to distinguish between potential and effective capacity to adapt. Here, the level of policy and decision-making (e.g. local to European) and the political will to adapt are important factors, as well as the access to, and cost of, adaptation measures (e.g. insurance). It was further noted that governments and managers have always adapted to change to a certain extend and will continue to do so.
- We need to clarify the terminology used and the interactions between the different components of vulnerability.
- We should explore the possibility of using an earlier baseline (e.g. 1980), to evaluate current vulnerability. This could also be achieved by introducing another time slice (i.e. 2000) in comparison to our present baseline (1990).
- The assumptions on policy and land use management used to obtain the final ATEAM maps should be clarified (e.g. Map A models the potential changes in vulnerability of wood productivity at exposure X assuming no climate mitigation and continuing current trends in forest management). This would help stakeholders to avoid misinterpretation and misuse of ATEAM modelled outputs.
- We should investigate possible collaboration with other social scientists and stakeholders who are likely to use ATEAM's indicators to derive econometric model outputs.
- We should investigate possibilities of an advanced risk evaluation in future vulnerability assessment modelling.
- In the long run we need to develop modelling methods to more appropriately assess the possible future change in frequency, magnitude and impacts of extreme events. A first step could be to derive a number of assumptions on sectoral adaptive capacity to extreme events.

2.2 Sectoral modelling of ecosystem services

2.2.1 Forestry

The interactions between different teams modelling the forest sectors within ATEAM were clarified as well as model terminology and methodology. The existing indicator list (based on the EFISCEN scheme) include felling potential, annual increment of stem wood and stem wood volume, suitability of tree species, pest susceptibility and biomass production potential. Afforestation and deforestation strategies are considered within the EFISCEN model, while the wider socio-economic setting and associated assumptions on forest land use trends are taken care of within the land use scenarios. Forest management strategies are currently being modelled within ATEAM as well as within the Silvistrat project (http://www.efi.fi/projects/silvistrat/). ATEAM has linked up with this project to explore cross-feeding possibilities between the two projects.

A standard methodology to design indicators of biomass energy and associated species and/or by-products of crop harvesting to model biomass energy potential is currently being developed within ATEAM for the agricultural and carbon storage sector. This will include woody biomass crops.

ATEAM's take home message:

- Stakeholders stated that estimates of specific species growth potential for a given area, and of land use change were useful. Model outputs at EU-wide scale and abstract measures of vulnerability would have however no practical value for foresters.
- When considering the adaptive capacity of the forestry sector stakeholders pointed out that as management operates on long time-scales (e.g. 20 to 150 years), adaptation is slow as species rotation and changes in species composition take time.
- We need to expand our methods to include more plausible future forest management strategies.
- Downscaled information from higher resolution analyses related to local climate, local socio-economic situation, forest-owner decision making and management trends would be welcomed by stakeholders.
- To explore the potential of carbon storage in forest products we need to follow their entire lifespan (i.e. from soil and tree components to end product). This includes forest product trading and recycling in and outside national borders.
- We should further explore the interactions between forestry and agriculture (especially) livestock.

2.2.2 Agriculture

ATEAM concentrates on the effect of climate, land use and nitrogen deposition changes on crop production including biomass energy crops. ATEAM also explores the interactions between biodiversity and land use intensity. Following the classification of the ACCELERATES project (http://www.geo.ucl.ac.be/accelerates/) ecosystem services are of varying importance to different groups of users, such as suppliers, consumer of products, and consumers of environmental externalities. The indicators of agricultural ecosystem services modelled by ATEAM include: agricultural production (changing crop yield, changing profitability), nitrogen leaching, and landscape and leisure/amenity value. Although livestock per se is not modelled within ATEAM, the land use scenarios draw a number of assumptions on influence of livestock on land use based on existing data on dairy and meat production. Environmental quality indicators considered within the assessment are: air, trace gas emission, soils (carbon storage, erosion, salinisation), water (N pollution, pesticides), and changing crop variability.

ATEAM's take home message:

- Stakeholders believed that the priority should be given to identify more clearly the relevant ecosystems services and the constrains which act on them. On these grounds we could identify more clearly user groups and target our maps of ecosystem services and vulnerability according their specific needs.
- The ACCELERATES classification of agricultural ecosystem services was agreed upon by stakeholders.
- Our assumptions on the distribution of biomass crops were discussed and refined. Stakeholders pointed out that the planting of biomass crops for liquid fuels will not be restricted in location. However, woody biomass crops for electricity and heat will be located close to power plants (for economic viability) and coastal regions (historic trend).
- The distinction between arable land and grassland would be a useful indicator.
- Future research should aim at considering livestock, horticulture, farm size (for agricultural intensity), and phosphorous leaching.
- Consider the (agro) industry when assessing the adaptive capacity of the agricultural sector.
- In future new indicators for food safety such as nitrate content of agricultural products may become important in wealthy countries.

2.2.3 Biodiversity

ATEAM produces estimates of changes in biodiversity using an indicator species approach. Different criteria for the selection of species to be investigated are applied: i) representativeness for biodiversity as a whole, ii) representativeness of a given habitat, iii) species economic interest; iv) rarity, v) importance in specific bio-geographic contexts (i.e. dominant species); vi) importance for the public (i.e. charismatic species) and; vii) aptitude for hunting. Stakeholders have different interests, and prioritise the above criteria differently, which complicates the species selection phase. To tackle this challenge, it was proposed that the starting point in species selection should be the habitats to be considered (i.e. important vs. threatened habitats for each region). The habitat approach allows considering bio-geographical factors, which are also determinant in species distribution (e.g. geology, soils). The Natura 2000 database is used to select specific habitats (e.g. grasslands). Existing databases are however not comprehensive and there is a bias towards specific habitats.

The influence of environmental change, e.g. landscape fragmentation, agricultural intensity as well as off-reserves conservation indicators (e.g. high nature farming value, sustainable forestry) on species distribution are currently being investigated. Conservation policy trends are to a certain extent included because they enter the models through the land use scenario. There are strong interactions with other ATEAM sectors, in particular agriculture and forestry, and ways to more fully integrate results from these other sectors are been sought.

ATEAM's take home message:

- Stakeholders approved the habitat approach to selection of species. They further considered the indicators and maps presented appropriate. It was noted that (non)-government organisations often call for biodiversity indicators based on number of species, although conservation networks are often based on important species (e.g. English nature). The difficulty in producing indicators based on species numbers was highlighted, as well as the danger associated with founding nature conservation decisions on country rankings of biodiversity.
- Modelled distribution of species should not be termed "species distribution maps". This causes confusion for stakeholders between actual data and simulations.

- Careful flags (on data quality and meaningfulness) should be provided to facilitate stakeholders' interpretation of ATEAM maps
- If ATEAM in a second project phase is extended to fresh water systems, the biodiversity of (migrant) fish, other waterborne species and micro-organisms needs to be considered.
- A synthetic biodiversity indicator per bio-geographic zone or country could be useful.
- More information on the feasibility of desired conservation networks would help to assess the sector's adaptive capacity.
- A user-selected set of indicators within an interactive tool would be interesting.

2.2.4 Carbon storage

The Lund-Potsdam-Jena Global Dynamic Vegetation Model was briefly introduced. This process base model simulates changes in the terrestrial carbon storage in vegetation and soils. One of the important drivers influencing the forest carbon balance is forest management and harvesting systems (e.g. selective logging). The ATEAM currently works on implementing these management aspects into the model and/or the land use scenarios. The assessment will result in maps of possible carbon intake and emission according to different scenarios, including fire susceptibility across European regions.

Carbon storage and trading are currently heavily discussed although there is no sufficient information on the relative efficiency of land uses as long term carbon sinks. Afforestation to increase forest sinks within the EU poses a number of challenges, such as competition with other land and forest uses, forest law, cost effectiveness, land value and business viability. Profitable forests within the EU will not be turned into carbon sinks easily as this would imply reduced revenue and land value. To fulfil its Kyoto commitments, the EU therefore encourages clean development mechanisms in Eastern Europe where set aside lands would be necessary to protect the common agricultural market.

Currently, there are no incentives to promote carbon storage, and the focus on phasing out hydrocarbon fuels is decoupled from the debate on carbon sinks. Inventive and flexible policies need to be developed. Carbon storage can be a by-product of current trends towards for example increased natural protection for leisure activities, and this potential could be exploited more fully.

ATEAM's take home message:

- There was a general agreement on the usefulness of the approach and the resulting information on carbon fluxes. This could give forest policy makers and managers incentives to change forest-harvesting systems. The temporal scale of 2050 and 2100 was also considered useful for sectors, which have long management timeframes, such as energy and forestry.
- ATEAM should further investigate the interactions of the carbon storage sector with other sectors such as agriculture, forestry and biodiversity.
- Future research may consider economic viability and efficiency of possible carbon storage options, as well as how to bridge the gap between the ATEAM modelling scale and local scales of management and legal frameworks.

