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Role of ICT in Adaptation to Climate Change

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Abstract: -

Now a day's climate change is a threatening issue to all sectors of life with adverse impacts expected on the environment, human health, food security, economic activity, and natural resources. Agriculture is a most vulnerably affected sector because it is more sensitive to changing local climatic conditions like temperature, rainfall and humidity etc. Climate change mitigation and adaptation strategies are increasingly becoming areas of priority on the radar of development practitioners. Timely access and sharing of critical information will become even more important as the intensity, unpredictability and frequency of disasters is likely to increase due to climate change. Use of Information and communication technology includes computer services, mobile, Radio and other interactive media etc. can enhance the efficiency and effectiveness of climate change adaptation programmes. ICTs can play an important role as a medium of information and communication in climate change awareness, adaptation and mitigation strategies. Risk and vulnerability can be reduced through ICT enabled information provision and the facilitation of knowledge sharing, which can ultimately help enhance coping strategies and save lives. ICT help to reduce the vulnerability and risk faced by poor and small farmers by 1.by raising awareness about the climate change at grassroots level. 2. Providing access to relevant information on different adaptation measures. 3. Enhancing decision making capacity of farmers to cope up with climate change. So there is a need to promote integration of ICTs as a strategic tool in climate change programmes and provide access to information about climate change, and connecting people and communities so that they share knowledge and practical coping strategies, can reduce the risk of the inevitable effects on livelihoods of the most marginalised populations.

Keywords- Climate change, ICT, Adaptation and mitigation

Introduction

Information and communication technologies (ICT) provide us with an unprecedented ability to collect and analyse environmental information that may

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encompass the entire terrestrial system, from the depths of the ocean to the upper reaches of the atmosphere. They enable us not only to assess the impact of humans on the environment, but also to manage our use of energy and production of greenhouse gases (in the home and in industry). Thus, ICT are an essential part of efforts to combat climate change and to mitigate its effects.

ICT tools for mitigating climate change

- Computer-controlled systems can be used in a multitude of ways to make home, work and manufacturing more energy efficient
- Telecommunications are vital in responding to natural disasters that climate change may bring
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- Monitoring vulnerable or dangerous environments is possible with sensor networks
- Satellite observations provide essential data on weather and vegetation patterns
- Ocean buoys communicate data on tsunami or sea-level changes, via satellite
- Data can be interpreted and illustrated by geographic information systems
- Increasing computational power, as well as new algorithms, make for better analysis and modeling of complex environmental and climate systems
- Broadband Internet access makes it easier to share large amounts of data globally
- Distributed (grid) computing allows researchers to explore topics in unprecedented depth

Reducing CO_2 emissions

ICT can help substantial cuts to be made in emissions of the greenhouse gases that are leading to global warming. The methods by which this can be achieved include, for instance, using computer controls to improve the performance of engines in factories; distributing goods more efficiently through computerized management of transport and warehouses; allowing people to meet or work remotely via videoconferencing, and using sensor networks to control the heating and lighting in buildings so that energy is not wasted.

Although ICT themselves contribute to greenhouse gas emissions, they help to save much greater amounts emitted by all other sectors of industry. And efforts are being made to reduce the carbon footprint of ICT equipment. In computer monitors and television sets, for example, flat, liquid crystal displays (LCD) use half the energy of cathode ray tubes— and do not contain harmful pollutants. Next-generation networks (NGN),

especially those based on optical fibre, also need less power. In turn, NGN lead to more efficient communication systems that form the backbone of energy-saving applications.

Keeping watch on the environment

Mitigating the effects of climate change is the other major task in which ICT are involved. The tools that are available are listed in the box ICT tools for mitigating climate change. ICT can be used in a number of ways to study and manage the environment, locally and globally. These come under three broad headings: observation, analysis, and sharing of data.

Observation

Our planet's land and oceans can be monitored through sensors placed directly on the surface, or remotely by satellite. The condition of the atmosphere can be checked for greenhouse gas emissions and wind currents that may presage a hurricane. Satellite images came into the public domain with the launch of LANDSAT 1 in 1972. However, meteorological satellites were used in the 1960s by the World Meteorological Organization (WMO) for its *World Weather Watch* programme — one of the most valued satellite applications, which is used every day throughout the world. WMO also operates the Global Observing System to monitor weather conditions and alert authorities (see Figure 1).

Analysis and modelling

Once environmental data have been collected, various computational and processing tools are required to perform an analysis. The more powerful the computer, the faster and more complex will be the research. As well as conventional supercomputers, the processing power of ordinary computers can be employed for the task, through grid computing. Via the Internet, this method of distributed computing loosely links together machines that may be thousands of kilometres apart and sited in a business, a university or someone's home. In addition to analysing data, the combined computer power can be put to the task of creating models of climate change, for example, that are invaluable for policy-makers. An example of grid computing used for these purposes was the world's largest-ever climate modelling experiment, organized in 2006 by the British Broadcasting Corporation (BBC) and Climateprediction.net, a consortium of research organizations led by the University of Oxford. More than 250 000 people downloaded computer models that used spare processing power in home computers to predict the future global climate up to 2080. This allowed thousands of models to be tested, each incorporating slightly different figures, and revealed which models were likely to be most accurate.

Sharing information

Grid computing allows data to be shared for in-depth research. One way in which the results can be accessed by all policy-makers is through the Global Earth Observation System of Systems (GEOSS). It is an intergovernmental initiative that arose from the 2002 World Summit on Sustainable Development, and which has at its centre a clearing house to "help users discover, evaluate and use the broadest range of data" from a multiplicity of sources.

