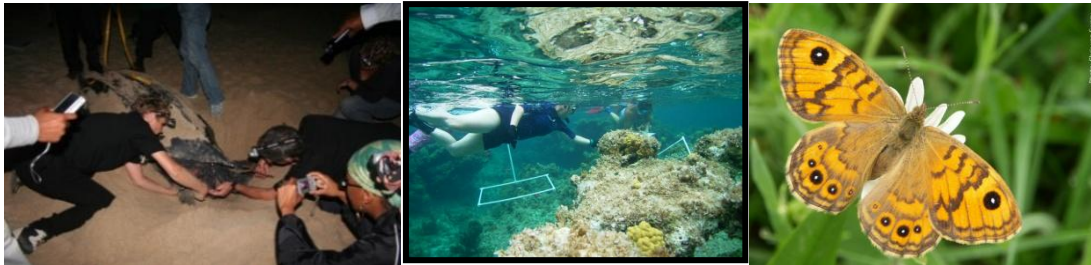




**Summary Report of the EEA Workshop**  
**Lay, Local, Traditional Knowledge and Citizen Science: Their Roles in**  
**Monitoring and Assessment of the Environment**

**27-28 June 2011**

**EEA Conference Room, Copenhagen**



**Prepared by EEA**

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**butterfly Photo: ©Chris van Swaay, child birdwatcher: Rick Bonney, coral reef survey: John Rollino**

**Collage by Cigdem Adem**

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## Objectives of the Workshop

1. Review LLTK (lay, local, traditional knowledge) and CS (citizen science) contributions to **collecting and processing information and the long-term monitoring of the environment**
2. Review / discuss LLTK and CS contributions to integrated **assessments of the environment** with a focus on **reliability**
3. Address challenges related to **data handling, quality assurance** and **effectiveness evaluation** in selected LLTK studies and CS projects.
4. Explore the use of **tools** (GIS, mapping, smart monitoring instruments etc.) in citizen science projects.
5. Review experiences of **interaction** between on the one hand LLTK and CS, and on the other **policy-makers, scientific communities** and **relevant organisations**.
6. Discuss how citizen science **networks are organized and maintained**.

## Expected Outcomes

1. Enhanced understanding within and across the EEA of the contribution of LLTK and CS to long-term monitoring and to integrated environmental assessments.
2. The identification of EEA project(s) that would help promote LLTK and CS.
3. A shared understanding of the most effective methods for ensuring a) the reliability of data and b) the continuity of LLTK and CS projects.
4. An inventory of the most reliable and innovative tools (GIS, mapping, smart monitoring instruments etc.) to support LLTK and CS projects.
5. An appreciation of the basic requirements for robust effectiveness evaluations of LLTK and CS projects.
6. To promote factors, processes (including dissemination of results etc.) and institutional models that can improve the links between on the one hand LLTK and CS, and on the other policymakers and relevant organisations.

## Workshop Report

### Summary

The workshop lasted one and a half days with the attendance of 59 participants who came from across Europe and from the US, Canada and Russia as well. A beekeeper's workshop was also held back-to-back with the LLTK and CS workshop. The agenda, objectives and brief summary of the beekeeping workshop can also be found in the appendix.

The goals and benefits of LLTK and citizen science were explained and good practices of citizen science projects were cited. Methods to cope with challenges related to data handling, quality assurance and effectiveness evaluation were discussed. To assure reliability different methods are used such as combining different sources, using holistic data and carrying out professional data analysis and quality control. The use of tools such as GIS, mapping and especially developing applications for smart monitoring instruments are getting popular and making monitoring more accessible to citizen scientists. The endurance of citizen scientists and citizen science projects were

another aspect of discussions. For the former, increasing the motivation and adequate training of citizen scientists is crucial as well as involving citizen scientists and indigenous people during project design, giving feedback regularly and maintaining good communication via various tools. For the latter, funding and sources of funding are significant. Plurality and diversity of knowledge, including scientific and lay, local, traditional knowledge can be valuable for good policy-making. Multi-dimensional approach (environmental, economic and social) and multi-stakeholder participation works better and improves trust in the interaction between lay, local, indigenous people and the scientific communities, policy makers and other various stakeholders.

### ***Establishing common grounds from diverse LLTK and CS activities: 'Rainbow Revealed'***



**David Gee** explained that the workshop has its origins in Volume 1 of the book “Late Lessons from Early Warnings: the Precautionary Principle 1896-2000” (EEA, 2001). [http://www.eea.europa.eu/publications/environmental\\_issue\\_report\\_2001\\_22](http://www.eea.europa.eu/publications/environmental_issue_report_2001_22). Two of the 12 late lessons were to make more use of ‘lay’ and local knowledge and to conduct more long-term monitoring. In order to further promote these lessons, we commissioned a scoping report into the use of LLTK and CS in monitoring and assessment, with a particular focus on the reliability of this knowledge.

On the basis of this report, we decided to organize a workshop with the objective of, *inter alia*, reviewing LLTK and CS contributions to the long-term monitoring and assessment of environments. The scoping report aims to promote the uptake of LLTK in decision-making, by investigating what LLTK is, how it can be used and what are the main factors that promote its use, including how the production of LLTK can be fostered by decision-makers. It is also accompanied by three case studies on bees, birds and Arctic knowledge.

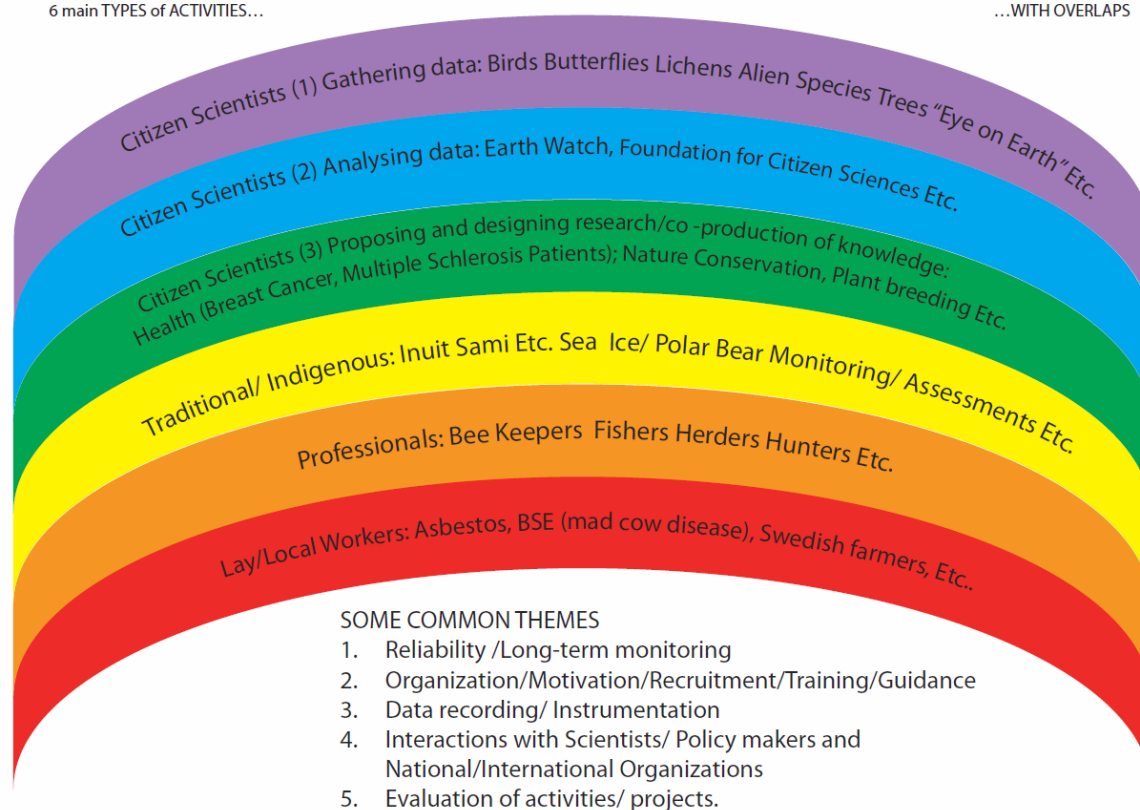
There is a very wide range of interests and activities covered by Lay, Local, Traditional Knowledge and Citizen Science. It embraces decades old monitoring of fisheries, birds, and indigenous ecosystems and their species as well the more recent citizen observations of corals, lichen, climate change impacts, noise, air pollution, beaches, butterflies, bees, and alien invasive species. It also includes varying levels of involvement of the public in mapping their neighbourhoods, helping to implement existing scientific research projects, and in working with scientists to construct and oversee research projects covering, for example, the causes of diseases, health inequalities, bee colony collapse, the health of lake ecosystems etc.