2.2.5 Mountain environments

European mountain systems are very diverse in terms of climate, vegetation, water supply, carbon storage, human settlement and activities. A case study from the Alps was presented. Two other case studies are envisaged in Norwegian and Pyrenean mountain ranges. Mountains are a regional focus within ATEAM assessed at higher resolution via a case study approach. Mountain ecosystem services are numerous, and ATEAM focuses on assessing water stream flow, tourism, carbon storage and slope stability. Indicators for the stream flow and tourism were considered in more detail.

Impacts of changing water supply on biodiversity and on the hydropower sector, competition for water between urban and rural populations, and alternative water supply sources are to a certain extent considered within the ATEAM land use scenarios and the water sector.

Simulations of timing of, and peaks in, stream flow were presented. From the validation of the model results, it was concluded that the model was not able to capture adequately extreme events peaks, although there is a very good match for mean water supply.

A number of indicators relevant to tourist activities are currently investigated. Concerning winter tourism, the modelled outputs can be used to interpret snow cover and snow safety (i.e. 100 days snow during the skiing season), both indicators being already used in the ski sector. For summer tourism, scenic beauty indicators and weather conditions (obtained from climate scenarios) are used. Biodiversity indicators used are been produced by the ATEAM biodiversity sector. Socio-economic indicators (i.e. access, shopping possibilities) will not be developed.

Tourist preferences will not directly lead to major land use change, although the pressure tourism can cause on sensitive ecosystem and the populations relying on tourist spending should not be underestimated. Sustainable tourism activities would evaluate and take advantage of the ecological value of a site and attempt to exploit this while minimising negative impacts on the ecosystem and other economic sectors. As such tourism is an adaptable, inherently flexible sector, which can take advantage of changes in demand and opportunities provided by global change.

ATEAM's take home message:

- There was an overall agreement on the usefulness of the approach developed within the mountain environment sector and the indicators used. It was noted that water supply information would also be important for non-mountainous regions (e.g. timing of annual peak in mountain water discharge), while weather indicators were judged particularly relevant in mountain areas.
- We should further consider the scale of the results (i.e. catchment) and the interactions with downstream areas, particularly for water supply. Meaningful modelling of water discharge peaks are important since in mountain areas, increasing precipitation can easily result in extreme events
- ATEAM should consider producing a combined indicator based on the number of sunny day with snow security.
- Additional stakeholders ATEAM could contact include: the EU water directive, the Rhine Commission, the Rijkswaterstaat, or other organisations dealing with large-scale river catchment management or flood mitigation via for example water polders, tourist master plans, public and private investors in tourist regions, ski infrastructure sector, farmers.
- Further case studies on the Carpathians and Apennines would be desirable.
- Future research should further explore interactions between vegetation change and water cycle.
- For the tourism industry it may be useful to further explore scenic beauty indicators using social science approaches, such as contingence evaluation, or willingness-to-pay methods.

2.2.6 Water

The object of ATEAM's assessment is the provision of water ecosystem services, rather than hazard and catchment management. Water ecosystem services include water supply, water quality, transport, hydropower, flood and drought protection, biodiversity and recreation. ATEAM focuses on water supply and quality. Feedback mechanisms between water supply, vegetation and soils are considered in terms of water interception and evaporation, and soil moisture.

In terms of water quantity, the considered indicators are: supply, demand, runoff, and frequency of flood/drought occurrence. The water demand is difficult to assess in future, since this largely relies on socio-economic factors such as wealth, urban, industrial and agricultural trends, water storage, and changing patterns in domestic uses. These aspects are to a certain extent covered by assumptions developed in the land use scenarios and water model.

ATEAM's take home message:

- It was noted that stakeholder-driven research and modelling is common in the water sector, and there are close collaboration ties between modellers and water management companies.
- Stakeholders believed that limiting factors for adaptation to global change could include economic restrictions, lack of information, awareness and technology, implementation of water policy and of land use planning. The adaptive capacity of the water sector was however judged to be fairly high. Compared to other sectors, awareness of possible climate variability and change impacts is significant (at least in certain European countries). Management time scales average between 10 and 20 years for water supply companies, although they can increase to 50/100 years for hydropower infrastructure. However, the flexibility of the water sector was judged low. Investment needs are high, and infrastructure is designed to last and be operational for a number of decades. Adaptation costs and insurance cover are thus important aspects, which may encourage or hinder adaptation.
- In terms of flood impacts, awareness, warning and disaster preparedness, flood alleviation measures are important factors. There exist a wide range of flood adaptation measures and it is likely that cost/benefits analysis will be more widely used in future to select the most efficient options. The priority in flood protection will probably continue to go to populated areas, while agricultural land may be less protected, and more often used as buffers to floods.
- We should link seasonal water flow to seasonal water demand (e.g. increased in summer by tourists) to explore water scarcity in certain regions.
- ATEAM needs to investigate how to integrate model results produced by the mountain sector models (e.g. changing timing of snowmelt, and mountain discharge volume and peaks).
- We need to investigate how to best disseminate the ATEAM maps in the commercial sector (e.g. water and insurance companies).
- Future stakeholders to contact should include Mediterranean and Eastern European representatives (e.g. Prof. Dr. Zbigniew Kundzewicz).
- We should further address any mismatch between ATEAM's scales and management requirements in the water sector (e.g. hourly timescale, river catchment scale).
- ATEAM will further explore indicators of water quality via indicators such as: nutrient levels (i.e. nitrate and phosphate, diffuse sources), water temperature (relevant for biodiversity and cooling water for industrial use).
- A future research goal is to develop methods to adequately model groundwater supply, retrieval and quality, fluxes through soil and the timing involved in groundwater recharge.
- A future challenge is to explore how to best tackle both the frequency and timing of extreme events and other hazards.
- Vulnerability research needs to explore the efficiency, failure potential and cost of adaptation options.

2.3 Final plenary discussion

The approach followed by ATEAM has been judged useful and relevant to stakeholders. Interest has been expressed for the vulnerability assessment methodology and tool developed by ATEAM. It was stressed that to increase the usability and clarity of the final ATEAM maps care should be taken to synthesise the assumptions and limitations involved in the modelling and the meaningfulness of the results at different scales (e.g. in a fact sheet attached to each map).

However, four great challenges need to be addressed: (1) finding ways to bridge ATEAM scale (Europe at a 10' x10' grid) to that which is locally relevant, (2) integrating between the different ATEAM sectors, (3) as a long term goal, exploring ways to provide information on extreme events, and (4) improving our ways to deal with the uncertainty inherent to global change scenarios. In the coming months, the project will seek to improve its current work to respond to stakeholders needs and promote sustainable use of ecosystem services.

PART 2: EVALUATION

1 Introduction

1.1 Overall aims of the stakeholder dialogue within ATEAM

Within ATEAM global change impacts on ecosystems are assessed in relation to the human sectors, which rely on ecosystem services. ATEAM is an ecological modelling assessment, which aims at elucidating how global change could affect ecosystem service provision, and to which extent this would influence the vulnerability of human sectors to global change. The sectors covered within the project are: agriculture and biomass energy, forestry, water, carbon sequestration/energy, biodiversity and mountain environments. ATEAM has a clear ecological emphasis, and the indicators modelled within ATEAM are not econometric in nature. However, a number of socio-economic driving forces are taken into account within the land use scenarios and the models themselves (e.g. urbanisation, wealth, changes in management practices). ATEAM engages in a stakeholder dialogue to produce more appropriate research results for policy makers and natural resources managers in Europe.

1.2 Steps leading to the 2nd ATEAM stakeholder workshop

A first stakeholder workshop took place 10 months after the initiation of the project to introduce ATEAM to a small number of stakeholders and obtain initial feedback on the modelling framework and the planned products. This first meeting had many important outcomes. Feedback from stakeholders reassured ATEAM that the overall aims and methodology of the project were adequate and useful. Suggestions from stakeholders led to adjustments within the modelling framework, and the development of new focuses within the project (e.g. biomass energy) and of a more appropriate dialogue strategy. The participating stakeholders suggested a number of important contacts of individuals and organisations to approach. ATEAM modelling partners engaged in a number of stakeholder activities on a sectoral basis (e.g. agriculture/biomass workshop; preparation of stakeholders Mountain workshop planned in late 2002).

1.3 Aims of the 2nd ATEAM stakeholder workshop

At the 2nd stakeholder workshop, ATEAM gathered a larger number of stakeholders to evaluate:

- the land use scenarios for Europe,
- sectoral driving forces of change,
- the methodology developed to produce vulnerability maps,
- the indicators of ecosystem services,
- sector adaptation to global change, and
- the dialogue process itself.

ATEAM wished more specifically to:

- explore stakeholders perception of global change and its impacts on their sectors,
- obtain feedback on the usefulness of its approach and the data it generates,
- identify which adjustments can be done within the timescale of ATEAM and the available data and modelling resources,

- develop a dynamic network and interactive discussion platform for a long term collaboration with stakeholders, and
- identify areas where future research should focus to satisfy stakeholders' information needs.

