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Comment

Knowledge sharing for sustainable development through biodiversity conservation in the Mesoamerican region

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As recognized by United Nations Secretary General Kofi Annan, the human community has reached a point in which it is faced with an array of choices that will determine the quality of our lives and the state of the global environment for present and future generations. One possibility is that at long last we will pave a path toward environmental stewardship and sustainable development. But it is also quite possible that we will travel a less enlightened course, running down the earth's natural capital and severely limiting the choices our descendants will face.[1]

International events such as the World Summit on Sustainable Development celebrated in Johannesburg in 2002, with the presence of Leaders from most nations, and where specific goals and an implementation plan have been agreed upon, at least suggest that there is a global interest in changing our relationship with the environment, among ourselves, as well as with the other species which we share the planet.

One of the biggest tasks facing those addressing the challenge of sustainable development, both in developed and developing countries, is the need to generate the capacity to apply science and technology to achieve this goal.[2]

The Mesoamerican Biotic Resources Network

With this in mind, in 2001 the Mesoamerican Network of Biotic Resources (REDMESO) was established. This organization brings together 23 public universities from Mexico and the eight Central American countries (Belize, Guatemala, El Salvador, Honduras, Costa Rica, Nicaragua and Panama). The network seeks to create synergies among local scientists in order to conduct research projects and develop technologies designed to support the sustainable management of ecosystems, having respect for both cultural and biological diversity.

REDMESO also endeavors to train professionals in research at a high scientific and technical level in order to improve the capacities of researchers in the region to respond to the needs of ecosystems and society. One of the main projects of REDMESO is the development of computer mediated collaboration and communication structures operated through ten regional thematic virtual laboratories in the areas of Systematic and Biogeography, Ecology, Reproductive Biology, Integrated Resources Management, Conservation Biology, Geographic Information Systems, Contamination and Toxicology, Biotechnology, Ethnobiology and Environmental Education

We place biodiversity at the core of sustainable development because of the fact that in areas with high species richness, there have been many experiences where the successful integration of Biodiversity into mainstream development can provide important socioeconomic opportunities.[3] This situation is well recognized in the Johannesburg Political Declaration on Sustainable Development, that clearly states: "We are determined to ensure that our rich diversity, which is our collective strength, will be used for constructive partnership for change and for the achievement of the common goal of sustainable development".[4]

The former is particularly valuable for the Mesoamerican region, which is recognized as a global biodiversity hotspot due to the high number of mushroom, plant an animal species it harbors. This

situation is due to a combination of factors, among which is its position in the transition zone of the two great biogeographic regions (Neartic and Neotropical). The region has important mountain ranges that reach their highest altitude in the Mexican "Pico de Orizaba" with 5,610 meters above sea level. It has great costal plains and lagoons, as well as the second largest coral reef (Caribbean), with an extension of 1,000 Kilometers.

We are certain that this situation should be considered as strategic for the future development of the region, specially in an era considered by many as the golden age of biology,[5] due to the advances and economic perspectives of disciplines such as those related to the biomedical sciences and biotechnology in general. If the former is true, special focus should be put into a better understanding of the amplitude of our gene banks (biodiversity inventories and databases) and to the establishment of strategies for their conservation, mainly through natural protected areas.

If we as a region, are to avoid being marginalized form the present biotechnological revolution (as was the case of previous industrial, technological and informatics revolutions) and to stop present natural resources depletion, we need to implement strategies that will allow us to strengthen the human resources we have, and to optimize the use of our infrastructure. In the same manner, we need to prepare the researchers required for generating new knowledge, as well as the professionals required for initiative implementation and monitoring.

Thus the main issues addressed by REDMESO are those relative to conservation biology and sustainable development. These are approached in three levels: (1) *Knowledge Generation, standardization and systematization,* which consists in the generation of new knowledge related to our biodiversity, its status, present and potential uses, as well as mechanisms for information storing and sharing (2) *Model generation and biotechnology development*, by means of state of the art tools, regional natural resources models are developed, and successful experiences related to sustainable resources management are shared. On the other hand, new biotechnological techniques for product development are shared. (3) *Promotion of development and technology transfer*, a regional structure has been established in order to make the generated information useful for natural resources management, and to serve as a link between academia, governments the private sector and society as a whole.

