

Climate change around the Mount Everest (Nepal)

The Himalaya-Karakoram-Hindu-Kush chain contains some of the largest glacier masses found outside of polar regions. From a hydrological perspective, these glacial masses play a fundamental role in the environmental system of the entire Asian continent, as they constitute a water resource which assures the survival of millions of people. The retreat of these glaciers could reduce the availability of water therefore Ev-K2-CNR investigated variations in the surface area of glaciers around the Mount Everest, Nepal during the second half of the 20th century through comparison of historical maps. The comparison reveals an overall decrease in glacier area (by 5 %), a result which is in line with the area reductions found by other studies of Asian glaciers. In many cases, the retreat of glaciers is most visibly evinced by the rapid growth in the number and size of glacial lakes. Such changes can result in catastrophic glacier lake outburst floods (GLOFs), which in the region constitute the strongest manifestation of the deglaciation process and its attendant risks. We found that the park around the Mount Everest experienced a very large increasing in lake surface cover of 26% from the end of the '50s to 2008. These variations are huge considering the short time period and suggest to go on in monitoring the phenomena in the future years.

Research for development of Mount Everest area (Nepal)

In the wake of the climate change debate a great number of new researches concerned with high altitude ecosystems - atmospheric and cryospheric phenomena and environmental issues - have been launched. However, the problems and concern of the inhabitants of these areas stakeholders of high altitude ecosystem management in developing countries have received little attention in the design of such research programs. Over the past year, Ev-K2-CNR has continued to integrate stakeholder needs and real management issues regarding mountain ecosystems in the Hindu Kush-Karakoram-Himalaya Region, most notably in the HKKH Partnership Project. mechanisms to support adaptive management of Sagarmatha National Park whereby key stakeholders are included in the participatory design of practically relevant researches have been developed in partnership with leading organizations in this field: ICIMOD and IUCN. The practical application of methodologies and tools developed based on this approach by stakeholders demonstrate that such a participatory process is the key to ensuring that academic efforts result in useful knowledge that supports decision-making processes in high altitude eco system management. The thematic areas for research programs in the Everest Region were identified by the stakeholders as water pollution, energy management, wildlife, solid waste management, indoor air pollution, forest ecology and tourism. The systemic perspective and unique modelling approach applied by Ev-K2-CNR set these issues into relation within the framework of a comprehensive socio-ecosystem model "Sagarmatha National Park and Bufferzone". The value of this unique tool for the management of Sagarmatha National Park, and mountain ecosystems in general, is pioneering.

THE SHARE PROJECT: improving environmental research and policies for adaptation to the effects of climate changes.

In the last 4 years an important contribution to the study of the climate change effects has given by SHARE (Stations at High Altitude for Research on the Environment) , integrated project, promoted by Ev-K2-CNR Committee for environmental monitoring and research in the mountain areas launched in Europe and Asia and now widespread also in Africa and South America.

SHARE, studying and monitoring environment and climate in mountain areas, ensures long term collection of specific, high quality data by implementing terrestrial observation and monitoring networks: a **specialized scientific contribution** and provides in-depth scientific analyses on, *inter alia*, climate, atmosphere, circulation of pollutants, hydrology and water resources, glaciology, geophysical hazard, anthropogenic impact, energy and water cycle, limnology, biodiversity and natural resources, and medicine. for the international scientific community and decision-makers.

SHARE contributes to international integrated scientific projects on the climate and environment, such as: UNEP-ABC, WMO-GAW, WCRP-GEWEX–CEOP, NASA-AERONET, ILTER, EUSAAR

SHARE promotes the multidisciplinary study of the phenomena linked to global change, developing research activities in six thematic areas: atmosphere, glaciology, energy and water cycle, limnology, biodiversity and natural resources, and medicine.

However, the SHARE project doesn't just monitor and collect atmospheric data. Besides this principal activity, many other complementary actions have been fostered, including the development of innovative technologies in the field of climate and environmental monitoring. An innovative system, called Nano-SHARE extremely agile and sophisticated, will enable to carry out measurements in remote sites where the construction of a laboratory or a standard monitoring station would be too difficult or expensive. It uses renewable energy sources with low environmental impact.

Another related ongoing activity of the SHARE Project is the creation, in collaboration with UNEP – Vienna, of an integrated information system dedicated to environmental monitoring in mountain areas. This accessible system will be shared with scientific research institutions as well as governmental and inter-governmental bodies. Synergic collection of information will be encouraged in an effort to optimize investments and provide stakeholders with a harmonic multidisciplinary database. Making this information system and its databases accessible to governments and research institutions will facilitate the dissemination of knowledge concerning climate monitoring in mountain areas since to date no such integrated system exists, even in places like Europe where environmental awareness is high.