2 Workshop preparation

2.1 ATEAM's preparatory activities

Preparations for the workshop started soon after the introductory workshop. A dialogue strategy was produced and approved by ATEAMers[3] at the project's annual meeting in April 2002. The aims of workshop, and material required for presentation to stakeholders were clarified then and workshop dates were consolidated. Between April and September 2002, ATEAM dedicated considerable time for the development of the following activities:

- climate scenarios[4] (to produce preliminary model outputs),
- land use scenarios for presentation,
- sectoral models to obtain preliminary outputs,
- methodology for vulnerability mapping.

The stakeholder dialogue coordination focused on a number of activities:

- to develop guidelines for the production of clear and synthetic material to be presented to stakeholders,
- to produce a number of questionnaires to be submitted to stakeholders,
- to develop an interactive workshop agenda to foster greater communication with stakeholders,
- to identify relevant stakeholders and invite them to the workshop,
- to identify a relevant independent mediator and invite him/her to the workshop,
- to translate the English project flyer to Spanish, French and German, and,
- to extend the ATEAM website with pages that are specifically aimed to provide information to stakeholders.

An interactive process which required intensive discussion within ATEAM was necessary to carry out the above activities.

2.2 ATEAM's stakeholders

Identifying stakeholders

At the introductory stakeholder meeting (October 2001), a number of relevant organisations and individuals were discussed with the small group of stakeholders present (all stakeholders involved in the first workshop accepted to collaborate with ATEAM and were invited to the second

[3] We distinguish ATEAMers from the dialogue coordination. ATEAMers are the project partners responsible for the actual scenario and model development, while the dialogue coordination is responsible for the planning, organisation, facilitation, evaluation and reporting of the dialogue process between stakeholders and ATEAMers. The dialogue coordination attempts to remain neutral between the two communities involved in the dialogue in order to foster greater and better communication.

[4] The climate scenarios cannot be adjusted within the project timeframe to suit stakeholder needs. Since there is no possibility to address stakeholders' suggestions it was decided that these should not be presented at the workshop.

workshop). These possibly interested parties were contacted and invited. ATEAMers identified further contacts during the course of their work, while the dialogue coordination sought to obtain a balanced number of stakeholders per sector and explored new avenues primarily via web-searches and a snowball approach. The aimed number of stakeholder was 25, and this was reached although 3 stakeholders had to cancel due to last minutes circumstances. To obtain this level of attendance, a larger number of contacts was necessary. Parties were approached by repetitive e-mails, letters and telephone calls. Contacted parties were in general interested in ATEAM. When they could not attend, they were very active in identifying further contacts and stated their interest in receiving information on the outcomes of the workshop and in being invited in later stakeholder dialogue activities. This in itself was a very rewarding process, since it confirmed the relevance of ATEAM for stakeholders. The dialogue coordination also sought to react to the recent flood events of late summer 2002 by inviting key insurance and re-insurance companies. Unfortunately, due to the late invitations, stakeholders contacted were not available to participate.

Who are the stakeholders?

The full list of the participants and their profiles can be found in Appendices 2 and 3. Stakeholders who attended the workshop are very diverse, and their decision-making and activities take place at different temporal and geographical scales. They include:

- private land and forest owners or representatives,
- environmental resources managers both for the private and public sector,
- representatives of specific sectors and specific activities within these sectors,
- environment and policy advisers at national and European level,
- technical and management consultants for the public and private sector, and
- academics who are interested in using ATEAM's outputs.

Stakeholders are aware of current scientific research on global change impacts, and are science-literate. However, science is not their primary activity. They are often involved in research and development activities for their specific sectors. They can thus understand and comment on the achievements and limits of ATEAM's developments. However, their goal in attending ATEAM's workshop is clearly to obtain information, which can help them in their activities. They will therefore introduce a valuable pragmatic point of view on ATEAM's work.

2.3 Information presented to stakeholders

Of great importance was the large time dedicated to produce adequate informative material for presentation to stakeholders. This included primarily:

- an introductory flyer on the ATEAM project,
- a flyer on land use scenarios and downscaling developments for Europe,
- a flyer on vulnerability mapping,
- sectoral posters summarising model developments, indicators for ecosystem services, and guiding questions to stakeholders,
- presentations to be given by ATEAMers during the workshop, and,
- participants' profiles.

Most of the above documents are attached in Appendix 5, or available online (i.e.: ATEAMers' posters) at: http://www.pik-potsdam.de/ateam/stakeholderweb/ateam_stakeholder_material.html

Information flyers, together with the agenda of the meeting, were sent before hand to stakeholders in order for them to familiarise themselves with ATEAM and the aims of the workshop. Stakeholders were in general satisfied with the amount of information provided and had sufficient time to consult it (See Appendix 7).

Introductory questionnaire

To help stakeholders initiate a reflection on ATEAM's research and prepare the workshop, a questionnaire was sent prior to the event (Appendix 4). This contained key questions to be asked at the meeting, in open form to leave stakeholders total freedom concerning their responses. Although this format prevents systematic analysis and quantification of stakeholders' answers, it helps to explore the sectoral context of stakeholders, their perception on ecosystem services and global change and their present use of scientific indicators. Twelve out of 22 stakeholders returned the completed questionnaire before the workshop. A brief overview of the results (See Box 1) was presented to ATEAMers in a preparatory meeting, which took place the day preceding the stakeholder workshop. This, together with the participants' profiles, helped ATEAMers to familiarise themselves with stakeholders.

Box 1: Summary of stakeholders' responses to the introductory questionnaire

- A high return of questionnaires (12 out of 25 stakeholders invited)
- A good starting point of reflection
- A diverse crowd (both in term of activities & stakeholders)
- wide range of ecosystem services identified by stakeholders (e.g. agricultural products, soil quality, genetics diversity, landscape, flood control)
- Threats to these services are related to changes in land use, climate, but also importantly to market and management of environmental resources (e.g. plant diseases and pests, conservation policy, wood market).
- Opportunities of global change are not very clear (except in some examples: carbon fertilisation, biomass energy).
- Vulnerability is a concept, which is not immediately clear to stakeholders.
- Management time horizon: a wide range (e.g. seasonal for agricultural sector; 100 years for climate policy) and explicit difference made between the actual and desirable time horizon.
- Adaptation options are in general well identified, although there is an overall agreement that they are insufficient to tackle global change threats.
- A vast number of interesting indicators, and an idea on targets/minimum levels
- Some indicators mentioned by stakeholders are already covered within ATEAM (e.g. yield, timber volume).
- Some indicators are interesting and unusual (e.g. number of typical agricultural products for tourism).
- Economic indicators are important for thresholds in business viability.
- A reality check: our stakeholders are very knowledgeable, scientific minded, although they have clear concerns: "how will ATEAM helps us " +" what do ATEAM indicators mean to us"?
- Selected questionnaires were distributed to ATEAMers in order to familiarize themselves with the stakeholders needs.

3 Workshop content

The agenda of the meeting is located in Appendix 1, and the extended summary of the debates that took place during the workshop in Part 1 of the present report. Stakeholders and ATEAM partners evaluated and discussed the development of land use scenarios and the vulnerability mapping methodology, as well as the usefulness of preliminary model outputs and indicators for ecosystem services. During a stimulating two-day workshop, stakeholders have provided very interesting comments and suggestions, which are currently being addressed by ATEAM researchers.

3.1 Stakeholders' evaluation of the workshop content and discussion

Stakeholders in general believed that the number of topics covered during the workshop was adequate, although more time should have been dedicated per topic. The time for discussion was judged sufficient and the mix between plenary and break out session adequate by most respondents. Stakeholders were originally allocated a break-out group according to our understanding of their expertise and main interest. However, participants were left free to decide which session to join. Therefore, the majority of the respondents believed that the land use and sectoral break-out sessions they had attended were appropriate. Most stakeholders would prefer to be involved in a sectoral event in future, which suggests that more emphasis on sectoral event and break-out sessions would be preferable (See Appendix 7).

3.2 The facilitation process

The facilitation process was the main responsibility of the dialogue coordination and involved three *main activities.*

- Promoting a common ATEAM entity (as opposed to a collection of collaborating universities), while emphasising the diversity of stakeholders.
    - The description of ATEAMers in the profile document was kept minimal. With this short introduction of ATEAMers stakeholders were able to immediately identify the expertise of each person, and direct their queries directly to the responsible person.
    - The nametags of ATEAMers did not specify their individual affiliations, but simply ATEAM.
    - At the beginning of the workshop, the project leader, Prof. Wolfgang Cramer, introduced briefly ATEAMers, while stakeholders were invited to introduce themselves. This also gave more time for stakeholders to present their interests and goals.
- Preparing ATEAMers to the workshop. This included briefing ATEAMers on the results of the introductory questionnaire, emphasising the needs of stakeholders, and fostering greater self-confidence.
- Observing the process and advising ATEAMers, especially moderators, on how to optimise the workshop and foster greater interactions with stakeholders.

The role of moderators

The original aim was to secure an independent plenary moderator. Unfortunately, none of the persons contacted were available at the time of the workshop. It was thus decided that the project leader and the associate coordinator would fulfil this role, and a number of ATEAMers would serve as break-out moderators.