Broadband networks in general mean that information on climate change can be circulated around the world via the Internet. More powerful, intelligent and user-friendly applications are becoming available to assist in decision-making. Nowadays, for example, the free services *Google Earth* and *Microsoft Virtual Earth* allow us to zoom in on satellite images that map the world in great detail.

Geographic information systems (GIS) are one of the most effective — and widely used — ways to present environmental data. The systems are created with software that integrates visual and other information from databases on a geographic basis: by clicking on an online map, for example, you might be able to see data on environmental conditions, human population, and so on. This can include real-time elements, such as the current temperature.

Mitigating natural disasters

According to United Nations statistics, some 200 million people - 96 per cent of them living in Africa — are affected by natural disasters every year. In 2007, most of the appeals issued by its Office for the Coordination of Humanitarian Affairs (OCHA) were in response to climate-related events. And the 2007/2008 Human Development Report from the United Nations Development Programme (UNDP) says that the increased frequency of natural disasters is likely to continue, they will be more intense, and they are likely to occur in places that have not seen such phenomena before. Secondary results, such as outbreaks of disease, will also take their toll.

Early warning and mitigation is now considered an issue of major importance in national development planning. Former UN Emergency Relief Coordinator Jan Egeland has calculated that USD 1 spent on disaster mitigation saves between USD 4 and 7 that would otherwise go to responding to a humanitarian emergency. Providing such early warnings is an area in which ICT play a vital role.

Alongside the use of sensor networks to monitor such hazards as active volcanoes, ICT offers invaluable data on the effects of climate change that can lead to disasters. These include rising sea levels, shrinking

freshwater supplies, deforestation and threats to ecosystems.

Early warning of famine

One example of how ICT can help is the Famine Early Warning System Network (FEWS NET). Its purpose is to strengthen the ability of countries in Africa and Central America, as well as Haiti and Afghanistan, to manage the risk of food shortages by providing early signs of famine. Founded some 20 years ago, FEWS NET is funded by the United States Agency for International Development (USAID) and works with international, national, and regional partners.

The system works by using ICT to monitor and analyse data relating to climate and weather, and their impact on crops. The information is then presented to decision-makers in the form of monthly food security updates, forecasts and alerts, and support for emergency planning and longer-term policy-making.

In cooperation with such agencies as the National Oceanic and Atmospheric Administration (NOAA) in the United States, FEWS covers environmental factors that affect food security, including rainfall, vegetation and soil erosion. Among its tools are data gathered via satellite, which allow rainfall patterns to be estimated and the Normalized Difference Vegetation Index (NDVI) to be compiled on the extent and health of vegetation. Personnel on the ground travel through agricultural areas to observe conditions and gather details of production and marketing. They present regular reports to the host country and international organizations.

The UNDP Human Development Report points out that many developing countries lack the capacity and resources to assess climate-related risks. For instance, there is a severe lack of meteorological stations in sub-Saharan Africa, where farmers depend on rain-fed agriculture. Much more access to ICT is needed to help vulnerable regions adapt to climate change.

Looking out for tsunami

There are several early warning systems in place in areas of the world's oceans that are vulnerable to tsunami. Others are being developed, spurred by the terrible consequences of the Indian Ocean tsunami in December 2004. Various governments are cooperating in the creation of an International Tsunami Information Centre, which at present is hosted in Hawaii by NOAA. The tsunami warning systems use a number of sensor systems developed for weather observation (ocean buoys) and earthquake detection (seismic sensors). Once collected, the data are fed, via satellite, into real-time analysis and detection systems.

Emergency communications

After a disaster occurs, the faster that Internet and telephone links can be provided to humanitarian agencies in the field, the more lives will be saved. Communications are essential for the effective planning and provision of rescue and relief efforts. They also give victims a chance to contact loved ones, and to receive and give information and reassurance. ITU has provided equipment and facilities for emergency communications following floods, earthquakes and other natural disasters. For example, in May 2008 satellite terminals were sent to help relief operations in two areas: Myanmar, hit by a devastating cyclone, and Sichuan Province in China, which experienced a major earthquake.

Raising awareness

ICT are also crucial in raising awareness of climate change, in educating people how to mitigate it, and in building up human resources to adapt to its effects. Local, national and international broadcasting by radio and television are obvious ways in which information can be disseminated. The Internet is also playing an increasingly important role in schools and in adult training.

Among the initiatives that are specifically targeted at this area are the online study programmes of the Global Virtual University Consortium in Education for Sustainable Development, in partnership with the United Nations University. The UNU-GVU Consortium is an alliance of universities that share knowledge on the topic, with a particular focus on providing greater access to UN-related educational and scientific resources. The aim is to create a critical mass of people with the expertise to protect the environment, especially in developing countries that are often most vulnerable to the effects of climate change.

This kind of capacity development is vital, since not all countries are able to take advantage of ICT in responding to the challenges posed by climate change, while also striving to achieve the Millennium Development Goals. There is a clear need for a more comprehensive and integrated approach — but ICT themselves can contribute. They provide a unique opportunity to offer not only online education, but also the tools for using our Earth's limited resources more wisely.

Conclusion

ICTs can play an important role as a medium of information and communication in climate change awareness, adaptation and mitigation strategies. Risk and vulnerability can be reduced through ICT enabled information provision and the facilitation of knowledge sharing, which can ultimately help enhance coping strategies and save lives. ICT help to reduce the vulnerability and risk faced by poor and small farmers by raising awareness about the climate change at

grassroots level, providing access to relevant information on different adaptation measures, enhancing decision making capacity of farmers to cope up with climate change. So there is a need to promote integration of ICTs as a strategic tool in climate change programmes and provide access to information about climate change, and connecting people and communities so that they share knowledge and practical coping strategies, can reduce the risk of the inevitable effects on livelihoods of the most marginalised populations.