Max-Planck-Institut für Meteorologie

REPORT No. 322

SUMMER SESSION 2000

Beyond Kyoto : Achieving Sustainable Development

Edited by

Hartmut Graßl and Jacques Léonardi

HAMBURG, August 2001

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FINAL REPORT

Hamburg, 2001

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ACKNOWLEDGEMENTS

We would like to thank first of all each person which supported the Summer Session, each lecturer and also each participant for his interest in our project and his contribution to the excellent results.

A special thank is extended to our sponsors:

- DBU (Deutsche Bundesstiftung Umwelt)

- SHELL AG

- SUN System

- OTTO-Versand

- Lufthansa German Airlines

- HEW – Hamburgische Elektrizitäts Werke

- Haus RISSEN

Many colleagues from the Max-Planck-Institute for Meteorology and from other institutions in Hamburg helped with great professionalism and high efficiency. We would like to thank: Barbara Zinecker, Wolfgang Senft, Gerhard Lammel, Imme Masberg, Reiner Letscher, Norbert Noreiks, Gesine Rahlfs, Stephanie Prien, Evelyn Wolters, Reiner Weigle, Jan Sellmann, Reinhard Budich and Stephan Bakan.

Furthermore we would like to thank the IGEI Board Members who proposed this Summer Session. A special thank is given to Bernard Giovannini, Claudine Dayer, John S. Perry and Miriam Balaban for suggestions concerning the curriculum. A very special thank goes to the founder and the president of IGEI: Beatrice Traub.

Special thanks are also extended to the Summer Session management team: Martin Bolte and Oliver Krusch.

Many thanks also for the very constructive comments from the reviewer of this final report, Gerhard Lammel and Volker Barth, from MPI.

Without the generous support of each of them, the Summer Session 2000 would not have come true.

Hartmut Grassl and Jacques Léonardi

BEYOND KYOTO – ACHIEVING SUSTAINABLE DEVELOPMENT INTRODUCTION

Hartmut Grassl

Jacques Léonardi

Eight years after Rio, the difficulties of the Sixth Conference of the Parties to the United Nations Convention on Climate Change (UNFCCC) in The Hague and Bonn, 2000 and 2001 show us the virulent form of the international debate on how to implement sustainable development policy and measures. A high amount of detailed questions on how to manage environmentally sound projects in an economic and social successful way remains unclear, not only in Activities Implemented Jointly or in Clean Development Mechanism pilot projects, but also in participative Local Agenda 21 processes around the world. Additionally, the lack of capacity building, the lack of solid evaluation skills and the lack of co-ordination in the experience exchange at the global level inspired us to start a new educational activity.

Environmental issues are frequently addressed only in purely scientific terms, and practical political and economic actions to deal with them are neglected. For example, it is clear that the growth of aviation world wide must have an impact on atmospheric composition, and therefore must contribute to climate change; but how can policy makers devise practical measures to reduce these impacts? Moreover, general scientific knowledge of environmental problems and potential policy responses are rarely translated into specific targets, integrated management plans, and timely schedules. The main objective of the six week Summer Session in Hamburg was to enhance the understanding and skills of young professionals so that they are now able to develop successful strategies for sustainable development in their own individual institutions.

The Summer Session 2000 – Beyond Kyoto: Achieving Sustainable Development focussed on the transfer of scientific and practical knowledge into successful management measures. In addition to providing participants with a broad background of scientific and policy knowledge, the Session has given them practical experience in addressing concrete problems through integrated *Case Studies* in different domains and *Group Projects* on topics like "Sustainable Regional Development" or "Renewable Energy". In these Group Projects, participants assessed the sustainability problems of a region or of a socio-economic sector, and developed original solutions based on sound scientific, engineering, economic, and political understanding. The project ideas in this report present the main findings of these Working Groups.

OBJECTIVES AND OUTCOMES OF THE SUMMER SESSION

Through active contribution to the Session, the participants improved understanding of SD and have acquired the following skills:

- Ability to think strategically about how to achieve sustainable development (SD) and turn key strategies into successful operating plans
- Derivation of the factors that affect success of SD measures
- Understanding of the role of other key actors, and how to integrate and plan across departmental and institutional boundaries to achieve desired goals and planned results
- Design of the preparation process for a successful conflict management

- Development of an appropriate communication process
- Gain the knowledge and tactics to skillfully use position and values of others to reach a better agreement, a win-win situation and thus more effective SD
- Ability to manage SD and surmount barriers for SD implementation in projects in different sectors like housing, forestry, transportation, energy management, etc.
- Full understanding of the air transportation system and development of integrated strategies to meet aviation responsibilities to the public, government agencies and commercial enterprises
- Integration of key actors in the aviation field to help participants to apply concepts of recent SD best practices to their own businesses and administrative or scientific environments
- Provision of time for creative thinking and the development of ideas for new projects related to sustainable development (SD).