Ideally, moderators should act as a neutral trigger for discussion, rather than endorsing ATEAM. Stakeholders often first point at deficiencies or areas where further research is needed despite the fact that they believe that ATEAM is a valuable research enterprise. Stakeholder often omit to first provide positive feedback, and ATEAMers often feel that their work is not valued, and react by defending their work, justifying their choices by the restricted resources available. If the moderator is openly biased towards ATEAM, stakeholders may feel less comfortable in expressing their views, as they may perceive that their comments are taken as "attacks" on ATEAM, rather than food for discussion.

It is thus the role of the moderator to move away from an "attack – defence" mode of discussion. The moderator can for example encourage stakeholders to first express their positive comments on ATEAM. When ATEAMers hear remarks of interest and approval of stakeholders, they can more easily understand that later comments are not "attacks" but stimulating contributions.

The moderator's participation in the discussion should also be minimum. Since the longer the moderator speaks, the less stakeholders and ATEAMers do. Ideally, the moderator should identify the key questions that ATEAMers need answered, and the key concerns the stakeholders have, and strive to guide the discussion so that these issues are covered in the limited time available. The moderator should thus restrict his/her contribution to asking questions to stakeholders and to ATEAMers alternatively. In this way, the goals of either party are more easily fulfilled.

The moderator has two further tasks: to steer the discussion away from points of limited relevance to the group, and to balance the interventions of each participant (i.e. to encourage those who speak less, and moderate those who speak a lot).

Since all moderators were directly involved within ATEAM, it was often difficult for them to remain in a neutral guiding position. This led to some confusion and two stakeholders suggested that discussion in break-out groups would improve greatly if the role of moderators was better defined. One stakeholder further commented that the break-out discussion might gain by being more focused, while acknowledging that too much control from moderators would on the other hand hinder the free development of the discussion. However, most stakeholders clearly noticed the role of moderators during the workshop. More importantly, most stakeholders were comfortable enough to express their views, and felt that their opinions were adequately valued (See Appendix 7).

The rapporteurs

At the end of each break-out session, rapporteurs summarised in plenary the discussion of each separate groups. Participants could thus have an overview on the issues considered in the separate groups. This also fostered further discussion during the plenary. During the workshop, stakeholders were encouraged to act as rapporteurs. In this way, stakeholders could feel more active and empowered, and use this time to express their views freely. A further interest is to hear the important issues of the discussion from the point of view of stakeholders, as these may differ substantially from those ATEAMers would have reported upon. The different emphasis during reporting illustrates the different perceptions between ATEAMers and stakeholders and can help the two communities to understand each other better.

4 Main achievements

Overall, stakeholders appreciated the meeting, the interactions with ATEAMers and other stakeholders, especially during break-out groups, and the organisational arrangements. When asked if the workshop had been relevant and worth their time away from work, stakeholders in general answered "yes" or "mostly". The presentations were in general interesting for stakeholders. Most of them believed they had gained some useful insights on the topics covered, and that they would be able to integrate these in their work. Moreover, all stakeholders who answered the survey would like to remain informed of ATEAM's activities and results. Many had already talked about

ATEAM to colleagues of theirs, or stated their intention to do so in future. Most stakeholders are happy to continue participating in ATEAM activities, and some suggested the possibility of a deeper bilateral collaboration for example on biomass energy issues and in feeding the next round of European Environmental Agency reporting. Most stakeholders have met some relevant contacts during the workshop, and consider keeping in touch with them, even outside ATEAM activities. Finally, most believe that ATEAM should act as a networking platform (see also Appendix 7).

When asked what would motivate them to attend future ATEAM stakeholder events, the respondents stated that closer collaboration, networking, awareness raising and obtaining information on current research and at national and sectoral scales would be their greatest motivation to do so.

ATEAMers did not fill the evaluation questionnaire, but provided informal feedback. ATEAMers involved within the dialogue have by now overcome their initial resistance to this process, and have realised the significant benefits of engaging in such activities. They believe that workshop has been very useful, stimulating and enjoyable to them.

Clearly, the workshop was a success and achieved its overall aims: to provide a dynamic and stimulating discussion platform for stakeholders and ATEAMers, and to build closer collaboration between these two communities.

5 What can be improved?

In the evaluation questionnaire, stakeholders were asked to identify what elements could be improved in later dialogue activities. The following summarises their suggestions.

- More information required prior to the workshop, including: basic information on ATEAM (especially for new stakeholders), more details on the methodology of vulnerability mapping and scenario development, more information on ATEAM's sector modelling, and how the land use scenarios are implemented within each sector.
- Clarification on areas not covered by ATEAM: stakeholders would in this way focus on the areas where they can contribute.
- Further clarification of the terminology and indicators used by ATEAM (e.g. vulnerability) to foster more active stakeholder contribution.
- Most stakeholders valued especially the break-out groups, and believed that more time should be dedicated to this form of interaction. The possibility to collectively summarise the results of each break-out group was also suggested.
- Prioritisation of the topics to be covered. Future workshops should aim at covering fewer topics in greater depth. In this way, discussion can be extended, and stakeholders would have a more substantial impact on the project during the workshop.
- A bigger focus on sectoral issues, since this is where stakeholders can contribute more fully. The plenary, project-wide presentations should just aim at setting the overall context.
- The possibility for stakeholders to attend different sectoral groups was proposed, as more than one sectoral group maybe relevant to their activities.
- More focus on key ATEAM issues in the discussion, and further clarification of the key questions to be considered with stakeholders.
- Moderators to act more as neutral guides of the discussion, encouraging stakeholders to provide feedback.

Collectively, these comments suggest that stakeholders call for more background material, a clearer leadership from ATEAM in setting the agenda and guiding the discussion and more opportunities to contribute to ATEAM in its diverse aspects. These comments also constitute positive feedback for the dialogue coordination, since it confirms that ATEAM has stimulated stakeholders sufficiently for them to ask for a closer, more in depth collaboration.

6 New stakeholder avenues to be explored

Stakeholders suggested a number of new organisations/sectors, which might be interested in collaborating with ATEAM. These included: ACTA PLAN (society stemming from ACTA), the agrochemical industry, plant and cattle breeders, the EUROPEAN SPACE AGENCY (ESA network), earth observation specialists, MINISTRY CONFERENCE ON THE PROTECTION OF FOREST IN EUROPE (MCPFE), Louise Auckland (forestry coordinator in Ecosecurities).

The ATEAM stakeholder database has been growing steadily since the beginning of the project largely thanks to such recommendations given by stakeholders. At the final stakeholder workshop, ATEAM aims to invite a number of stakeholders who have collaborated with the project to foster continuous in-depth evaluation of the project's progress and results, as well as a number of other organisations not involved so far. The number of invitees should be around 30 participants.

7 Future steps in the ATEAM stakeholder dialogue

- The full report of the workshop will be loaded on ATEAM's webpage
- A number of sectoral workshops will be encouraged (since the 2nd annual workshop, the Mountain Environment modelling team has hosted a one-day workshop in November 2002 in Zürich, Switzerland)
- Further development of ATEAM's stakeholder network
- ATEAM will host a 3rd annual workshop (planned for the end of 2003) to evaluate ATEAM's final outputs and disseminate them.

8 Conclusions

The second ATEAM annual stakeholder workshop has been a great opportunity for stakeholders and scientists to discuss the state of affairs in ecological modelling and vulnerability assessment. Views on major issues to be put on the research agenda have been exchanged to further improve our understanding of potential impacts of global change. The stakeholder group was larger and more diverse than in previous events. The overall response of stakeholders has been a positive, stimulating and encouraging one. Specific stakeholder concerns have been isolated for further work within ATEAM and future research. Participating ATEAMers have emphasised how collaboration and discussion with stakeholder has been beneficial and interesting. In the coming months, ATEAM will integrate as many leads suggested by stakeholders as feasible within the time and resource constrains of the project. ATEAM will continue to encourage stakeholder involvement throughout the rest of the project and will prepare a final stakeholder workshop. This last event will focus on evaluating of the ATEAM results, i.e. the maps of vulnerability, and dissemination.

Appendix 1: Agenda of the workshop and break-out groups

Second ATEAM Stakeholder Workshop:
Land use scenarios and indicators of Ecosystem service change

Thursday 12th September 2002:

Morning: Land use Scenarios (part 1)

08.30-09.00 Registration & Tea/Coffee

09.00-12.00 Plenary

- 09.00-09.20 Wolfgang Cramer: Welcome, programme, goals of the workshop, and introduction of ATEAM partners
- 09.20-09.40 Stakeholders briefly introduce themselves
- 09.40-10.20 Rik Leemans: Introduction on the ATEAM land use scenarios
- 10.20-10.45 Mark Rounsevell: General scenario development methodology
- 10.45-11.00 Discussion
- 11.00-11.30 Tea/Coffee Break
- 11.30-12.30 Discussion
- 12.30-13.30 Lunch

Afternoon: Land use Scenarios (part 2)

13.30-15.30 Break-out group per major land use type

- Mark Rounsevell and Eva Kamphorst (agricultural and urban land use)
- Susanna Kankaanpää (forestry land use),
- Jacomijn Pluimers (protected areas land use)

Each break-out group will address the development of ATEAM's land use scenarios (e.g. assumptions made) and how relevant these scenarios are for stakeholders. Stakeholders views on global change; driving forces at European scale and specific land use scale; and possible effects on their activities.