Our information exchange platform (REDMESO Virtual Unit)

Due to the fact that distances and consequently high travel expenses are an obstacle for network operation, we maintain meetings at a minimum and depend mostly on Information and Communication Technologies, through what we call the REDMESO Virtual Unit (RVU), that was developed in 2001 by a team of specialists that where contracted to operate the Virtual Campus of the Network, but as a result of an evaluation of REDMESO members, demonstrated that there were many technological inequalities despite most of the Mesoamerican community members were very interested in these tools. At the same time, there were huge differences in the technological skills and levels of appropriation of the technologies, mainly in the academic institutions which faced a shortage in resources. This disabled the appropriate access to the tools and services that were offered.

RVUs mission is to offer an integral and efficient service to the Mesoamerican region members, in general, and to the REDMESO institutions in particular. This service is in terms of assessment, training, and technological development, to assist the main goal of the REDMESO. So its main objective is to promote training, dissemination, assessment, strengthening and development of institutions and members of the Mesoamerican Network of Biotic Resources (REDMESO) by means of Information and Communication Technologies (ICTs).

The RVU has four main focus areas (1) Education Technology, (2) Computer Support Systems, (3) Technological Development, Web Design and Multimedia, (4) Strategic Alliances, these are outlined below:

Education Technology

Integrated to develop capacity building programs based on ICTs, as well as academic formal and non-formal programs of interest to REDMESO. Its work is done mainly through the REDMESO Distance

Learning System (SEAD-REDMESO), supported by the Distance Learning Steering Committee (CAED-REDMESO). In a operative level, projects in this area are implemented through the REDMESO Virtual Campus, and its main learning tool, the Virtual Study Environment (AVE). The activities of this Educational Technology Area, range from the instructional design of didactic materials using ICTs, to the assessment and academic development of online courses.

Computer Support and Systems

Performs technological support tasks for REDMESO, and offers services of assessment and diagnosis to promote technological equipment and infrastructure strengthening. Moreover, manages services and computer devices from REDMESO: web servers, software, communication tools.

Technological Development, Web Design and Multimedia

Collaborates developing computerized tools (Databases, Computer Applications, e-Guides) supporting different projects implemented by URV. This area also contributes to the graphic design and to structure online virtual environments (Websites, Dynamic applications for Internet, dissemination media), as well as generating multimedia applications on CD (Educational interactive CDs, Tutorials, Presentation CDs). Finally, participates generating audio-visual products (videos, streaming, image bank), and editing printed material (brochures, fact sheets, posters, documents).

Strategic Alliances

Due to its adviser and promoter condition, REDMESO Virtual Unit has an area seeks to establish alliances with different coordinators and institutions inside REDMESO to improve the efficiency and produce win-win scenarios. At the same time, this area establishes linkages with external institutions that serve as sponsors, collaborators, and similar institutions from governmental and non-governmental sector which are interested in related activities. In this field we now have support from the European Union for a specific academic program, but we are working on further collaborations with other organizations. One very promising alliance we are promoting is with the United Nations University in Tokyo, specifically with their Online Virtual Unit, with whom we have integrated a research project related to evaluating and disseminating local, national and regional experiences of sustainable natural resources use. We have also established a work agreement with the Iberoamerican Cooperation Agency to put forward a work strategy in the area of Biodiversity and sustainable development.

REDMESO Virtual Unit has several strategic issues that have been identified and are being developed through projects and specific activities, these are the following*:*

S1: Technological Equipment and Infrastructure strengthening for REDMESO academic institutions to improve connectivity.
Among REDMESO members there is unequal access to the ICTs. This digital gap should be reduced or overcome if we wish an homogeneous impact of ICT-based projects all over the region. This premise requires the technological enhancement that will promote the acquisition of suitable equipment, and efficient connectivity services with low cost of maintenance.
The URV, through diagnosis and technological development proposals, serve to identify shortages and propose in collaboration with academic institutions, integrated technological solutions.

S2: Technological Literacy for REDMESO Community.
The use of technological tools, besides the ability of computer devices, requires capacity building that allows an appropriate operation. This has led to the need to generate technical and technological capacity programs, both in basic and advanced levels. First it has been necessary to improve the generalized use of computer tools: personal computers, peripheral devices, office applications, Internet browsers. In a second phase, more specific skills should be build up: web page design, online courses, specialized

software. This capacity programs are offered through traditional teaching modes (computer classroom), or by online courses, involving administrators, faculty members and students.