GOOD SD EXAMPLES AND METHODS: ABSTRACTS OF LECTURES

The Summer Session 2000 was divided into two main parts:

1) Basics and interdisciplinary case studies (training and lectures)
2) Group Project (working groups with growing intensity during the Summer Session weeks)

Each week consisted of a workshop focusing on a sustainability topic and integrating exercises in each course. Each instructional section (lasting from half a day up to a full week) was structured as follows: two 60-90 minutes morning lectures on basics and a case study, followed by up to 60 minutes discussion and exercises.

The afternoon working groups with 2 to 6 participants were organised according to individual capacities of participants and took place in parallel in the afternoon.

The topics of the working groups, chosen by the participants, were

- Renewable Energies
- Energy efficiency
- Urban Development
- Sustainable Development of Agriculture
- Sustainable Regional Development
- Climate Change Policy
- Raising Public Awareness through School Education.

Focus and objectives of each project were discussed by the participants at the beginning of the Summer Session and at the beginning of each week. It was possible to develop the topics in direct relation to companies and administrations. Each working group rapporteur had to present a weekly report at the plenary session on Friday. In the projects, participants apply the principles and methods shown by the lecturers in the morning lectures. Focus of the discussions between lecturers and participants were the methods used in the good examples and the application of the SD principles in many fields. It appears that the principles were often similar, for example that the lessons learned on efficiency in aviation could be easily "translated" to other industrial or transportation projects. Therefore, it was not necessary to focus on a very specific subject, but to offer a broad range of topics and fields of application.

The participants presented also their own professional experience on SD and transdisciplinary Climate Change mitigation projects. This was an opportunity to inverse the roles of lecturers and participants and contribute to emphasize the perspective of developing countries and of

countries in transition.

Based on scientific assessment, methods and the experience of environmental management practices, the lectures were held on following topics (see in annex: contacts, lecturers).

Hartmut Graßl:
Human Influence on Global Climate, the Challenge for Sustainability

There is no doubt that human activities influence regional climate, and with a very high probability human activities influence global climate as well.

What are the human activities that lead to global climate change? Through trace gas emission into the atmosphere we change composition in the long term. These gases originate from: Fossil fuel burning (e.g. energy production, industrial processes, traffic, leading to e.g. carbon dioxide, methane, sulphur dioxide and soot emissions), food production (e.g. rice paddies, livestock causing methane emissions), land use (biomass burning, urbanisation leading to further carbon dioxide emissions), emissions of other trace gases from industrial activity (e.g. chlorofluorocarbons).

How do these trace gases affect climate? They cause an additional greenhouse effect, that is, they inhibit the direct radiation of heat into outer space, and so the lower atmosphere and the earth's surface become warmer to re-establish an energy balance between absorbed solar radiation and emitted heat. Due to the different warming potential of the different trace gases, their chemical reactions, and the temperature dependence of the hydrological cycle, it is very difficult to estimate human induced climate change. The climate system tries to adapt to the changed radiative conditions and we feel climate change via changed temperature, precipitation and new weather extremes.

Has the climate already changed? This can be clearly demonstrated by the development of surface temperature during the last 1000 years. For the first 850 years or so, the time series are based on various sources (e.g. ice cores, tree rings, corals) since no instrumental data are available for this period. Nevertheless, scientists have succeeded in reconstructing the surface temperature with sufficient accuracy. The overall trend of the northern hemisphere is a slight cooling until the end of the 19th century with a rapid change into a strong warming that lasts until today. Even taking into account the uncertainty in the determination of the temperatures, there is no other episode during the last 1000 years with such substantial warming as observed during the last 100 years and there is no other period in the record that was as warm as today.

Severe weather events caused by extremes of climate variability that might become more frequent with increasing strength are one of the possible impacts of human influence on the earth system. For example severe droughts (Botswana, 1983), bush fires (Australia, 1982), and floods (Ecuador, 1982) during warm phases of the El Niño - Southern Oscillation (ENSO Phenomenon) affect large parts of the earth's climate.