The “Rainbow” below tries to capture this wide variety of LLTK and CS activities which this workshop will cover. (Fig. 1)

## THE RAINBOW OF LLTK and CS ACTIVITIES

6 main TYPES of ACTIVITIES...

...WITH OVERLAPS



**Figure 1** Rainbow of LLTK and citizen science activities.



**Jacqueline McGlade**, the Executive Director of EEA, focused on the EEA (2011) publication of Signals, the basic features of green economy where public participation and protection of the public good is vital, GMES (Global Monitoring for Environmental Security) in-situ coordination and INSPIRE (Infrastructure for Spatial Information) which integrate space and in-situ observations via web mapping, Eye on Earth and the role of citizen science. Data fusion and Sensor Web Enablement can work with different themes such as urban, biodiversity, waste, disasters and energy related issues. In addition, Ms. McGlade explained that the landscape of information and data is changing; people have the power to observe things before they have become part of science and to tell the rest of the world. Further, the evidence used in policy development needs to better reflect LLTK and CS.

## *Science for Citizens and Citizens in Science*



The next presentation was by **Rick Bonney** from Cornell University, Lab of Ornithology, US, who asked “Can citizen science save the world?” Citizen science is organized research in which members of the public—who may or may not be trained in science—are involved in one or more steps of the research process. He talked about the history of citizen science activities. Citizen science goals are to increase scientific knowledge, conservation action and scientific literacy. He mentioned the e-bird portal, citizen science.org website, the research on state of the birds and the plans to form an association of citizen scientists. He also outlined the steps in Public Participation in Scientific Research such as defining a question; gathering information; developing explanations; designing data collection methods; collecting and analyzing samples; analyzing data; interpreting data; disseminating conclusions; discussing results which can all be co-created with citizen scientists. “The citizen scientists that we have created will be bird enthusiasts for life. This encourages observation skills that can be extended well beyond bird watching ... bringing science into their homes and hearts.”



**Samantha Burgess** from Earth Watch talked about the motivation of scientists and ‘volunteers’, discussed issues related with data quality, and explored what makes a citizen science project successful. Ms. Burgess explained that successful projects contribute to education, research, implementation, community involvement, improved livelihoods and better informed management strategies. She cited examples from on-going coral reef projects underlining the benefits of the projects. She emphasized that citizen science is not eco-tourism and training is required. (See working groups section below **Requirements of effectiveness evaluation of activities/ projects** for further information.)



**John Rollino** talked about his long experience of working with volunteers as part of an Earth Watch project on coral reefs in Bahamas. He underlined the considerable economic benefits of working with citizen scientists and emphasized that citizen scientists serve as multiplied benefits such as providing the lay person with firsthand experience, with scientific information and improving skills for data collection. It can also provide useful information to scientists such as local knowledge, anecdotal references and prior site photographs.



**Johannes Vogel** from English Natural History Museum described the projects of the NHM on citizen science such as OPAL (Open Air Laboratories Network) that conducted 6 surveys on soil quality and earthworms, air quality and lichens, water quality and aquatic invertebrates, hedgerows, climate and bugs counts, He further emphasized the opportunities of citizen science, how it can function as a tool to reach new audiences like fly fishermen. Mr. Vogel explained the vision Natural History Museum on citizen science for 2020: To convene a coalition and International partnerships, to lead best practice and thinking in citizen science engagement, to foster innovative development using face to face and new technologies, to develop science - community partnerships. He also underlined the historically high motivation of the people in the UK to engage in such activities.

***Using indigenous knowledge in environmental monitoring and assessment activities***



**Patricia Cochran** described the database [www.nativeknowledge.org](http://www.nativeknowledge.org) on traditional Arctic knowledge and the interactions of indigenous people and scientists; [www.nativescience.org](http://www.nativescience.org) on Arctic projects and protocols; various existing Arctic networks like Arctic Alliance, Northern Research Forum, and Many Strong Voices. Ms. Cochran also talked about the involvement of indigenous peoples at international conferences especially the ones related with climate change such as COP-15 in Copenhagen and COP-16 in Cancun and the Indigenous Peoples' Global Network on Climate Change and Self Determination.

**Victoria Sharakhmatova's** presentation was about a climate change project that was conducted by Ethno-Ecological Information Center "Lach" in 2010 in Russia and supported by the Bureau of the United Nations Permanent Forum on Indigenous Issues. The goal of the research was to identify the impacts of climate change on the traditional land use of Kamchatka indigenous peoples. The main methods of the research were questionnaires and interviews. Ms Sharakhmatova focused on explaining the results of the research accompanied by nice pictures from the site. The research was based on questions such as "Do people notice the change in climate?", "Have the weather conditions changed the fields of economic activities" and "Have the places of traditional economic activities shifted?" She also highlighted the need to develop adaptation measures at regional level and an aboriginal system for community-based climate change monitoring.



**Kári Fannar Lárusson and Michael Svoboda** briefly explained their organization CAFF (Conservation of Arctic Flora and Fauna), established in 1992, which is part of Biodiversity Working Group of Arctic Council. The Circumpolar Biodiversity Monitoring Program (CBMP) is an international network of scientists, government agencies, Indigenous organizations and conservation groups working together to harmonize and integrate efforts to monitor the Arctic's living resources. For CAFF, existing monitoring in the Arctic is largely uncoordinated, limiting the ability to effectively monitor, understand and respond to biodiversity trends at the circumpolar scale. Hence, CBMP is developing four biodiversity monitoring plans on marine, freshwater, coastal and terrestrial ecosystems. The primary objectives of CBMP are to incorporate data, interpretation, and expertise from CBM (Community based Monitoring) in the CBMP's efforts to detect, understand and report on significant Arctic biodiversity trends. It also provides CBMP data, interpretation, and expertise to CBM efforts. It further promotes the extension and/or replication of established CBM approaches and programs to other regions of the Arctic. To reach these objectives, CAFF is working in cooperation with ELOKA (Exchange for Local Observations and Knowledge of the Arctic), with representatives from the Arctic Council Permanent Council, and other related stakeholders.

**Brian Wynne** approached the local and traditional knowledge from the perspective of science focusing on the challenges to science by proposing new value-based frames and criteria. He underlined the fact that for good policy-making, plurality and diversity of knowledges can be valuable. Mr. Wynne explored the case of sheep farmers and scientists in Sellafield, UK in the aftermath of the Chernobyl accident. To monitor, understand and manage the post-Chernobyl (and chronic Sellafield) problems, local and scientific knowledge was relevant. Indigenous and traditional knowledge-actors do not only possess salient knowledge which experts lack, they also have different value-based frameworks for environmental assessment such as longer timescales of relevance and different questions and frames of meaning from different social needs. They can also provide

evidence of important, causal relations and awareness of connections across boundaries that are normally guarded by different scientific disciplines.