S3: e-Learning through Virtual Campus.
One of the main strategies for REDMESO Virtual Unit, is to promote high quality education in Mesoamerica, by means of implementing a Virtual Campus, that contains a Virtual Study Environment (AVE). Allowing the creation of academic programs linked to biotic resources issues without distance or time limits, and less expensive (cost) than a traditional education abroad.

S4: Promotion of research activities and development of environmental projects using ICTs.
The REDMESO seeks to establish collaborative work environments and discussion spaces, that promote and strengthen the links between researchers and students, in an inter-institutional framework. The goal of this exchange is to solve regional environmental constraints through multi-disciplinary projects. The new ICTs, managed by REDMESO Virtual Unit, carry out a fundamental role for this purpose, where the exchange of points of views and documents becomes more reliable, flexible and agile.

S5: Technological Development of Software and Tools for the dissemination and management of information as an academic support.
The URV develops technological projects which improve information flows: online databases with members, institutions and (projects) information of projects, web pages, e-bulletins. In addition, URV compiles a large electronic library as a support to research and academic activities.

S6: Promotion of partnerships to improve education, information and technologies in the Mesoamerican region.
The implementation of the strategies mentioned above, requires the collaboration and support from other partners interested in URV projects. Strategic alliances maintain a continuous updating and improvement of the Unit, as well as the cooperation results in a more efficient use of available resources.

Sharing knowledge to make a difference

Perhaps due to Latin American Public Universities historical involvement in social and political issues, mostly with positions contrary to that of local governments, there is presently a perverse discussion regarding the value of maintaining governmentally funded higher education, in spite of the fact that in practically all transcendent developments in the region, the work of our graduates has been influential.

This is particularly true in the area of biodiversity conservation and sustainable natural resources management, where 90% of the research and education in the region is carried out in public academic institutions. In this sense, with 23 Educational Institutions involved, 427 academics participating, and 10 Regional Laboratories in operation, we are certain that the work of REDMESO will improve the Academia-Government-Society relationship. But to do this, it is imperative to have examples where by working together we are able of making changes.

We now have some examples of this kind related to a series of projects we have undergone by means of summing the expertise of specialists from several Universities from Central Mexico, for the sustainable and ecological land management plans of the States of Morelos, Queretaro and Nayarit, in which several local, state and federal agencies are involved, and in which a territorial perspective of future development for each State is analyzed in three general dimensions: (1) natural, (2) social and (3) economic. By means of Satellite photo interpretation and an Geographical Information System put together on the basis of previous information generated mainly by members of REDMESO, and through workshops with local communities as well as representatives of different actors related with these three components, we have carried out an integrated diagnostic an a conflict analysis, which has allowed us to define and project a view of the future, base on Environmental Management Units.

Due to the lack of expertise in every area involved, it would be impossible for any one Academic Institution to carry out such a project by itself, but the structure of REDMESO allows us to organize *ad*

hoc work groups for many types of projects. This is an aspect that we have just started to implement in Central America.

Future plans

Due to its origin, REDMESO fundamentally works among academics, who are its fundamental component, and receive immediate benefits, but the impact of the network must go further towards its participation in strategic project at a local, national and regional level. This situation must benefit local populations of the region. In the same manner, we need to strengthen our capacity for the development and transfer of sustainable technologies related to natural resources management.

Our basic future goals are:

- Increment the number of academic institutions in the network.
- Extend our geographic coverture to the Caribbean and South America, areas with which we have strong historic, cultural and natural links.
- Consolidate our collaborative work through the Regional Laboratories, which will be reflected in the number projects, publications, and courses undergone.
- Offer our graduate academic program in at least one Central American Country.
- Develop an editorial strategy that promotes the publication in scientific journal the vast quantity of information generated by our members.
- Become an important agent in the solution of the environmental problems that our region faces.
- Develop and transfer new technologies towards the social and industrial sectors.
- Operate our Bio-TIC initiative in order to improve participating academics capacity to use and take advantage of ICTs.

Generate new alliances with other networks or organizations with similar interests.

Notes and references

[1] Global Environmental Facility, *The Challenge of Sustainability*, Washington D. C., 2002, 124 p.
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[3] S.M. Pierce *et al*., *Mainstreaming Biodiversity in Development. Case Studies from South Africa*, The World Bank Environment Department, 2002, 153 pp.
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