For a global climate policy after Kyoto, these main challenges presented by Hartmut Graßl show the further urgent need for global co-ordinated mitigation of and adaptation to climate change, a prerequisite for sustainable development (IPCC, 2001).

Peter Brown:
Sustainable Economy

Conventional economic approaches to climate change fail to explain the real causes of negative environmental impacts and of intensified resource use: Peter Brown offered first a critical review on these theories, especially on the hypothesis of Nordhaus, that has strongly influenced the debate.

Why there are duties beyond persons? This section was designed to show why climate change

is not just an issue of human well being. The need for a commonwealth of life was demonstrated.

Contrasts between conventional macro-economics, sustainability, and stewardship economics were highlighted. They show that mainstream economics cannot offer satisfactory answers to four questions:

- What is the economy for?
- How big should it be?
- How does it work?
- What to do about waste.

Arguing that Keynesian macro-economics is a source of the climate problem, it needs to be replaced by an economics that respects other species than humans, and is cognizant of the biophysical limits of the earth. Though Keynes claimed to have a GENERAL theory he in fact had a SPECIAL theory and a true General Theory has still to be constructed. The main ideas and concepts for a commonwealth of life were presented (Brown, 2000).

Jacques Léonardi:
Urban Development Projects and Housing Sector

Is an effective reduction of emissions possible in cities, on the background of a global extreme growth of urban populations, road traffic and resource needs? This sustainability question affects the transportation and energy sector, but also spatial planning, building quality, the housing sector and the involvement of inhabitants in the local decision making processes. Technical aspects of transformation possibilities are certainly setting the frame of achievable projects in all these fields. But for an adequate local SD policy, the engineering technique is often not crucial and therefore the focus has to be on management methods and good SD practices, shown in the lecture and in the excursion.

Nevertheless, there are many types of obstacles for a successful implementation of sustainable development projects at the city level and especially in the housing sector. With examples from different cities in the world and an excursion to boroughs of social and ecological housing in Hamburg, one of the richest towns in Europe, some of these obstacles were presented and observed. Solutions on how to surmount the barriers were first shown in different quarters and further developed by the participants in their Working Group discussions. An integrated example for a good SD practice was visited, in a quarter of Hamburg. The inhabitants are in a new residence without infrastructure for cars, but with solar heating systems, passive solar energy use and a socially mixed decision making institution. The discussion with house owners showed how the conditions for effective SD project solutions have to be set at the state, the enterprise and the inhabitant level.

Fritz Gassmann and Markus Schwaninger:
Complex Systems

During the last three decades, a major paradigm change, induced by novel concepts arising in the natural sciences associated with the notions of *chaos* and *self-organisation*, lead to the development of the science of complexity. This approach, presented and explained by Fritz Gassmann, tries to circumvent important limitations encountered by traditional reductionistic methods when dealing with complex systems such as ecosystems, the global climate system, living organisms, the immune system, socio-economic systems or the human brain. The most important outcome of complexity science probably is the identification of common traits of spatio-temporal evolution for very different systems and leads us to expect the following

characteristics:

- The seemingly impossible happens abruptly
- Important changes are unpredictable and irreversible
- Be at the right place in exactly the right moment

The work with Markus Schwaninger focussed on the management of complexity in human and social systems. A systemic methodology combining qualitative and quantitative features were outlined. A System Dynamics case study was used to gain deeper insights into the dynamics of ecological management and of learning organisations. An analysis based on the Viable System Model unveiled the necessary and sufficient structural prerequisites for sustainability at different levels - organisational, local, regional, national, continental and global. The tools and methods of managing complexity have built the starting point for further analyses and the problem solving approach in the Working Groups.