### ***Involving citizens in the monitoring of Invasive Alien Species***



**Myriam Dumortier** from DG Environment talked about why the EU is interested in invasive alien species (IAS). IAS is a rapidly growing driver of biodiversity loss and yet there is no comprehensive EU policy. IAS has not only negative impacts on biodiversity but also on human health and the economy. At COP 10 (Convention on Biological Diversity, 10<sup>th</sup> Meeting of the Conference of the Parties), held in Nagoya and also in EU Biodiversity Strategy 2020, 3 of the targets are on IAS: That IAS and pathways are identified and prioritized, priority species are controlled or eradicated, and measures are in place to prevent their introduction and establishment by 2020. Ms. Dumortier focused on the EU Biodiversity Strategy which will fill policy gaps in combating IAS by developing a dedicated legislative instrument by 2012. This will cover prevention, early warnings, rapid responses, eradication, management, containment, restoration and surveillance. As specialist volunteers, hunters, farmers, fishermen, anglers, foresters, gardeners, water managers, local authorities and general public have the capacities to contribute to these goals.

**Malene Bruun** from the EEA Eye on Earth team presented Eye on Earth and why the EEA uses Eye on Earth as a website to run citizen science activities. The aim is to initiate and facilitate citizen science activities via a website. There are several reasons for the EEA to engage in citizen science activities: An increasing interest in Citizen Science, the Agency's need to engage with more target audiences and the advancement and availability of Information, Communication, Technology (ICT) tools which make such activities more accessible to citizens. EEA is particularly interested in running a citizen science project about invasive alien species (IAS). She underlined the political interest in the monitoring of IAS, expert emphasis on the need for 'surveillance and monitoring activities', and the already existing communities active in voluntary biodiversity monitoring. The vision is to engage citizens in the observation and reporting of invasive alien species so as to fill gaps in our knowledge, and hopefully to contribute to the establishment of an IAS Early Warning and Rapid Response System for Europe. The pilot phase of project will be started in 2011. The ultimate target is using citizen science for Naturewatch.

**Eric Graham** from the Center for Embedded Networked Sensing (CENS) at UCLA informed the audience about the smart phone and website systems that have been developed with the National Park Service to help combat the spread of invasive species. Visitors "geo-tag" photos of invasive weeds and pests and the app automatically sends them to the database. The most common IAS is

sent to the phone, based on GPS location and a classroom field trip was organized with the students as a pilot study. Mr. Graham addressed three challenges: (1) reports of IAS are mostly tied to “events” rather than to constant data collection by hikers. (2) only about 10% of the registered users actually collect data. (3) an increase in data collection does not seem to be linked to the release of the iPhone app but the establishment of new areas by park officials and new registrations are. He also described the BudBurst Mobile – U.S. Plant Phenology Watch. Project BudBurst has, since 2009, over 12,000 participants to monitor individual plants and collect “survey” phenology data. Participants can view the progress of their own data collection relative to historical data and mapping. Shared, “community” plants add a layer of social activity to participation. Lists of plants, both local and national, based on GPS, are available. For uploading photos, flickr can be utilized.

### ***Monitoring biodiversity: living things, lively techniques***



**Petr Vorisek** –Czech Society of Ornithology

After explaining the role and importance of volunteers in Pan-European Common Bird Monitoring Scheme, Mr. Vorisek told about the number of volunteers in 25 countries in the latest monitoring, in 2010. Petr underlined the fact that training and data quality control are crucial in getting bird related data. Accuracy, precision and detectability are very important regarding the data quality. Hence it is significant to explain to the volunteers why they are required to count birds. Mr. Vorisek emphasized the importance of keeping volunteer happy. He highlighted the difference of volunteers since in some countries they are inspirational to professionals whereas in other countries the organizers had to prepare identification guidebooks. He mentioned that data analysis and quality control is carried out by professionals.



**Romain Julliard** from French National Natural History Museum

explained about the flower-dwelling insects survey based on amateur photographs with more than 500 participants. This survey is significant because pollination is a degraded ecological function and there are multi-factor pressures such as climate change, urbanisation, intensified agriculture and pesticides. The participants identified the names of the insects by checking the on-line identification guide. They also share their collection on the Internet and they can comment on the collections of other participants. Mr. Julliard shared the mapped results of the survey with the audience.

**Jurgen Binder**, President of European Beekeepers Association, made a short presentation highlighting that bees are a sensitive indicator of the health of the landscape. If the agriculture system is not switched back to organic, the bees will get weaker and weaker and they may become extinct. Industrial agriculture has brought pesticides and insecticides which are more or less negative on bees, especially when sprayed into the blossom. The beehive cannot grow and sustain. They need to be banned by the governments. Bees need to be considered as a partner of agriculture by farmers. The scientists in bee research have to be independent from the chemical industry.



**Walter Haefeker**, President of the European Professional Beekeepers Association, focused on the necessity of a new approach to agriculture arising from European and especially the German bee colony loss. He emphasized that whatever happens in the man-made environment has a huge impact on the health of honeybees; quality and marketability of bee products; viability of beekeeping operations; the number of honey bee colonies in the environment; and the pollination of agricultural crops and nature. He also talked about the interaction between scientists, beekeepers and policy makers. Citizens should not be perceived as just an extension of projects designed by the scientists. Citizens need to be closely involved in the design of the projects. They need to observe scientists and make sure that they actually work for the public interest. Government agencies and publicly funded scientists need to be reminded that they work to protect the general public, the environment and beekeepers from harm and they are not working for the interest of multinational corporations. Mr. Haefeker thinks there is strong evidence of synergy between common bee diseases and GMO crops. He emphasized that honey is not marketable if GM pollen is found so GM crops need to be banned.



**Mike Depledge**, from the European Centre for Environment and Human Health of the Peninsula Medical School pointed to the link between monitoring the environment and human health. Not monitoring effectively may result in failure to detect human health threats in addition to ecosystem decline and biodiversity loss. He cited three examples: Rapid Assessment of Marine Pollution (RAMP) the Mappiness Application and the Message Application. RAMP utilizes chemical and biological techniques and is rapid, easy to use, inexpensive, ecologically relevant, and useful to environmental managers. In risk assessment, conducting detailed chemical, biological, ecological, socio-economic and health studies at specific locations are necessary to decrease scientific uncertainty. The Mappiness Application maps under what circumstances people

are happy and how happiness varies over time. The location of people plus other data on physical activity, air quality and noise are recorded with sensors/ instruments and individual questionnaires are conducted. In addition, Message App uses GPS-enabled air pollution sensors and creates high resolution maps for air and using sensors on bikes, cars and people.

## **Working Groups**

### **Reliability of long-term environmental monitoring and assessments**

There were four presentations in this working group to foster the discussions.

**John Rollino** from AECOM Inc. delivered a presentation on Long Term Reliability and Monitoring Using Citizen Science by focusing on his longstanding work on Bahamian Coral Reef Survey. After briefly explaining the main features of corals and the work that needs to be carried out he emphasized the importance of volunteer management and the involvement of local people. As part of Earth Watch expeditions data was gathered by volunteers in the last 20 years. Mr. Rollino, focused on the importance of training, underlining the fact that excellent results are achieved when classroom training is combined with practical field work. Bahamian coral reef survey carries out 2 days of training where within two days; volunteers are comfortable in identifying 25 individual species using taxonomic keys. Further, he mentioned that volunteers enjoy receiving a brief synopsis of the data they collected. Providing frequent updates on the findings keeps the interest in the research alive as well. He added that local knowledge is a good source of non-technical data implying that photos, memories of change are as important as technical data. He thinks that locals need to be encouraged to participate and utilize their efforts as much as possible.