15.30-16.00 Tea/Coffee break

16.00-17.30 Plenary

- 16.00-16.30 Report back on break out discussions
- 16.30-17.00 Dagmar Schröter: Introduction: ATEAM modelling framework
- 17.00-17.30 Discussion

20.00 Workshop dinner

Friday 13th September 2002: Models and Ecosystem Services Indicators

Morning:

09.00-10.00 Plenary

09.00-09.30 Marc Metzger: Vulnerability assessment and preliminary maps
09.30-10.00 Discussion

10.00-12.30 Break out groups per sector

A 20-30 minutes presentation of models and ecosystem services indicators by leading researchers followed by discussion.

- Agriculture/biomass energy Pete Smith
- Forestry Santi Sabaté
- Carbon sequestration Martin Sykes
- Water Wolfgang Cramer on behalf of Nigel Arnell
- Biodiversity Sandra Lavorel
- Mountain environments Harald Bugmann

Each break-out group will consider the relevance of ATEAM's indicators, and discuss possibilities of rescaling these indicators for vulnerability mapping. Consideration of sectoral adaptation strategies and stakeholder information needs.

[Tea/Coffee break between 11.00 and 11.30]

12.30-13.30 Lunch

Afternoon: Plenary

13.30-17.30 Reporting back on morning break-out group discussions
Integration (Rik Leemans)
Evaluation of ATEAM progress

16.00-16.30 Tea/Coffee

16.30-17.30 Next steps & Concluding remarks (Wolfgang Cramer)

Scenario break-out groups

Agriculture and urban areas Presentation: Mark Rounsevell and Eva Kamphorst Moderator: Rik Leemans Reporter: Anne de la Vega-Leinert	Rosie Bryson (Velcourt Ltd., UK) Michael Butts (DHI Water & Environment, Denmark) Pierre Gatel (Association Générale des Producteurs de Blé, France) Daniel Green (Wessex Water, UK) Ybele Hoogeveen (European Environmental Agency, Denmark) Belinda Kinkead (Ecosecurities, UK) Pete Smith (University of Aberdeen, UK) Jacob Jan Vreugdenhil (Wageningen University, The Netherlands) Sipke de Vries (OBL, The Netherlands)
Forestry Presentation: Susanna Kankaanpää Moderator: Dagmar Schröter Reporter: Sönke Zaehle	Maria Teresa Baiges (Centre de la Propietat Forestal, Spain) Joan Botey Serra (European Confederation of Forest Owners, Spain) Ronan Girard (European Landowner Organisation, Belgium) Claude Rene Heimo (Environment –Ecology – Forest, Switzerland) Daniel Johansson (Eurelectrics, Belgium) Paul-Antoine Lacour (AFOCEL, European Confederation of Paper Industries, France) Oliver Scholz (European Confederation of Forest Owners, Germany) Santi Sabaté (Centre de Recerca Ecològica i Applicacions Forestals, Spain) Martin Sykes (Lund University, Sweden) Hans Verweij (Face Foundation, The Netherlands) Richard Volz (Swiss Agency for the Environment, Forest and landscape, Switzerland)
Protected areas Presentation: Jacomijn Pluimers Moderator: Sandra Lavorel Reporter: Marc Metzger	Pam Berry (Monarch Project, UK) Harald Bugmann (Eidgenössische Technische Hochschule, Switzerland) Laura Capone (Acta, Italy) Helmut Franz (Nationalpark Berchtesgaden, Germany) Rob Jongman (Alterra, The Netherlands) Dominique Richard (European Topic Centre/Nature Conservation, France) Bodo Weigert (Wasserforschung e.V., Germany)

Model indicator break-out groups

Agriculture:	Rosie Bryson (Velcourt Ltd., UK)
Presentation: Pete Smith	Pierre Gatel (Association Générale des Producteurs de Blé, France)
Moderator: Mark Rounsevell	Ybele Hoogeveen (European Environmental Agency, Denmark)
Reporter: Eva Kamphorst	
Carbon storage/Energy:	Ronan Girard (European Landowners Organisation)
Presentation: Martin Sykes	Belinda Kinkead (Ecosecurity, UK)
Moderator: Rik Leemans	Hans Verweij (FACE Foundation, The Netherlands)
Reporter: Sönke Zaehle	
Forestry:	Teresa Baiges (Centre de la Propietat Forestal, Spain)
Presentation: Santi Sabaté	Joan Botey (Confederation of European Forest Owners, Spain)
Moderator: Dagmar Schröter	Paul-Antoine Lacour (European Confederation of Paper Industries, and AFOCEL)
Reporter: Susanna Kankaanpää	Oliver Scholz (Confederation of European Forest Owners, Germany)
Water:	Mike Butts (DHI Water & Environment, Denmark)
Presentation: Wolfgang Cramer	Dan Green (Wessex Water, UK)
Reporter: Uta Fritsch	Daniel Johansson (Eurelectrics, Belgium)
Biodiversity/Nature conservation	Pam Berry (MONARCH Project)
Presentation: Sandra Lavorel	Dominique Richard (European Topic Centre in Nature Conservation)
Moderator: Richard Klein	Jacob Jan Vreugdenhil (Wageningen University, The Netherlands)
Reporter: Marc Metzger	
Mountain environments:	Laura Capone (Acta, Italy)
Presentation: Harald Bugmann	Helmut Franz (Nationalpark Berchtesgaden, Germany)
Moderator: Anne de la Vega-Leinert	Claude René Heimo (Environment –Ecology – Forest, Switzerland)
Reporter: Jacomijn Pluimers	Rob Jongman (Alterra, The Netherlands)
	Richard Volz (Swiss Agency for the Environment, Forest and landscape, Switzerland)

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Appendix 3: Participants information

Stakeholders

Ms Maria Teresa Baiges (*Centre de la Propietat Forestal, Spain)*

Training: Agriculture & Forestry Engineering, Agroforestry & Rural Resource Management.

Expertise: local private forest management plans in Catalunia, forest management constrains and opportunities in Mediterranean areas, close relations with and understanding of, forest owners, traditional silvopastoral systems.

The *Centre de la Propietat Forestal* is a public company, which fosters sustainable management of private forests [77% of total forested area (i.e. 1,5 M ha) in Catalunia]. It encourages forest owners to produce Forest Management Plans. It advises technicians and forest owners and eases their relation with forestry administration. A pioneer public forestry administration, which has integrated private competences, and in which, stakeholder participation plays an important role. **ATEAM sector:** forestry

Dr Pam Berry (Environmental Change Institute, University of Oxford, United Kingdom)
Training: Biogeographer with strong interests in applied plant ecology.

Expertise: potential impact of climate change on landscapes, ecosystems and selected groups of species in Britain and Europe; stakeholder dialogue on: i) conservation management; ii) definition of climate change concerns; iii) identification of key species and habitats and, iv) assessment of alternative response strategies in relation to European and UK policy.

Most recent projects: impacts of climate change on: biodiversity in East Anglia and the north west of England (RegIS - www.ukcip.org.uk/integ_assess/integ_assess.html), nature conservation resources in Britain and Ireland (MONARCH - www.ukcip.org.uk/model_nat_res/model_nat_res.html), agricultural activity and biodiversity across Europe (ACCELERATES - www.ukcip.org.uk/accelerates/acc.html).

ATEAM sectors: biodiversity, agriculture

Mr Joan Botey Serra

Expertise: Forest Owner in Catalonia (Spain), in charge of leading responsibilities in a number of forest owners organisations, including Consorci Forestal de Catalunya, Confederation of Spanish Forest Owners (Vice President), Confederation of European Forest Owner (Vice President), Pan European Forest Certification Council, Cork and Non-wood products Working Group in the Advisory Forest & Cork Committee of the EU (Coordinator). **ATEAM sector:** forestry

Dr Rosie Bryson (Velcourt Ltd., United Kingdom)

Training: biology, plant pathology, genetics. *Expertise:* evaluation of new crop protection products and varieties, remote sensing and precision farming, crop production methods and technology transfer.

Current responsibilities: Velcourt's Research & Development (R & D) project manager

Velcourt Ltd.: a farm management company which manages over 40,000 ha in the UK with a further 20,000 ha of advisory agreements. The farms are mainly arable but Velcourt also manage livestock and organic farms. The company has international consultancy contracts in France, Spain, Germany, Hungary and Zambia. Velcour R & D department focuses on needs-driven research to find practical solutions for the industry. The research is funded both by industry and government bodies such as Department of Environment, Food and Rural Affairs, Home Grown Cereal Authority and the European Commission. **ATEAM sector:** agriculture (biomass energy)

Dr Michael Butts (DHI Water & Environment, Denmark)

Training: Hydrologist. *Expertise:* fieldwork, hydrological data analysis and network design, development and application of hydrological models in ground and surface water, integrated catchment modelling and flood forecasting.