Robert Sprinkle:
Aviation and the Micro-environment

Compared to previously dominant modes of long-distance public transportation, aviation seems "clean." Its adverse effects on land use, surface traffic, and noise levels are perennially troublesome world-wide but almost universally tolerated. Its adverse effects on the atmosphere are well known but usually accepted as less significant than those of other fossil-fuel consuming activities. Even further removed from controversy are aviation's many subtle effects on the micro-environment, local and global. Airports change water flow and may adulterate runoff, altering the microbial makeup of streams, lakes, and wetlands. Airports and, notoriously, airplanes themselves are sites of microbial exchange among humans. Airplanes are provocative also as rapid mass disseminators of known and novel microbial species and strains. Some of these are demonstrably harmful to humans, to other animals, or to plants. Airplanes likewise may inadvertently introduce into new habitats exotic animal and plant species, each hosting its own distinctive microbial community. These dynamics may become increasingly worrisome with expansion of immunosuppressed human populations and increasing reliance on clonal and near-clonal crop plantings. The management of these risks, presented by Robert Sprinkle, is at best complex.

Jean-Marc Alliot:
Air Traffic and Airspace Management

The first lecture of Jean-Marc Alliot described the general principles of Air Traffic Management and Air Traffic Control as an energy intensive economic sub-system, where important system efficiency improvements could be implemented in the recent years:

1) IFR and VFR flights
2) Airspace classification
3) Separation standards
4) Routes and sectors
5) Some basic figures regarding air traffic transportation and current trends

Then some recent technological evolutions which seem promising were presented

1) The Control Flow Management Unit (CFMU)
2) The Area Navigation (R-NAV)
3) The Reduced Vertical Separation Minimum (RVSM)
4) The Airborne Collision Avoidance System (ACAS)

In the second lecture, some evolutions that might reduce greenhouse gas emissions were

introduced

1) Better level allocations
2) Reduced taxiing time
3) Free Routing and Free Flight

The last part of the lecture was then dedicated to an in-depth examination and discussion of these two last techniques.

Heinz-Günther Klug
The Hydrogen Aircraft Project

A new type of aircraft has been developed by the engineers of Airbus Industries, with an extreme low greenhouse gas emission factor. The aviation sector could in principle be technologically able to reduce his impact on climate and to avoid oil based fuel consumption. But there are still some barriers and difficulties for implementation and co-operation with airlines and governments. A cryoplane prototype could not be build up to now. The chances of realisation in the next years are high, but political will has to give the starting signal. With regard to the solved technical details, the environmentally positive impacts through fossil fuel substitution, the high safety and the acceptable financial costs, the potential for this kind of hydrogen based propulsion system is immense and should be immediately taken into consideration by the political leaders and the responsible executives in the relevant companies.

Ulrich Eidecker:
Optimisation of Road Transport through Fleet Management Systems

The road transportation sector is one of the most rapidly growing economic sub-systems, with a high increase of total greenhouse gas emissions in Europe and in other industrialised countries. It is expected, that the global trade volume will also increase in the next decade. The introduction of ecologically efficient measures in private enterprises is a central objective for the implementation of a sustainable development strategy in the transport sector. A successful recent project in Germany was presented by the entrepreneur Ulrich Eidecker. An information and fleet management system has been developed, which could be transferred to other countries, other sectors and to other companies. The expected amount of emission reduction is 20-30%, compared to a Business as Usual Scenario (where the transport sector would continue to develop without emission reduction measures). The scientific evaluation of this project is ongoing.

Bernard Giovannini and Miriam Balaban
Participative Techniques and Communication for Sustainable Development

Sustainable Development issues usually appear as very complex problems, involving a variety of disciplines and many different actors. To tackle these issues, one must first make sure to define the problem properly, and to identify the relevant actors. One then in most cases must apply participative techniques, in particular conflict management and communication. Bernard Giovannini and Miriam Balaban proposed for the 4th week to study and practice some of these participative techniques and communication methods, through both lectures and group work, with a special emphasis on a case study: Energy 2000. To apply the methods, the participants have written an abstract and a press release for their respective project.

Hanz-Luzius Schmidt
The Swiss Energy 2000 Programme

Energy 2000 : Switzerland went in the 70's and 80's through a very conflict-laden political

process, focussed on nuclear energy and the potential of energy efficiency and renewables. This political process produced several lengthily reports but little political consensus. In the 90's, the authorities launched a pragmatic and participatory programme, Energy 2000, whose main purpose was to achieve a decrease in the use of fossil fuels mainly through some progress in energy efficiency through technical, financial and behavioural related measures. Another purpose was to work towards the solution of some conflictual problems, like the disposal of radioactive waste. The achievements, lessons and ideas from this 10 years long programme were used as examples by Hanz Schmidt for the discussions during the week.