**Michael Svoboda** from Environment Canada made a presentation on “Arctic Borderlands Ecological Knowledge Coop: Example of northern collaborative community based monitoring” that mainly focused on the goals of the community based monitoring (CBM) program of the Coop and lessons learned through this process. Borderlands Co-op monitors and assesses change in the Porcupine Caribou Herd and in Mackenzie Delta in Yukon and Alaska. The goals are to monitor and assess ecosystem changes in the range of the Porcupine Caribou Herd and adjacent coastal and marine areas; to encourage use of both science-based studies and studies based on local and traditional knowledge in ecological monitoring and ecosystem management; to improve communications and understanding among governments, aboriginal and non-aboriginal communities and scientists with regard to ecosystem knowledge and management and to foster capacity-building and training opportunities in northern communities in the context of the above-listed goals. Mr. Svoboda further depicted lessons learned during CBM. Local observations of environmental conditions supplement scientific indicators and fill in gaps which provide more detailed and site-specific information. Local knowledge from interviews is more easily analysed when obvious or strong trends exist. Both scientific and local knowledge can be used to develop a holistic understanding of ecological change in the Arctic Borderlands region. Reliability depends on the level of effort (funds, capacity, expertise,

and design) and also on the objectives such as early warning, relative trends and quantitative measures).

**Mora Aronsson** from EEA-European Topic Center (ETC) Biodiversity, made a presentation on the monitoring of Swedish threatened Vascular Plants from 1987. The partners are Swedish Botanical Society, regional NGOs, County boards, Swedish Species Information Centre and Swedish Environmental Protection Agency. The organization consists of one national coordinator, 24 country coordinators and 400-500 flora guardians. They visit sites of Red Data Book species regularly, improve information about the site (e. g. coordinates with GPS), count the number of individuals, and note various data as threat, need of actions. The results are used for Red List update; to prepare action plans for threatened species; EU Habitat Directive; for environmental monitoring; for the follow up of political goals in the environment sector; and to implement Protected Area management plans. It is successful because it is bottom up; it acts locally; there is no hurry; it interacts and integrates; and it is open for continuous feedback and public validation.

**Zsolt Molnar**, from the Institute of Ecology and Botany of the Hungarian Academy of Sciences, focused on the use of traditional ecological knowledge in monitoring nature conservation. TEK is needed in monitoring and gathering knowledge on behaviour of (complex) systems, slow changes and/or rare events – long-term monitoring. Many aspects were not documented in „historical” documents (aerial photos, maps, written records) so we need oral history, to find out the changes in traditional land-use. TEK is often detailed, science-independent and reliable. Adequate anthropological interview methods are necessary to inscribe the knowledge. The reliability can be assured by combining different sources. More holistic data is a must for more reliable monitoring. TEK can be on vegetation change, herding methods, speed of change, motivations, attitudes towards nature and nature managers. The research areas for TEK can include wild plant species and habitat knowledge, knowledge on vegetation/landscape changes and perception of the national park activities. The methods consist of free-listing, semi-structured interviews, picture-based questionnaire, „live” herbarium, participatory field work and field trips. Mr. Molnar further described examples from a salt steppe ecosystem such as conflicts on when to cut hay, how to maintain hay quality, what various local habitat names there are and the richness in diversity of habitat types distinguished by herdsman in the salt steppe. Another important aspect of TEK is to find out the perception of landscape history (e.g. since when has the landscape been salty?) and perception of population changes. TEK can be used in nature conservation in the following areas: Conservation of steppes needs traditional grazing regimes and adaptive management needs knowledge on landscape/vegetation changes. Better understanding of cause-effect relations of traditional grazing helps management planning. TEK can also help change government subsidy-systems.

### **Use of innovative tools in citizen science projects**

There were two presentations to stir up the discussions. One of them was by Loraiza Davies from Royal Society for the Protection of Birds on WorldBirds Global Implementation. (We are waiting for her presentation.)

**Loraiza Davies**, from the Royal Society for the Protection of Birds made a presentation on WorldBirds as a tool for data collection and to foster participation and public involvement. The group's objectives are to make use of technology to facilitate public involvement in conservation at a global scale, to harness data previously unavailable, and to encourage the collection of data in a more systematic way especially as a precursor of bird monitoring schemes. The WorldBirds system is set up to answer birdwatchers' main questions (where, when, what species, etc.) but is flexible to allow for defining other fields. Data sharing will occur via a consolidated database through the Avian Knowledge Network and made available to GBIF. Each country manages its own system, the data quality in it and its usage. Desired outcomes include increased public involvement and numbers of volunteers, a common bird monitoring scheme and training, and paper data that would have been lost otherwise will have been computerised and imported into the relevant system.

**Chris van Swaay**, from Butterfly Conservation Europe, made a presentation on butterfly monitoring in Europe and focused on their experiences with citizen scientists. He talked about why volunteers are needed, how to find volunteers and how to keep volunteers and maintain the motivation. Butterflies are good indicators for biodiversity, are attractive and easy to count. Butterflies offer possibilities for large scale trend detection with the help of volunteers, on a local, national and European level. Counts made by volunteers help the conservation of butterflies directly by collection of local data on changes in the number of butterflies, which can be used immediately for conservation at the local level. The results can also be used to in nature conservation at a state or country level. On a European scale it helps to direct conservation efforts. After explaining various methods to count butterflies, Mr. Swaay illustrated how to keep volunteers by publishing butterfly magazines, preparing an annual report, organising butterfly days and websites and taking the contribution of volunteers seriously. A manual can be prepared with detailed description of the transects and counts and what to do when there are problems. Strict quality control of data is crucial via various methods such as checking the distribution with atlas data, checking the flight period and by double checking the data.

Discussion by the group included the following points:

Innovative Technology (mobile devices, webcams and simple sensors) is attractive in that the immediacy (in data collection and feedback) is attractive and engaging and the main reason to use technology. In order to facilitate the creation and use of technology for citizen science, the cyber infrastructure (backend servers and databases) must be established and maintained. Maintenance is often not supported by many academic grants and so much comes from governmental or non-governmental organizations willing to host the backend. Because citizen science projects are often under-funded, it will be necessary to engage programmers for citizen science by non-financial means. An established cyberinfrastructure should ideally offer open, free data analysis packages for feedback, web services as open Application Program Interfaces (API), provide connections to outside data sources / translations, provide a means for integration of separate databases and systems, and leverage social networks (Facebook, twitter) for the advancement of contributors, information about contributors, and recruitment.

Technology covered included mobile phones (both basic with only SMS texting support as well as “smart phones”) and newer tablet computers. New and current capabilities of such devices include the open-source Ushahidi for incident reporting/text messaging, augmented reality programs, and outdoor games (such as <http://floracaching.org>). Development of software for mobile devices can be aided by open-source software, such as Open Data Kit (<http://opendatakit.org>) for survey-like applications versus creating custom applications which are better suited to more specific or “branded” tasks. Barriers to the use of mobile devices for data collection include the ownership of smart phones vs. basic phones, age barriers to acceptance of mobile technology and the web, education level, and the current use of paper forms.

Other technology covered included web cams and simple sensors. Web cams can be from individuals or civic-run. One barrier to the use of web cams for automated data collection is the backend required for harvesting images and then the subsequent image processing in order to reduce data for later human-verification/observation. The creation of a set of web pages to facilitate human verification (like <http://www.galaxyzoo.org>) is ideal. Sensors discussed included those that could be attached to mobile devices to increase the data collection capabilities of the phones and it was indicated that these need to be simple to use and inexpensive.