Current responsibilities: in charge of research activities within the Water Resources Division of DHI Water & Environment and co-ordinator of the EU 5th Framework project FLOODRELIEF (integrated hydrological and meteorological modelling and forecasting).

DHI Water & Environment is an independent, self-governing research and consultancy organisation affiliated to the Danish Academy of Technical Sciences. Emphasis on the development and dissemination of interdisciplinary knowledge, technologies and software regarding ecology and environmental chemistry, water resources, hydraulic structures, hydrodynamics and related areas (www.dhi.dk; www.dhisoftware.com). **ATEAM sector:** water

Ms Laura Capone (Associazione Cultural Turismo Ambiente, Italy).

Expertise: sustainable tourism issues, eco-labelling, development of ecological criteria for EU Eco-label on tourist accommodation for the Italian Environment Protection Agency (ANPA) and the European Commission. Involved in a series of activities to build awareness and increase the value of natural and cultural heritage within the Italian territory to promote local development through tourism according to the principles of sustainability.

Current responsibilities: in charge of Acta's international activities.

ACTA: a non-profit consultancy firm, which promotes sustainable tourism compatible with local environmental, cultural and economic concerns. It provides advice on (ecological) management and marketing of tourism activities; environmental impact assessments, landscape interpretation, nutrition, eco-auditing and eco-labelling. **ATEAM sector:** mountain environments, biodiversity

Mr Hans Franz (Nationalpark Berchtesgaden, Germany)

Training: biology and geography. *Expertise:* zoology, limnology, development of park management plans using geographic information systems (GIS). Involved in the Unesco-Program 'Man and Biosphere' (MAB).

Current and future responsibilities: i) head of the department for research coordination and information systems of the National Park of Berchtesgaden; ii) environmental monitoring (using the concept of the German cross-boundary Biosphere Reserve Rhön) and iii) analysis of land cover change and impact on Natura 2000 areas and landcover biodiversity.

The *National Park of Berchtesgaden* aims at: i) natural and natural process protection; ii) research (especially ecosystem research based on GIS; and iii) greater public awareness on environmental issues. Three Bavarian ministries (Environment, Interior, Forestry) and the district administration of Berchtesgaden are responsible for the administration of the national park. **ATEAM sector:** biodiversity

Mr Pierre Gatel: (Association Générale des Producteurs de Blé, France)

Expertise: modelling of carbon sinks and crop yields in the context of climate change, and biomass potential. Close collaboration with a number of French research institutes (especially l'Institut National de la Recherche Agronomique (INRA), France).

The *AGPB* represents the interests of French cereal producers at national and European level and liase between up and down stream activities. Its aims are: i) to consolidate market shares within the EU and worldwide; ii) to seek for new markets for cereal products, in particular by exploring potentials of new technologies; and iii) to address new consumers demands for greater quality and environmental labels.

ATEAM sector: agriculture (biomass energy)

Mr Ronan Girard (European Landowners Organisation, Belgium)

The *European Landowners Organization* (ELO) advises the decision-making and legislative process within the European Commission. It encourages a profitable and competitive European agricultural sector and a diversified rural economy. It promotes active involvement of owners in environmental and conservation policy and decision-making, rural businesses and development projects (e.g. under EU's structural funds). It raises public awareness on rural issues, and disseminates owners "best practices", especially where a successful relationship has been created with land use planning authorities.

ATEAM sector: agriculture, forestry

Dr Daniel Green (Wessex Water, United Kingdom)

Training: geography, European Union rural development and sustainable development

Expertise: sustainability reporting, environmental full-cost accounting, carbon management, biodiversity, stakeholder dialogue, medium to long term business planning, external communication, corporate social responsibility, general enquiries on sustainability and environmental policy and a pilot sustainability management system, Project SIGMA.

Current responsibilities: Sustainability Co-ordinator at Wessex Water Services Ltd.

Wessex Water is a regional water and sewage company for part of southwest England. Its catchment represents 10,000 km^2. It provides drinking water to around 1.2 million people in 513,000 properties and sewerage services to 2.5 million people. The company is committed to becoming a sustainable water company. **ATEAM sector:** water

Mr Claude René Heimo (Environment – Ecology – Forestry, Switzerland)

Extensive experience of international development agencies and regional and national development initiatives. A particular focus on socio-economic, financing and trade instruments, policy reform negotiations and institutional mechanisms for the promotion of environment conservation, sustainable development and natural resource management in many African and Asian countries. Closely involved in the Millennium Ecosystem Assessment.

Environment-Ecology-Forestry-Switzerland: a Swiss partnership venture specialized in the preparation, implementation and monitoring of natural resources development and environmental conservation projects. Currently involved in the TESEO Program on desertification sponsored by the European Space Agency and designed to reinforce the efficiency of desertification monitoring and drought early warning systems developed by national and international institutions working on behalf of the UN Convention to Combat Desertification. **ATEAM sector:** mountain environments, forestry, biodiversity, water

Mr Ybele Hoogeveen (European Environment Agency, Denmark)

Training: animal ecologist. *Expertise:* Biodiversity in relation to (agricultural)land use, indicator development, monitoring concepts and scenario studies.

Previous positions: Senior Policy Officer at Dutch Ministry of Agriculture, Nature Management and Fisheries, Research Team Leader at Alterra, Green World Research. More than 10 years experience in (nature) policy-making and applied scientific research in the fields of landscape ecology, metapopulation theory and multifunctional land use. Was closely involved in policy analyses by the National Institute of Public Health and the Environment and the National Bureau for Economic Policy Analysis.

Present position: Project Manager Agriculture & Biodiversity at the European Environment Agency, Copenhagen. Formally employed by the Dutch Ministry of Agriculture, Nature Management and Fisheries (Directorate Cabinet), but working as detached national expert at the EEA. Responsible for work in the area of agriculture and biodiversity, including contributions to the major EEA reports, sectoral and thematic assessment reports and agri-environment indicator development.

The European Environment Agency aims to support sustainable development and to help achieve significant and measurable improvement in Europe's environment through the provision of timely, targeted, relevant and reliable information to policy making agents and the public.

ATEAM sector: biodiversity, Agriculture

Mr Daniel Johansson (Euroelectrics, Belgium) Union of electricity industry

Training: biology, environment management and policy. *Expertise:* environment and sustainable development issues. As a centre of strategic expertise for the European Electricity Industry, *Eurelectric* identifies and represents the common interests of its members. **ATEAM sector:** carbon storage and energy

Dr Rob Jongman (Alterra Green World Research, The Netherlands)

Training: landscape ecologist. *Expertise:* Environmental statistics, river ecology, landscape analysis, classification and modelling, European ecological networks and planning, nature conservation and landscape planning.

Current responsibilities: treasurer of the International Association for Landscape Ecology. Involved in a number of European research projects on European landscapes.

Alterra Green World Research: the main Dutch centre of expertise on rural areas. Alterra engages in strategic and applied research to support design processes, policymaking and management at the local, national and international level. Among Alterra's research topics are: multiple use of rural areas, economy and ecology, integrated sector management (e.g. water, forest), sustainable agricultural systems, decision support systems, biodiversity, spatial and landscape planning (e.g. for recreation), geo-information and remote sensing, habitat creation, green belt development and ecological webs, and pollution risk assessment. **ATEAM sector:** biodiversity

Ms Belinda Kinkead (Ecosecurities, United Kingdom).

Training: environmental engineer. *Expertise:* energy efficiency programmes in the domestic sector, Australia; applied engineering work in the water and wastewater sector; development of carbon value from energy and energy-related projects; international climate change policy analysis and the clean development mechanism project cycle.

Coordinator of *EDGE, EcoSecurities:* Emphasis on baseline studies and designing, monitoring and verification plans for energy projects. e.g.: rice husk to energy biomass plants in Thailand, landfill gas to energy projects in Brazil and Malaysia, bagasse projects in Brazil and coal mine methane projects in the United Kingdom. **ATEAM sector:** carbon storage and (biomass) energy

Mr Paul-Antoine Lacour (European Confederation of Paper Industries and AFOCEL, France)

Expertise: competitiveness of primary resources, present and future forest resources in relation to fibre market dynamics, evaluation of economic efficiency of new technologies, policy implications for the paper industry sector and the implementation of eco-certifications

Current responsibilities: leader of the “Laboratoire Economie et Compétitivité”, within AFOCEL.

AFOCEL is a large consultancy collaborating with a number of pulp industries in France and abroad. It aims to improve supply of forestry-wood paper industry, to promote a reflection on wood in paper industry in France, and integration of up and downstream activities at national and international level. AFOCEL advises paper industries on technical, economic and strategic issues, and develops a range of tools for wood industry management. Its main research topics are in the fields of biotechnology, forestry, genetic improvement, supply and transport logistics, relationships between wood and industrial processes. **ATEAM sector:** forestry, carbon storage and energy.