Energy 2000 had in the ninth year an impact on the Swiss energy consumption on round about one third of all activities. In the year 1999, the energy consumption showed a 4,3 percent decline, the amount of the canton Ticino. 9.500 work places were created and investments of one billion SFr (0,7 Billion US $) were triggered. In 1998, the CO_2 emissions decreased by two to three million tons. A total of 470 to 690 million Franks external costs (climate change and air pollution costs) were reduced. The targeted results were obtained with an investment of the federal government of only 51,3 million SFr. The cost-benefit analysis is therefore excellent.

Beate Günther:
Conflict Resolution Techniques, Environmental Mediation and Local Agenda 21 in Germany

To achieve sustainable development, a broad variety of international, national and local policies, institutional interests, values and decisions of key actors and target groups have to be taken into account. Therefore it is necessary not only to focus on the scientific knowledge about complex environmental, economical or political issues, but also on the psychological, sociological and strategic aspects of communication processes, conflict management and participation tools. Based on case studies from the energy sector, communication techniques, methods of conflict management and participation were discussed. During the working group sessions there was the opportunity for exercises in basic communication and conflict solving techniques. The experience of several environmental mediation and Local Agenda 21 processes in Berlin and the Federal State of Brandenburg were presented by Beate Günther and intensively discussed.

Gerrit Vonkeman:
Sustainable Development and Regional Integration of Interest

Sustainable development, as developed in the context of the United Nations, is a not very concrete and not well-defined concept. It was designed to address two major global problems simultaneously: the intolerable pressure on the global environmental resources and the likewise unacceptable differences between the wealth of nations and their inhabitants.

Until now, very few of the existing sustainable development programmes address any of these problems. It is therefore necessary to recall the UNCED definition, translate it into tangible and feasible options for regional and local actors and offer them a methodology and instruments for ‘real’ sustainable development planning.

Case studies and practical examples presented by Gerrit Vonkeman illustrated the subject.

All tasks of the previous weeks of the Summer Session appear on a regional level and different interests has to be co-ordinated. The objective of the week was to find solutions on how to integrate the different interests for a sustainable development at the regional level.

Ruggero Schleicher-Tappeser:
Quality Management for Sustainable Regional Development

Sustainable development appears to be an emerging broad paradigm with a growing consensus about its meaning. As such it stands for a change in perception and in values at the same time. Since Rio the principle of subsidiarity and thereby the role of the local and regional dimensions of development have increasingly been recognised as essential for sustainability. The concrete interpretation of the general idea therefore inevitably varies over time and space. Flexible management approaches that allow for an appreciation of situations with a common framework, strategy development, transparent setting and revision of objectives, appraisal and monitoring of actions and programmes become essential tools in this context. Ruggero Schleicher-Tappeser present the "SQM – Sustainable Quality Management" as a management system that provides concepts, methods and supporting tools in this sense. The underlying conceptual framework has proven to be highly useful for a structured exchange of experiences in several projects across Europe.

Jonas Åkerman:
Aviation, and Sustainable Mobility

What approaches can deal with the large changes needed to achieve sustainable mobility? The casting approach allow the necessary design of a scenario image in the first step and of a pathway back to present (back-casting) to reach the targets represented in this image.

Demand management might be necessary. This leads to the basic question of sustainable mobility, why do we have to travel fast?

Aviation is one part of the transport sector which in turn is one part of society. What targets are reasonable for aviation in the context of a sustainable society?

Will these targets be reached in a Business As Usual (BAU) development?

What are the potentials of technological improvement, alternative fuels and modal shift to high speed ground transport?

Andreas Eke:
Emission Trading and Forestry Projects beyond Kyoto

Greenhouse gas emissions certificates could become within the next years a global trade market with 8.500 milliard $/year turnover. But how can we reduce the emissions of greenhouse gases, increase the sinks potential for CO_2 etc. in an environmentally and economically efficient local project? Andreas Eke presented successful examples on global CO_2 trading, forestry projects and international co-operation. Specially relevant are the foreseen "clean development mechanism" (CDM) and the "joint implementation" (JI), respective for developing countries and for countries with economy in transition. The principles for starting and achieving successfully sustainable development projects in the private sector were presented and discussed. As a conclusion, he showed that forests in the tropics can be managed in a sustainable way and increase the amount of sequestred carbon over long year through adequate methods, recognised by the certification institution Forest Stewardship Council (FSC), like less intensive plantation, less tree density per hectare, use of local varieties, etc. Additionally, the substitution of pesticides through human work is not only a technical, but an important social measure for forestry projects. However, the way to a domination of the global wood market through FSC certified tropical forest plantations is long.