Some of the issues brought up included that all technology for citizen science needs methods to deal with groups (school groups or those lacking full access to technology) and their input of data. It would be ideal if we could use technology to create a culture of data collection. It was also pointed out that because motivation to participate in citizen science is often intrinsic (for personal gain, whether it is merely satisfaction or for increase in status) rather than extrinsic (for the greater good), that new technology may be adapted more quickly if before it asks for data input it provides a service first, such as points gained in a game, status updates to social networking, or useful information for individuals (weather or beach conditions, plant descriptions or photos, or news items of interest).

### **Interactions between LLTK and CS and scientific communities/ policy makers/ National/ International Organizations**

**Peter Schlyter** described a successful use of a group modelling method over a one year period with more than 40 stakeholders who identified factors and processes (social, economic, biophysical and psychological) that effected their life in the mountain area and their relations to the achievement /non-achievement of the national environmental objectives for mountainous areas and their narratives were converted to common system maps as part of the process. This modelling provided an efficient platform for dialogue. As a result, all participants, including the Swedish Environmental Protection Agency, gained a better understanding of the mountainous environment (both in physical and social terms) and identified new relationships and previously unidentified causes of stakeholder conflicts and poor environmental target achievement. A joint causal loop diagram model on the social, economic and environmental dynamics in the Swedish mountains was developed during the project. A multi-dimensional approach (environmental, economic and social) and multi-stakeholder participation helps to improve the interaction between lay, local, indigenous people and the scientific communities, policy makers and other various stakeholders. During group modelling stronger stakeholders lost some of their position and the disadvantaged groups were able to better express themselves and mutual understanding also improved.

The second presentation was on Participatory Plant Breeding project that continued for 10 years in France by **Berangère Storup** from the Citizen Sciences Association. Farmers and scientists work together in participatory plant breeding which lowers the risks. Farmers have the intuition and scientists have the methodology and tools especially for mechanisms of evolution which are further utilised to analyse the consequences of practices of biodiversity. The network is making the coordination and communication.

The third presentation was by **Lis Mortensen** on INTERACT (International Network for Terrestrial Research and Monitoring in the Arctic) Project. The project has 32 partners from 14 countries (including all arctic countries). It builds capacity to identify, understand, predict and respond to environmental change.

#### Main points of discussion

- **Talking circles:** Patricia Cochran suggested that group modelling technique does not always work in Arctic communities since in such communities there are traditional ways of utilising the information such as traditional talking circles. In Alaska the indigenous people own the land and resources and when oil industry or scientists come to work in the field they organize a talking circle where they also have indigenous people trained as facilitators. These traditional talking circles received lots of attention from the audience both at the working group and the reporting back at the plenary. Ms. Cochran expressed her concern that the group modelling was primarily a linear thinking process. Peter Schlyter clarified that the group modelling is not linear and they involve other types of knowledge e.g. the Saami knowledge and group modelling is a tool for better interaction. Traditional circles are good platforms to build trust.
- **Giving feedback** on the research and involvement of local, indigenous people in **research design** is crucial. Patricia Cochran mentioned that many research institutes come to Arctic to carry out research from diverse parts of the world such as Japan, Germany do not give any feedback to the indigenous communities. Hence, protocols are established for people working in the Arctic with the indigenous communities. The protocol includes interaction with the communities from the beginning. A broader understanding of indigenous people and indigenous knowledge is necessary especially by the policy makers. Lis Mortensen from INTERACT Project mentioned that the local communities are involved in formulating the research.
- The scientific communities, researchers and other stakeholders alike have to respect the local culture as well as have trust in locals. Alona Yefimenko cited an example regarding sacred sites for men in Greenland. Honesty is important to maintain confidence between indigenous people, citizen scientists and scientists, policy makers.
- The **process** is as important as the outcome.
- Various **challenges** were mentioned by the speakers and participants such as coping with different languages and arranging the timing of meetings. Language can serve as a barrier between scientists and farmers or indigenous people. Scientists sometimes make presentations in a language that the farmers or Arctic indigenous people do not understand so one solution is to have multi-lingual meetings and conferences. Further, the timing of the

research or meetings can coincide with a busy period of farming and beekeeping. In such circumstances, it is significant to schedule meetings at appropriate times.

- Intellectual Property Rights (IPRs) were mentioned a couple of times during the discussions. There is a computer community created around IPRs.
- Internet connection in remote areas can either be expensive or impossible. Another point of discussion was whether it is appropriate to share traditional knowledge on Internet. Local, indigenous people are concerned that Internet does not provide a cultural background and there is a genuine need to protect them to have an identity. Another concern is about the loss of local, indigenous information. So, is Internet a good platform to share local, indigenous knowledge? Should local, indigenous knowledge be shared? Some of traditional knowledge is at risk with climate change.

### **Requirements of effectiveness evaluation of activities/ projects**

Discussions were focused on the volunteer potential and effectiveness evaluation of data and methodologies of citizen science projects. The volunteer potential differed according to age, gender, experience and training and especially the age distribution of citizen scientists varies a lot at each project. The involvement of elder people was underlined by some participants: they can help set the agenda on environmental issues. Another aspect discussed was the best audience to target and it was decided that there is a range of target groups.

According to Samantha Burgess from Earth Watch Institute, previous experiences of volunteers are not necessarily a benefit to the citizen science project. On the contrary they prefer an open mind. Rick Bonney emphasized the consequences and purpose of evaluation. It is a question of increasing scientific literacy. Before the evaluation it is crucial to understand if people will take part in a project. He developed a series of methodologies to evaluate citizen science projects.

**Samantha Burgess** presented the main results of evaluation of their projects. The projects are successful in translating knowledge; in improving participant's level of understanding; in having a personal impact on participant's lives; and increasing their connection to the natural world. However, it does not help in improving understanding of global environmental issues. Further, the rate of return was low and follow-up is not conducted 6 months later so it is impossible to grasp if the project had a long-term impact on people's lives or perceptions. EarthWatch project coordinators did a study on volunteers and they identified the most appropriate methods of training them, the type of training to use, ways of stimulating and motivating people and how to create more cohesive teams. Volunteers perform better if they are fit and motivated. The number of volunteers is more or less constant across all age categories and gender but there were a big number of male participants in the 40-50 age category.

The other presentation was by **Robert Kenward** who focused on the outcomes of the TESS Project. TESS Project is a 33-month research project supported by the 7<sup>th</sup> Framework Programme of the European Commission, which had 14 partners from 10 countries. It assists the integration of biodiversity information from the local level into planning and land-use decisions, while encouraging and empowering local people to collect relevant information to maintain and restore biodiversity and ecosystem services. The aim of the system is to aid restoration and maintenance of biodiversity and natural resources by reversing the processes that lead to degradation. The **objective** of TESS is

to design a decision support system related to environment and land use that enable policy makers to integrate knowledge from the regional and local level into the decision making process for adaptive management purposes, while encouraging local people to maintain and restore biodiversity and ecosystem services.

#### Main points of discussion

- Online teaching material does not work with everybody and teaching on the field provided a high knowledge gain and needed less repetition. However online material is a good way to reach a widespread audience.
- Children in general are the best in being volunteers; adults have a tendency to overthink; family groups reached some high success rates; and school groups that underperformed are probably due to some competitive issues among the group members.
- The training of the trainers is a very good opportunity to make use of the multiplying effect of knowledge transfer. Moreover this is highly rewarding for both the trainer (the scientist) and the trainees.
- On the question of the validity and quality of the data reported, one of the participants pointed to the fact that some professionals/or experienced participants sometimes make mistakes because they tend to overlook on other environmental issues/areas for which they do not have expertise. However, these mistakes can sometimes be identified by the excess number of data collected in a short time.