Dr Dominique Richard (European Topic Centre in Nature Protection and Biodiversity (ETC/NPB), France).

Current responsibilities: Deputy Manager of the ETC/NPB. In charge of «Monitoring and Reporting activities». Coordinator of the next European Environmental Agency report on «The State of the Environment in EU and AC, 2004», the general focus of which should be on «sustainable development», based on several plausible scenarios of future socio-economic evolution. Also involved in the Millennium Assessment programme, which focus is on ecosystems services.

The aims of the *ETC/NPB* are the collection, analysis, evaluation and synthesis of information relevant to national and international policies for environment and sustainable development. The ETC/NPB supports the implementation of the European Union network of sites designated by Member States under the Bird Directive and under the Habitats Directive (e.g. Natura 2000). The ETC/NPB is involved, on behalf of the European Environment Agency, in various working groups, steering committees, fora of international or European programmes. **ATEAM sector:** biodiversity

Mr Oliver Scholz (European Confederation of Forest Owners, Germany)

The *European Confederation of Forest Owners* is an umbrella organization of national forest owner organizations in the European Union and represents the interests of the approximately 12 million forest owners across its member countries. Its member organizations in their turn represent around 42% of the privately owned forests in the member countries. **ATEAM sector:** forestry

Mr Hans Verweij (Forest Absorbing Carbon dioxide Emission Foundation, The Netherlands)

Expertise: carbon sequestration, clean development mechanisms, carbon trading, climate negotiations, sustainable forest management. *Current responsibilities:* Director of the FACE Foundation

The *FACE Foundation* promotes a number of activities leading to the planting and management of sustainable forests worldwide. Its revenues originate from forest planting within clean development mechanisms, consultancy, and carbon credits trading. FACE further develops carbon sequestration verification and certification, monitoring (e.g. of development of biomass) in collaboration with a number of (non)governmental and academic organisations. Example of recent projects include: reforestation in Mount Elgon National Park (Uganda), promotion of indigenous wood planting (e.g. Ecuador), restoration of forests damaged by acid-rain in Krkonose (Czech Republic), rehabilitation of tropical rain forest in Sabah (Malaysia). **ATEAM sector:** carbon storage and energy, forestry

Dr Richard Volz (Swiss Agency for the Environment, Forests and Landscape, Switzerland)

Training: Natural sciences, geography. *Expertise:* Forest monitoring, assessment of the state of forests, air pollution impacts on forests, acidification and eutrophication of forest soils, carbon sequestration in forests and forest soils, climate change impacts on forests, storm damages.

Current responsibilities: Informs and advises the policy and decision-making process concerning future Swiss forest strategies and storm-damaged forests.

The *Swiss Agency for the Environment, Forests and Landscape* is in charge of the implementation of the forest legislation with the following main principles: sustainable management of forests, maintenance of biodiversity, conservation of forest regenerative capacity, preservation of forest vitality and productivity. **ATEAM sector:** carbon storage and energy, forestry, mountain environments

Dr Sipke de Vries (OBL, The Netherlands)

Training: Technical sciences, economics, philosophy.

Expertise: Agricultural, bioenergy (e.g. bioethanol, biodiesel, wheat gasification) and renewable energy research and development.

Currently, secretary of OBL (which combines three Dutch companies: Royal COSUN U.A., CSM Sugar b.v. and Royal Nedalco BV) to foster the development of bioethanol from agricultural sources. Chairman of the Commission 'Biotechnology, Bioenergy and Agricultural resources' of the European Farmers Organisations (COPA) and the European Co-operative Agricultural Industries (COGECA).

ATEAM sector: agriculture (biomass energy)

Dr Bodo Weigert (Wasserforschung e.V., Germany)

Training: Biotechnology and Environmental Engineering; technical Biochemistry. *Expertise:* i) water and wastewater technology; ii) urban water management; iii) water management in the Berlin region, and iv) research management in water sciences

Managing director of *Wasserforschung e.V., Association for interdisciplinary water research:* a public, non-profit network organisation in the field of water sciences. Close collaboration and public – private partnership with a number of important actors in the water sector at international as well as local scale such as research institute, universities, businesses and water authorities (e.g. Vivendi, Berlinwasser, the Berlin Technology Foundation (TSB) and the Berlin University of Technology). Since 2001, close cooperation with Kompetenzzentrum Wasser Berlin (KWB). KWB's emphasis: technology transfer, bank filtration and groundwater recharge, (ground)water and waste management.

ATEAM sector: water

ATEAM

Prof. Nigel Arnell (University of Southampton, United Kingdom)
Expertise: Hydrology, water and catchment modelling.
Function within ATEAM: Principle investigator – water sector

Prof. Harald Bugmann (Eidgenössische Technische Hochschule, Switzerland)
Expertise: Forest population ecology, carbon, water catchment modelling in mountains regions
Function within ATEAM: Principle investigator – mountain sector

Prof. Wolfgang Cramer (Potsdam Institute for Climate Impact Research, Germany)
Expertise : Plant ecology, ecological modelling
Function within ATEAM: Project leader, Steering Committee Member

Dr Eva Kamphorst (Université Catholique de Louvain, Belgium)
Expertise: Physical geographer, land use scenarios - agricultural land use
Function within ATEAM: Scenario development

Dr Susanna Kankaanpää (Finnish Environmental Institute, Finland)
Expertise : Land use scenarios - forest land use
Function within ATEAM: Scenario development

Mr Richard Klein (Potsdam Institute for Climate Impact Research, Germany)
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Function within ATEAM: adviser on stakeholder dialogue, Steering Committee Member

Dr. Sandra Lavorel (Centre d'Ecologie Fonctionnelle et Evolutive, France)
Expertise : plant ecology, biodiversity modelling, species composition and distribution, migration potential, landscape ecology
Function within ATEAM: Principle investigator – biodiversity sector, Steering Committee Member

Prof. Rik Leemans (Wageningen University, The Netherlands)
Expertise: plant ecologist, emission (climate change) and land use (socio-economic) scenarios
Function within ATEAM: Principle investigator – scenario development, Steering Committee Member

Mr Marc Metzger (Wageningen University, The Netherlands)
Expertise: Vulnerability assessment maps, environmental classification
Function within ATEAM: Development of vulnerability mapping methodology

Dr Jacomijn Pluimers (Wageningen University, The Netherlands)
Expertise: Land use scenarios, in particular protected areas; stakeholder dialogue
Function within ATEAM: Scenario development, and coordinator of sectoral stakeholder dialogue

Prof. Mark Rounsevell (Université catholique de Louvain, Belgium)
Expertise: Land use scenarios, in particular agricultural and urban land use; agricultural modelling
Function within ATEAM: Principle investigator – scenario development, Steering Committee Member

Dr. Santi Sabaté (Centre de Recerca Ecològica i Applicacions Forestals, Spain)
Expertise: Forest modelling, in particular timber yields, species composition and distribution
Function within ATEAM: Principle investigator – forest sector, Steering Committee Member

Dr. Dagmar Schröter (Potsdam Institute for Climate Impact Research, Germany)
*Expertise: S*oil ecology, food web modelling, vulnerability assessment
Function within ATEAM: Scientific coordination of *ATEAM,* Steering Committee Member

Dr Pete Smith (University of Aberdeen, United Kingdom)
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Function within ATEAM: Principle investigator – agricultural sector

Prof. Martin Sykes (Lund University, Sweden)
Expertise: plant ecologist, vegetation dynamics, biogeography, carbon budget modelling
Function within ATEAM: Principle investigator - carbon sector - Steering Committee Member

Dr. Anne de la Vega-Leinert (Potsdam Institute for Climate Impact Research, Germany)
Expertise: physical geographer, stakeholder dialogue, vulnerability and adaptation assessment
Function within ATEAM: Overall coordination of the stakeholder dialogue

Mr Jacob Jan Vreugdenhil (Wageningen University, The Netherlands)
Expertise: Agronomy student, focus on stakeholder dialogue and the communication of scenarios
Function within ATEAM: observer

Mr Sönke Zaehle (Potsdam Institute for Climate Impact Research, Germany)
Expertise: Geo-ecologist, dynamic vegetation and carbon modelling
Function within ATEAM: Vegetation model development, validation, scenario analysis

Appendix 4: Questionnaire on ecosystem services and global change

Thank you for participating in the second ATEAM Stakeholder workshop on land use scenarios and indicators of vulnerability of ecosystem services to global change, 12th-13th September 2002, Potsdam, Germany.

In order for us to get to know you and your needs better and thus to provide you with relevant vulnerability maps, we kindly ask you to fill in the present questionnaire, which considers:

- ecosystems' goods and services relevant to your activity,
- possible impacts of global change on these ecosystems' goods and services,
- thus, potential impact of global change on your activity, and
- adaptation measures to global change
- desirable targets and thresholds for ecosystem services

The questions below are open ended. Please, take some time to reflect on what is important for your sector and/or activities. **Your opinion is very important for us**, so please, be as comprehensive as possible. If you cannot answer certain questions, tell us what information would be helpful for you to do so.