Recent scientific results show the high carbon sequestration potential for tropical forests and thus, underline again the global importance of SD management practices in these ecosystems.

LITERATURE

Åkerman, J. (2000): Efficient high speed transport – Sustainable solution or dead end? Paper presented at KFB Research Conference: Transport systems - Organisation and planning, 2000 Stockholm.

Alliot, J.-M., Durand, N., Granger, G. (1999): FACES: A Free Flight Autonomous and Coordinated Embarked Solver. Toulouse.

Beer, S. (1988): Diagnosing the System for Organisations. Reprint, Chichester etc.: Wiley.

Brown, P. (1998): Toward an economics of stewardship: the case of climate. Ecological Economics, 26, 11-21.

Brown, P. (2000): Ethics, Economics and International Relations – Transparent Sovereignty in the Commonwealth of Life. Edinburgh: Edinburgh University Press.

Espejo, R., Schuhmann, W., Schwaninger, M. and Bilello, U. (1996): Organisational Transformation and Learning. A Cybernetic Approach to Management, Chichester etc.: Wiley.

Eurocontrol - EUROPEAN ORGANISATION FOR THE SAFETY OF AIR NAVIGATION (1999): Operational Concept Document. Brussels.

European Commission, Directorate XI (2000): Database on good practice in urban management and sustainability. (http://europa.eu.int/comm/urban/) Brussels.

European Commission (2000): Green paper on greenhouse gas emission trading within the European Union. Brussels.

Forrester, J. W. (1969): Urban Dynamics, Cambridge, MA: MIT Press.

Gallagher, R. and Appenzeller, T. (1999): Beyond Reductionism: Introduction to 10 following articles on complexity in different scientific disciplines. Science, 284, 79-109.

Greene, D.L. (1995): Commercial Air transport Energy Use and Emissions: Is Technology Enough? in: Transportation, Energy and Environment.

IPCC (1999): Aviation and the Global Atmosphere, Cambridge: Cambridge University Press.

Banuri, T., Weyant, J. et al. (2001): Setting the Stage: Climate Change and Sustainable Development; in: IPCC WG III – Intergovernmental Panel on Climate Change, Working Group III (2001): Third Assessment Report. Climate Change 2001. Mitigation. Cambridge: Cambridge University Press.

Léonardi, J. (2001): Hemmnisse der nachhaltigen Entwicklung in europäischen Metropolregionen. Münster: Lit-Verlag.

Mainzer, K. (1997): Thinking in Complexity - The Complex Dynamics of Matter, Mind and Mankind, Springer, Heidelberg, Beijing (Chinese translation), Tokyo (Japanese translation).

Mega, V. (2000): The Civilisation of Sustainability. Harmonising Policy Objectives in the European Urban Archipelago; in: SRL (2000): 3rd Biennial of Towns and Town Planners in Europe. Berlin: SRL Schriftenreihe, 46, 83-118.

MPI – Max-Planck-Institute for Meteorology (2000): Human Influence on Climate. EXPO 2000 Project. Hamburg.

Nordhaus, W. D. (1994): Managing the Global Commons: The Economics of Climate Change. Cambridge: MIT Press.

Schleicher-Tappeser, R., Hey, C. and Stehen, P. (1998a): Policy approaches for decoupling freight transport from economic growth. Paper 650, 8th World Conference on Transport

Research, Antwerpen.

Schleicher-Tappeser et al. (1998b): Instruments for Sustainable Regional Development - The INSURED Project - Final Report. Freiburg.

Schwaninger, M. (2000): Managing Complexity – the Path Toward Intelligent Organisations; in: Systemic Practice and Action Research, Vol. 13, No.2, 207-241

Sterman, John D. (2000): Business Dynamics: Systems Thinking and Modeling for a Complex World. Text and CD Rom, Irwin: McGraw-Hill.

UNCHS (Habitat), Dubai Municipality and The Together Foundation (2000): Best practice database (www.bestpractice.org) Nairobi, Dubai.

Vonkeman, G.H. (ed.) (2000). Sustainable development of European Cities and Regions. Series Enviroment&Policy, Vol. 26. Dordrecht, Boston: Kluwer Academic Publishers.