With the Ebird project (<http://ebird.org/content/ebird>) the evaluation focused on how to measure the increase of scientific literacy among the participants in the project. It is important to keep in mind what one wants to measure or get out of the evaluation. There are various stages of evaluation - a front end evaluation assesses the origin and type (population segment) of the persons interested in participating. A process evaluation tries to find out if the participants understood the training, what they learn, what impact it has and if the project is working. The end evaluation requires even more attention. The NSF (National Science Foundation) has developed a framework, a common set of metrics, ways to measure/evaluate PPSR (Public Participation in Scientific Research) Projects. Ebird has developed its own evaluation methodology, DEVISE, which is a set of tools, measurement instruments customized for the project. It is based on the study of motivation in CS projects using the IMI (Intrinsic Motivation Inventory), a self-determination theory whose main principle is that people do what is relevant to them. A user-guide is developed on their website. The survey is customizable to any CS project which is conducted online with SurveyMonkey. A distinction needs to be made between a quantitative evaluation that gives an overall sense of whether a project is working or not, like the online survey and a qualitative evaluation that is a more useful or efficient tool. This is run via interviews of 90 minutes on the phone with a selection of participants who are interviewed in depth on what they have learned and their impressions from the project. The interviews stop when the evaluation reaches a saturation point i.e. when nothing new comes out of it.

Another type of CS project called co-creative projects arises from the need of a community to seek scientific help to solve a local problem for example the drilling for natural gas in the US. The evaluation tools have not been tested for these types of projects.

## **Main points of discussion during the Plenary**

### **LLTK and CS**

We need to keep in mind not to recall only the Saami's when we mention indigenous people. For instance, traditional knowledge exists in the centre of Europe. In addition, how long one has to live in an area to be considered as an indigenous was another question posed during the workshop. Traditional knowledge and citizen science are tackled separately in some presentations. It would be better to cover them both instead. For instance, local shepherds and fisher folk know a lot and we need citizen scientists to collect this knowledge from elder people. Petr Vorisek noted that it is wrong to assume that local knowledge is always accurate. Local knowledge may be completely wrong as experienced by European bird watchers from time to time. Some locals pay no attention to wildlife but they claim to know 10 nests etc. Hence, double checking the knowledge by various groups of local people is essential. Citizens can also evaluate publicly funded projects so that they explore the relevance of the questions citizens have in mind. Walter Haefeker emphasized that IPRs are an important piece of traditional knowledge: communities and indigenous people develop great mistrust over the use of IPRs. Patricia Cochran explained an important point of consideration when working with indigenous people. Traditional costumes can act to re-establish connections with indigenous people. The dresses are symbolic and historical. For instance, there may be bird feathers, polar bear fur etc. It is a good way in getting people to relate.

### **Relations between scientists and citizen scientists and LLTK**

The cultural values of Western science and indigenous knowledge are often very different so science needs to discuss how to internalize indigenous knowledge. It is also significant to keep in mind that science is becoming more open, interdisciplinary, multi-disciplinary and generally not framed in rigid rules. It is up to the scientists to find ways to incorporate indigenous knowledge. Beekeepers observed that many scientists do not focus on the main problems. So, Walter Haefeker thought citizen driven science is necessary. John Tweedle, from British Natural History Museum, thinks that the involvement of public may encourage prompt decision making.

### **Sources of funding**

Rick Bonney explained that in the US most science projects and citizen science projects are funded by the National Science Foundation (NSF) with additional bonus for public outreach. They also receive funding from the fees paid by the users of the citizen science portal. Another source of

government funding is the EPA for the data on forest service. Walter Haefeker proposed that citizens should evaluate projects funded by public funds. He cited a case where European beekeepers had difficulty in finding funding for independent scientists and he proposed pool of funding to which beekeepers and citizen scientists have access. He is critical of encouraging public-private partnerships claiming that this sort of relationship undermines scientific independence.

### **Eco-justice**

Citizen science has an important eco-justice dimension in which some projects involve socially disadvantaged groups who are in the lower income group or are unemployed, have lower life expectancy and are less healthy or are otherwise often marginalized like many indigenous people. Some examples of eco-justice are OPAL project of the British Natural History Museum, the experience of Finn Danielsen at projects in the Philippines and Greenland, several projects of Cornell Lab of Ornithology and Bybi (Copenhagen Bee Honey Cooperation) Denmark. Once you appreciate the value of working with disadvantaged people, the input is fantastic and rewarding. It is possible that you build up a whole community. For instance, involving people who lack basic literacy is possible but it requires being imaginative. In some cases, such as the Community Based Management projects with hunters and fishers, disadvantaged people are empowered, become proud and feel that they have a voice to be heard.

### **Innovative Approaches to Evaluation of Citizen Science Initiatives**

Methods for monitoring and assessing the environment are often evaluated mainly on the basis of their power to detect a trend in e.g. species abundance within a certain level of significance. Methods are rarely evaluated for their ability to impact management and conservation of natural resources. Finn Danielsen suggested that we should also evaluate monitoring and assessment methods on the basis of the number and characteristics of conservation management interventions that emanate from the schemes (examples at [www.monitoringmatters.org](http://www.monitoringmatters.org)). This would encourage a holistic approach whereby monitoring and assessment are seen as integrated aspects of management. The 'management intervention' unit is close to the end-point: conservation and sustainable resource use on-the-ground. Keeping track of management interventions can also help provide direction in citizen science schemes. This point was taken by David Gee who asked each citizen science scheme to comment on this. It turned out that many citizen science schemes represented at the meeting knew that their initiatives had led to a great number of conservation management interventions.

### **Next steps**

EEA has already set up an Enviro Windows portal which will function for knowledge exchange on citizen science related papers, articles, good practices, a list with links to projects and network sites, and last but not the least workshop presentations. (<http://lltk.ew.eea.europa.eu/>) A forum for discussion is also provided for further exchange of information and opinions.

The presentations will be circulated and the workshop report will be presented at the Eionet/ National Focal Points meeting in the end of September and at the EPA network meeting in October.

The EEA platform Eye on Earth is being developed continuously. We are progressing with a number of additional web applications which are supporting the different “Watches” being developed such as Nature Watch, Noise Watch, Marine Watch and Earth Watch. The content, its use, its target groups and the state of development are at the moment different for all these areas and short descriptions will follow. **Nature Watch** is being developed within the frame of Invasive Alien Species (IAS). **Noise Watch** will enable citizens to give feedback on noise exposure. **Marine Watch** content is being discussed and suggested to include daily near real time GMES data on sea surface temperature and a citizen science component on marine litter.

More use of LLTK and CS will be made in long term monitoring e.g. by the long term ecosystem research and monitoring network.