Your answers will NOT be distributed to outside parties without your consent. If you wish to remain anonymous, please do not fill the fist row in Table 1.

If you are not directly involved with the management of environmental resources or decision-making (e.g. if you act as an adviser to policy and decision-makers), please try to answer as the people you advise would.

Please complete electronically or by hand and return by the **6th September** to:

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Some definitions:

Ecosystem' services

Ecosystem' services are conditions and processes through which ecosystems, and the organisms that constitute them, sustain and fulfil human life.

Global Change

Global change includes changes in climate, atmospheric composition (e.g. CO_2 concentration), in nitrogen deposition (and other substances), biodiversity and land use

Indicator

An indicator is a sign or signal that relays a complex message, potentially from numerous sources, in a simplified and useful manner. The primary uses of an indicator are to characterise the current status and to track or predict significant change

Thresholds

Thresholds delineate acceptable from unacceptable conditions. Thresholds facilitate the interpretation of indicator results.

Table 1 – You and your activity

Name: Position: Organisation: If you wish to remain anonymous, please do not fill	…… …… ……
Mission of your organisation:	……
In which sector would you locate your activities? (more than one answer is possible)	☐ agriculture ☐ forestry ☐ recreation/tourism ☐ energy/carbon ☐ water ☐ biodiversity/nature conservation ☐ finance/insurance ☐ other, namely: ……
What is your role within this sector?	☐ entrepreneur ☐ environmental resource manager ☐ environmental resource adviser ☐ sector/ landowner representative ☐ regional policy adviser ☐ national policy adviser ☐ international policy adviser ☐ researcher and/or consultant ☐ other namely: ……
What spatial scale are you most concerned with?	☐ local ☐ regional ☐ national ☐ European ☐ international If you are concerned with a particular location and/or region, please specify: ……

Table 2 - Ecosystem services and the impact of global change

What are **the five most relevant** ecosystems' services for your sector/activities? (e.g. agricultural products, flood control, slope stability, drinking water, wild life, amenity value, timber)	What are **the mayor threats** of global change to these ecosystem services? (e.g. inundation, fires, tourism, intensive farming) Please indicate whether it is on the short term (<10 years), mid term (10 – 50 years), or long term (>50 years))	How could global change affect **beneficially** these ecosystem services? Which opportunities would you see for your activity? Please indicate whether it is on the short term (<10 years), mid term (10 – 50 years), or long term (>50 years)	Consider your list of ecosystem services in column 1. Which ones do you consider **most vulnerable** to global change? (simply tick the corresponding cell(s) below)
.....	.....	.....	.....
.....	.....	.....	.....
.....	.....	.....	.....
.....	.....	.....	.....

Table 2 Ecosystem services and impact of global change – Continued

What **other ecosystem services** do you consider important for your activity? Why? ……
Could they also be affected by global change? How? ……

Table 3 - Management and adaptation options

What is the **time horizon** for your management, investments or policy plans?	……
What adaptation measures do you **currently** use to cope with the threads identified in Table.2? (e.g. change in sowing/harvesting patterns, species planted, new energy/water supply, relocation of activity)	……
Do you think these measures would be **sufficient** should these threats increase in magnitude and/or frequency? What **other adaptation options** could you then adopt?	……

Table 4 - Ecosystem services: targets and threshold

Consider each of the ecosystem services described in Column 1, Table 2. Please write these below once more.	What **indicators**, if any, do you currently use to base your management/policy decisions? Please describe each indicator. (e.g. crop yield/year, Number of days with sufficient snow cover, area covered with forest)	Briefly describe (in words) **a desirable target** for each ecosystem service to achieve **an ideal situation** for your activity?	Briefly describe (in words) **the minimum level** each ecosystem service needs to reach in order for your activity to continue?
……	……	……	……
……	……	……	……
……	……	……	……
……	……	……	……

Thank you very much for completing this questionnaire!

Appendix 5: Additional documents distributed to stakeholders

The following flyers and posters were presented at the workshop and are currently available on-line at **http://www.pik-potsdam.de/ateam/stakeholderweb/ateam_stakeholder_material.html**

- **ATEAM flyer**
- **Land use scenario flyer**
- **Vulnerability flyer**
- **Agriculture and biomass energy poster**
- **Biodiversity poster**
- **Carbon storage and energy poster**
- **Mountain Environment poster**
- **Water poster**

Appendix 6: Evaluation questionnaire for the 2nd ATEAM's stakeholder workshop

Thank you once more for participating in the 2nd ATEAM stakeholder workshop. Please take a little time to complete the present evaluation questionnaire. This should take about 15 minutes. Your answers will be used to improve future ATEAM stakeholder dialogue activities and to report to the European Commission.

Please return during the workshop

1. Workshop preparation

	Yes	Mostly	Not really	No	No opinion
Did you receive sufficient information on ATEAM and the workshop (e.g. logistics, background information etc)?	☐	☐	☐	☐	☐

	Sufficient time	Not enough time	No opinion
Did you receive the information with sufficient time to read it appropriately?	☐	☐	☐

On what topic would you have liked to receive more information?

……

Feel free to add other comments on the workshop preparation:

……

2. Workshop content

	Yes	Mostly	Not really	No	No opinion
Do you think the workshop was worth the time you took away from your work?	☐	☐	☐	☐	☐

	Yes	Mostly	Slightly	No	No opinion
In general, was the workshop relevant to your work?	☐	☐	☐	☐	☐

	Yes	Mostly	Slightly	No	No opinion
In general, were the presentations interesting?	☐	☐	☐	☐	☐

	Yes	Some	Not really	No	No opinion
Do you think you have gained useful insights on the topics covered?	☐	☐	☐	☐	☐

	Yes	Some	Not really	No	No opinion
Do you think you will be able to integrate these insights into your work?	☐	☐	☐	☐	☐

	Too many topics	Enough	Too few Topics	No opinion
Was the number of topics covered adequate?	☐	☐	☐	☐

Which topic/s was/were most relevant to you?

……

Which other topic/s would you have liked to cover?

……

	Too much time	Enough	Too little Time	No opinion
Was time allocated per topic adequate?	☐	☐	☐	☐

Feel free to add other comments:

……

3. Discussion

	Too much time	Enough	Too little Time		No opinion
Was time allocated for discussion adequate?	☐	☐	☐		☐
	Too much plenary	Adequate	To many break-outs		No opinion
Was the mix between plenary and break-outs adequate?	☐	☐	☐		☐

Did you feel you were in the appropriate break-out groups?

	Yes	Mostly	Sometimes	No	No opinion
Scenario group (Day 1)	☐	☐	☐	☐	☐
Sector group (Day 2)	☐	☐	☐	☐	☐
Did you feel comfortable enough to express your views?	☐	☐	☐	☐	☐
Did you feel that your views were adequately valued?	☐	☐	☐	☐	☐

	Yes	Mostly	Sometimes	Did not notice the moderators	No opinion
Was the role of the moderators clear to you?	☐	☐	☐	☐	☐

	Yes	Sometimes	No	No opinion
In general, are moderators important for you?	☐	☐	☐	☐

Feel free to add other comments:

……

4. Networking

	Yes	Most	Some	No	No opinion
Were the other participants relevant to your work?	☐	☐	☐	☐	☐

	Your scenario group	Your sector group	In both groups	In neither of these groups	No opinion
Were the most relevant people in…?	☐	☐	☐	☐	☐

	Yes	Perhaps	No	No opinion
Do you consider keeping in touch with some of them outside ATEAM activities?	☐	☐	☐	☐

If **yes**/**perhaps**, what would motivate you to do so?

……

	Yes	No	No opinion
Do you think that ATEAM should act as a networking platform?	☐	☐	☐

5. Future collaboration with ATEAM

	Yes	Perhaps	No	No opinion
Would you consider attending another ATEAM stakeholder dialogue activity?	☐	☐	☐	☐

	sector-specific activity	project-wide activity	no preference?
If **yes**, would you prefer to participate in a …	☐	☐	☐

If **perhaps**, what could we improve/change in our future stakeholder workshop (e.g. shorter activity, more focus on a specific topic, closer to your work…):

……

If **no**, please tell us why (e.g. not relevant enough, no time…):

……

	Yes	No
Have you talked about ATEAM with colleagues of yours?	☐	☐

Who else should we approach?

……

	Yes	No
Can we contact you later to obtain their details?	☐	☐

	Yes	No
Would you like to remain informed of ATEAM's activities?	☐	☐

	Yes	No
Would you like to receive information on ATEAM's results?	☐	☐

Thank you very much for answering this questionnaire!

Appendix 7: Results of the evaluation questionnaire

Note that the evaluation questionnaires was only filled by stakeholders. Eighteen out of twenty-two questionnaires were handed in. All charts displayed in the following pages are based on absolute numbers, rather than percentages. ATEAMers provided a more informal feedback.