Waldrop, M. M. (1992): Complexity: The Emerging Science at the Edge of Order and Chaos, Simon&Schuster, New York, London.

Whitelegg, J. (1993): The conquest of distance by the destruction of time, in: Whitelegg, J., Hultén, S. and Flink, T. (ed): High Speed Trains - Fast Tracks, London.

The World Commission URBAN 21 (2000): World Report on the Urban Future 21. Berlin.

ACHIEVING SUSTAINABLE DEVELOPMENT IN THE ENERGY SECTOR THROUGH RENEWABLE ENERGY PROJECTS

WORKING GROUP REPORT

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I. ABSTRACT

Energy is vital for sustainable economic development. It is used to generate electricity for homes, in factories to produce goods to meet basic human needs, and for transport. However, presently energy production by fossil fuels is primarily responsible for global climate changes (global warming and enhanced greenhouse effect) caused by the emission of carbon dioxide and other greenhouse gases into the atmosphere. These changes adversely affect agriculture, water availability and human health, cause floods in low-lying coastal areas displacing people, depriving them of their livelihoods, loss of biodiversity and damage to marine ecosystems. To reduce the increasing emission of greenhouse gases into the atmosphere, the world community of nations, particularly developed nations, need to reduce their consumption of fossil fuels and shift their economy from carbon to non-carbon sources of energy. They must harness more renewable sources of energy such as solar, wind, hydro power and biomass for generation of electricity. Undoubtedly such a measure will not only address to the issues of climate change but also lead to sustainable development.

Undoubtedly, this will entail support from the various actors: the people in urban areas as well as those in the countryside - politicians, officials in NGOs, academics and more particularly from the business sector. Government has to provide financial/tax incentives for renewable energy project developers. A pro-active role of business and industry is critical to the use of cleaner technologies. Developed countries should make these technologies easily accessible to developing countries on easy terms.

Conflicts that could arise among the various sectors and constituents should be anticipated and avoided and amicably resolved by bringing to the various sectors the social and economic benefits, such as a healthier environment, higher income and better employment opportunities in remote rural areas. With “Renewable Energy” (RE) systems installed in these areas, the local people can engage in micro-enterprises such as food processing and other ecologically-sound sustainable livelihood activities. By developing the renewable energy technologies and investing in them, the quality of water we drink and the air we breathe will improve. At the end, our overall quality of life will be enhanced.

The challenge of addressing the pressing environmental problems rests not only upon government but also on non-government organisations and people's organisations, civil society and private corporate sector. Local communities themselves have an important role to play in promoting clean energy sources in our society. This will help achieving a more

sustainable living for both present and future generations.

The present report deals with renewable energy from mini/micro hydropower and generation of electricity from agricultural wastes including biomass for achieving sustainable development and discusses some specific examples. This report finally brings out a set of recommendations from the Renewable Energy Working Group for maximizing the global benefits. The key recommendations are: 1) identification and development of the renewable energy projects such as mini/micro-hydro power or biomass co-generation. These projects should be country- and site specific; 2) there is a need for mixed options considering the unevenness of available solar and wind energy resources across the globe; 3) considerable emphasis should be given to continuing research and development in the renewable energy field particularly on mini/micro-hydro power and biomass co-generation; 4) continuing awareness building, education and training among the key stakeholders including school children; 5) continuing monitoring and verification of greenhouse gas emissions; and 6) each country must formulate, develop and implement its own renewable energy programmes in the short-, medium and long-term.

II. OBJECTIVES

2.1 General Objectives:

- to achieve sustainable development in the energy sector through renewable energy projects
- to reduce greenhouse gas (GHG) emissions

2.2 Specific Objectives

- to develop two renewable energy projects for rural sustainable development. They are:
  - a Mini/micro Hydro Project
  - a Power generation from agro-wastes Project.
- Sub-Objectives
  - to describe technical principles/concepts
  - to determine the costs/financial instruments
  - to assess sustainability of the whole project activities within and outside (local level) the project
  - to analyse how the stakeholders benefit from the project
  - to evaluate application possibilities with the use of case studies

2.3 Work Methods

- literature survey and research
- adaptation of lectures inputs
- group discussions
- plenary presentations
- refining ideas from feedback
- writing the concept paper