**APPENDIX I**  
**AGENDA**  
**and**  
**Working Group Questions**



**Agenda**  
**Workshop on LLTK and Citizen Science: Their Roles in Monitoring and Assessment of the Environment**

**27-28 June 2011**

**Venue: EEA, Conference Room, Copenhagen**

<b>27 June 2011</b>		
<b>12:00-13:30</b>	<b>Registration</b>	
<b>12:30-13:30</b>	<b>Lunch with Speakers</b>	
<b>Session 1: Plenary 13:30-18.00</b>	<b>Chairperson: Jacqueline McGlade, Executive Director, EEA</b>	
<b>13:30-15.45</b>	<p><i>Establishing common grounds from diverse activities: 'Rainbow Revealed'</i></p> <p>Welcome and Introduction Why is EEA interested in lay, local, traditional knowledge (LLTK) and citizen science (CS)?</p> <p>Why are we here? And what are we doing? <i>Integrated Environmental Assessments, EEA</i></p> <p><i>Science for Citizens and Citizens in Science</i></p> <p>How Citizen Science Can Save the World? <i>Cornell Lab of Ornithology Program Development and Evaluation, US</i></p> <p>Engaging People in Scientific Field Research <i>Earthwatch Institute</i></p> <p>A Scientist's Voice from the EarthWatch Field <i>AECOM Inc., New York, US</i></p> <p>Opposites Attract: From Scientist led to Citizen led Engagement <i>Natural History Museum, UK</i></p> <p><i>Using indigenous knowledge in environmental monitoring and assessment activities</i></p> <p>Monitoring and Assessment by Indigenous</p>	<p>Jacqueline McGlade</p> <p>David Gee</p> <p>Rick Bonney</p> <p>Samantha Burgess</p> <p>John Rollino</p> <p>Johannes Vogel</p> <p>Patricia Cochran</p>

	<p>People <i>Alaska Native Science Commission</i></p> <p>Observations of Climate Change by Kamchatka Indigenous Peoples <i>Russian Association of Indigenous Peoples of the North, Siberia and the Far East (RAIPON)</i></p> <p>Community – based Work of Circumpolar Biodiversity Monitoring Program <i>Conservation of Arctic Flora and Fauna (CAFF)</i></p> <p>“What Roles for Indigenous Participants in Expert Knowledges on Environmental Risk Issues?” <i>Centre for Science Studies and ESRC Centre for Economic and Social Aspects of Genomics Lancaster University, UK</i></p> <p>Discussions</p>	<p>Victoria Sharakhmatova</p> <p>Kári Fannar Lárusson</p> <p>Brian Wynne</p>
15.45-16.15	Coffee break	
16.15-17.30	<p><b><i>Involving citizens in the monitoring of Invasive Alien Species</i></b></p> <p>Why is the EU interested in CS and Invasive Alien Species? <i>European Commission Directorate General for the Environment</i></p> <p>EEA activities: Eye on Earth, CS and Invasive Alien Species <i>Eye on Earth, EEA</i></p> <p>Mobile phones for Data Collection and Engagement: 'What's Invasive!' and 'BudBurst Mobile' <i>Center for Embedded Networked Sensing University of California, Los Angeles, US</i></p> <p><b><i>Monitoring biodiversity: living things lively techniques</i></b></p> <p>Pan-European Common Bird Monitoring Scheme <i>Czech Society for Ornithology</i></p> <p>A Photographic Survey of Flower-Dwelling Insects: The Role of Citizen Scientists <i>National Natural History Museum, France</i></p>	<p>Myriam Dumortier</p> <p>Malene Bruun</p> <p>Eric Graham</p> <p>Petr Vorisek</p> <p>Romain Julliard</p>

	Experiences of Beekeepers <i>European Bee Keepers Association</i> <i>EEA/ Eionet National Focal Point / Switzerland</i>	Jurgen Binder Nicolas Perritaz
	Innovations in recruitment and instrumentation <i>Peninsula Medical School, Devon, UK</i>	Mike Depledge
<b>17.30-18.00</b>	<i>Discussions and Working Group preparation</i>	
<b>19.00 -22.00</b>	<b>Dinner and Discussion</b>	<i>EEA Guest Canteen</i>

<b>28 June 2011</b>					
<b>Session 2</b> <b>9.15-12.45</b> <b>Working Groups</b>	<b>WG1</b> Reliability of long-term environmental monitoring and assessments	<b>WG2</b> Mobilising/ Organising/ Sustaining	<b>WG3</b> Use of innovative tools in citizen science projects	<b>WG4</b> Interactions between LLTK and CS, and scientific communities/ policy makers/ National/ International Organizations	<b>WG5</b> Requirements of effectiveness evaluation of activities/ projects
	<p><b>Chairperson:</b> <i>Mike Depledge</i> <i>Peninsula Medical School, Devon, UK</i></p> <p><b>Presenters:</b>  John Rollino <i>AECOM Inc.</i></p> <p>Arctic Borderlands Ecological Knowledge Coop: Example of northern collaborative community based monitoring Michael Svoboda</p>	<p><b>Chairperson:</b> Malene Bruun EEA</p> <p><b>Presenters:</b>  Robert Kenward <i>TESS Project</i></p>	<p><b>Chairperson:</b> Eric Graham <i>Center for Embedded Networked Sensing</i> <i>University of California, Los Angeles</i></p> <p><b>Presenters:</b>  WorldBirds Global Implementation Loraiza Davies <i>Royal Society for the Protection of Birds</i></p> <p>Butterfly monitoring in Europe: Experiences with citizen</p>	<p><b>Chairperson:</b> Cigdem Adem EEA</p> <p><b>Presenters:</b> Formal Group Modelling as a Deliberative Platform Peter Schlyter <i>Department of Physical Geography and Quaternary Geology</i> <i>Stockholm University</i></p> <p>Participatory Plant Breeding with peasants and scientists: An example of Participatory Research</p>	<p><b>Chairperson:</b> David Gee EEA</p> <p><b>Presenters:</b>  Documenting the Impact of Citizen Science Rick Bonney <i>Cornell Lab of Ornithology Program Development and Evaluation, US</i></p> <p>Earthwatch's evaluation data and methodologies Samantha Burgess <i>Earth Watch Institute</i></p>

	<p><i>Environment Canada</i></p> <p>Mapping LLTK and CS activities related to Biodiversity Mora Aronsson <i>EEA-European Topic Center (ETC) Biodiversity</i></p> <p>Use of traditional ecological knowledge in monitoring nature conservation Zsolt Molnar <i>Institute of Ecology and Botany of the Hungarian Academy of Sciences</i></p> <p>Conference Room</p>	Fontana Room	1.28	<p>scientists Chris van Swaay <i>Butterfly Conservation Europe</i></p> <p>Berangère Storup <i>Citizen Sciences Foundation</i></p> <p>Benefits of Interaction between local communities and scientists Lis E. Mortensen <i>INTERACT Project, Faroe Islands</i></p>	<p>Creative space</p> <p>8.1.1 Auditorium</p>
<i>12.45- 13.45 Lunch</i>		<i>EEA Guest Canteen</i>			
<b>Session 3: Plenary session 13.45-16.30</b>	<b>Chairperson: David Gee, Senior Adviser on Science, Policy, Emerging Issues, EEA</b> Working groups report back Discussions and next steps				

## Special Event to Celebrate the EEA Urban Forest Courtyard and Project Welcoming Honey Bees on our Roof

### Programme

17.00	Welcome drink and finger food served in the EEA courtyard
17.15	David Wijkman will sing a couple of forest and bees songs, accompanied by a pianist.
17.15	Welcome to the visitors and inauguration of the EEA urban forest courtyard by Gordon McInnes (Deputy Director)
17.30	Presentation of the EEA bee project and the EEA/Bybi collaboration by Oliver Maxwell, director of Bybi, presentation of the decline of European bees by Jurgen Binder from the European Beekeepers Association Introduction of our intention to create the 'Kongens Nytorv urban bees partnership' with the EEA neighbours by David Gee
18.00	Network and mingle, walk to the Danish Film Institute (DFI)
18.45	Walk to the Cinemateket movie theatre (5 min)
19.00	At the DFI: Short introduction of the movie, projection of ' <a href="#">Queen of the Sun</a> ', followed by a Q&A session moderated by David Gee  Movie news from New York Times: <a href="http://movies.nytimes.com/2011/06/10/movies/queen-of-the-sun-what-are-the-bees-telling-us.html?ref=movies">http://movies.nytimes.com/2011/06/10/movies/queen-of-the-sun-what-are-the-bees-telling-us.html?ref=movies</a>
21.30	End of the programme

### Working Group Structure

- Chairperson's Introduction
- Appointment of Rapporteur for the WG.
- Initial presentation(s)
- Discussions on the WG questions

### WG Questions:

### **WG1 Reliability of long-term environmental monitoring and assessments**

- How can the reliability of LLTK and CS be assured?
- How can LLTK and CS projects be maintained so as to ensure their long term viability and benefits?

### **WG 2 Mobilising/ Organizing/ Sustaining**

- How do we best mobilise, manage and sustain the engagement of contributors in LLTK and CS projects?

### **WG3 Use of innovative tools for citizen science**

- What are the opportunities and challenges ICT tools offer to data handling and quality assurance activities, and how can we best address these?

### **WG 4 Interactions between LLTK and CS and scientific communities/policy makers/National/ International Organizations**

- In your experiences what are the factors, mechanisms and processes of linking LLTK and CS with policy makers, scientific communities and relevant organizations?
- How can this be improved?

### **WG 5 Requirements of effectiveness evaluation of activities/ projects**

- What were the methods used and results generated by previous Effectiveness Evaluations of LLTK and CS projects and what would be your recommendations for future evaluations?

**APPENDIX II**

**BEEKEEPING WORKSHOP OBJECTIVES AND AGENDA**

**Workshop on Beekeeping: Its Role in Monitoring and Assessment of the Environment**

**29 June 2011**

**Venue: EEA, Creative Space, Copenhagen**

**Objectives**

1. How to make the most of beekeeper knowledge and experience in monitoring and assessing the state of health of bee colonies and their environment?
2. How can we ensure that such knowledge is reliable enough to be used by scientists and policy makers?
3. How can the activities of bee keepers across Europe be better coordinated?
4. How can urban beekeeping be further promoted?
5. What added value role can the EEA play in achieving the above objectives?

**Agenda**

<b>29 June 2011</b>		
<b>Session 1: Plenary 09:30-13.00</b>	<b>Chairperson: David Gee, EEA</b>	
	Welcome and Introduction Why are we here? And what are we doing? <i>Senior Adviser on Science, Policy, Emerging Issues and Integrated Environmental Assessment</i>	David Gee, EEA
	Pesticides and Beekeeping: The evolution of the relations between beekeepers, policy-makers and scientists in France	Frank Alétru
	The Scientific and Social Dimensions of knowledge on honey bees: A Challenge for Democratic Governance <i>National Center for Scientific Research (CNRS) France</i>	Laura Maxim
	Reliability of beekeeper's knowledge and experience: A key issue with scientists and policy makers – Preliminary Thoughts <i>EEA/ Eionet National Focal Point, Switzerland</i>	Nicolas Perritaz
	The Interaction of Beekeepers in Denmark with Scientists and Policy-Makers <i>Danish Beekeeping Association</i>	Steen Fogde
	Urban Beekeeping: Challenges, Opportunities and Lessons Learned	Oliver Maxwell

	<i>Bybi – Copenhagen, Denmark</i>	
	How to Make A Difference? Coordination and Organization of European Beekeepers <i>European Beekeepers Association</i>	Jurgen Binder
	Discussions, EEA's Role and Future Steps	

### **Summary of the Beekeeping Workshop**

There were very interesting presentations from French, German and Danish beekeepers accompanied with animated discussions.

**Laura Maxim** and **Frank Aletru** explained the history of the honey bee related controversy since 1994, involving the French Ministry of Agriculture, BAYER, AFFSA (the French Agency for the Safety of Health Products), beekeepers and public scientists. Frank Aletru who is a professional beekeeper for 30 years explained that bees are good indicator of ecosystem health and democracy. French beekeepers accomplished many achievements such as the successive ban of Gaucho (maize/sunflower) and Regent (fipronil); the cancellation of authorization of Cruiser (maize) for 2008 and 2009; recognition by the French State Council of the failure of the risk assessment procedures; formation of the 'Methods' working group and evaluation protocols; improvement of techniques for seed-dressing and reduction in dust emissions; support of the National Unit of Veterinary and Pesticides Investigation and development of a network of genetic conservatories of the black honeybee. The NGO Terre d'Beilles demanded that the experts should be independent, the risk assessment methods should be revised and the members of expert committees should be chosen based on their competence in honeybee sciences.

Laura Maxim analysed how beekeeper's knowledge was used in pesticide's risk assessment. She thought that beekeepers had several challenges in this process such as lack of opportunities to intervene in the production of regulatory knowledge, lack of experience in lobbying and language barriers due to the high scale of risk assessments. Nevertheless, beekeepers promoted their knowledge by good communication strategies, appropriation of scientific language, changing the evaluation system of knowledge quality via the judiciary and by moving to a higher level of risk assessment procedures used for marketing pesticides.

**Steen Fogde** made a presentation on the change in the situation of beekeeping over time in Denmark and how the Beekeeping Association supports the beekeepers. He noted that in the recent years the number of beekeepers and especially women and family beekeepers is on the rise.

**Walter Haefeker**, President of the European Professional Beekeepers Association, focused mainly on beekeepers and scientists observing, monitoring and analysing honeybee losses at the German bee monitoring project formed in 2004 after the winter losses in 2002-2003. He further cited a very recent successful example of collaboration between beekeepers and

dairy farmers in Germany, fair milk project, where the milk production is bee friendly. He added that such collaborations with different fields of agriculture is mutually beneficial because of the high amount of interlinkages.

**Oliver Maxwell** talked about the Danish NGO Bybi surrounded by the beehives on the EEA roof. 'Bybi' provides a meaningful occupation for disadvantaged social groups, engaging and training them as new beekeepers. The high quality of honey produced was approved by the bee keepers. EEA roof is home for 80000 hard working bees living in three bee hives.

### **Next Steps**

- To help promote bees as an indicator of ecosystem integrity
- To improve the risk assessment of pesticide harm.
- The story of the French and German beekeepers will appear in Late Lessons Volume II (EEA, 2012).
- To further apply DPSIR framework to identify issues of pollinator loss. (Kuldna, Piret Peterson, Kaja, Poltimäe, Helen, Luig, Jaan, 2009, "An application of DPSIR framework to identify issues of pollinator loss", Ecological Economics, Vol. 69, pp. 32–42 doi:[10.1016/j.ecolecon.2009.01.005](https://doi.org/10.1016/j.ecolecon.2009.01.005))

**APPENDIX III**

**LIST OF PARTICIPANTS**

**List of Participants for Workshop on LLTK and Citizen Science**  
**27-28 June 2011**  
**EEA Conference Room, Copenhagen**

<b>Name</b>	<b>Expertise</b>	<b>Contact Details</b>
<b>Academics</b>		
Brian Wynne	Professor, Faculty of Arts and Sciences, Lancaster University	b.wynne@lancaster.ac.uk
Rick Bonney	Professor, Cornell University – Lab of Ornithology	reb5@cornell.edu
Mike Depledge	Interim Director of ECEHH and Professor of Environment and Human Health, Peninsula Medical School, Devon, UK	michael.depledge@pms.ac.uk +44(0)1752 437402
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<b>International Organizations</b>		
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Shailendra Mudgal	BioIntelligence Service	sm@biois.com
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Dr John Tweddle	Natural History Museum, UK	J.Tweddle@nhm.ac.uk
Bob Bloomfield	Natural History Museum, UK	rmb@nhm.ac.uk
Gregor Hagedorn	Natural History Museum, Berlin	g.m.hagedorn@gmail.com

Uwe Moldrzyk	Natural History Museum, Berlin	Uwe.Moldrzyk@mfn-berlin.de
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