III BACKGROUND AND ENVIRONMENTAL PROBLEM ANALYSIS FOR THE ENERGY SECTOR

3.1 Climate Change and Energy Use

The energy is central to the world's economic development. Energy 2000 scenario emphasises the use of the (1) enormous potential of energy efficiency and (2) renewable resources, more due to the fact that nuclear alternatives are not clearly favoured by many nations and have imposed moratorium. Moreover, in many developing countries as well as in countries in economic transition, electricity is not available to the people in rural and remote areas to speed up their economic growth for poverty alleviation and sustainable development. For example, in a country like India, out of the total population of 1000 million, more than 70% live in the rural and remote areas and need electricity for their development. Similar situation exists in most of the developing and economic transition countries. To provide *sustainable livelihoods* to such a large number of world population as well as to gradually shift the world economic development path from carbon to non-carbon, promotion of renewable energy technologies and maximising their use in world's economic development efforts are considered to be the most desirable alternatives, globally.

However, the applications of renewable energy must be country and site specific depending in the renewable energy resource availability and their institutional capacity.

Further the current emphasis on sustainability and carbon dioxide emission reductions has led most countries to institute policies and programmes to assist renewables to become competitive on a widespread basis and to promote their deployments.

3.2 Science of Climate Change

The earth's climate is a complex system, resulting from an aggregated interaction of many components like the ocean, atmosphere, human being and the living organisms like the forest and the biodiversity.

The earth's climate has changed over the millennium but what is causing concern of this *complex system* is the projected *rapid rate of changes in the earth's climate due to increased human activities* like *energy use, industrial processes, agriculture and land use change and forestry.*

The natural greenhouse effect keeps earth's average temperature at 15°C and this has made the evolution of the present life form possible. In the absence of natural greenhouse effects, the earth would have been a frozen planet with an average surface temperature of –18°C. The natural greenhouse gases are water vapour (H_2O), carbon dioxide (CO_2), nitrous oxide (N_2O) and methane (CH_4). The human activities are not only increasing concentrations of the existing greenhouse gases (CO_2, N_2O and CH_4) in the atmosphere but also adding new greenhouse gases such as hydrofluorocarbons (HFCs), perfluorocarbons (PFCs) and sulphur hexafluoride (SF_6) into the atmosphere. The Intergovernmental Panel on Climate Change (IPCC, 1996) has assessed that at the present rate of emissions of GHGs, the global mean temperature will increase between 1°C to 3.5°C with the best estimate at 2°C relative to 1990 by 2100. Such a rapid rate of increase in temperature has not been observed in the last 10,000 years and is projected to have various adverse impacts on the earth's environment, biodiversity, ecosystems, economic activities and human habitat and health. The Second Assessment Report has also clearly brought out that *"the balance of scientific evidence suggests a discernible human influence on the global climate system"* (IPCC, 1996).

Existing Energy Situation and the Key Environmental Problems of the Energy Sector

The energy use has increased and is still increasing, but at a much slower rate than foreseen in the 70's. Fossil fuels-coal, oil and gas are still the main energy sources increasing the concentrations of the greenhouse gases. The main key problem today is climate change.

On the other hand the role of renewable is still marginal, and for maximizing their use state support is needed in the initial stage and therefore a strong political support.[1] Some countries like India have launched a number of incentives at the Government level to promote renewable energy in the country, but what is needed is that the business sector as the prime stakeholder gets involved, takes the initiative and catalyses the growth in the renewable energy sector. Only state/political support would not be able to address the issue and promote renewable energy use, the direct involvement of the business sector as the prime stakeholder in the process, may provide a solution to the slow development of renewable energy uses in countries. The climate change is not considered as the only key problem of the present day energy use. There are many other key problems associated with the use of fossil fuels for energy. They are:

- air pollution: local and global
- natural resources depletion (coal, oil and gas)
- inefficient use of energy source
- electricity from grid is not available in most of the remote and rural areas
- acidification of terrestrial and aquatic ecosystems from SO_X emissions
- higher atmospheric turbidity causing health effects and aviation hazards

3.3 Energy, Climate Change and Response Strategies

Scientific evidence and research have shown that world wide use of fossil fuels (coal, oil and gas) for energy use accounts for more than 50% of human made GHG emissions and 80% of GHG emissions in the energy sector is due to emissions of carbon dioxide. To address to the issue of climate change several response strategies have been suggested in the IPCC assessments such as: (1) climate change mitigation strategy for reduction of GHGs and (2) adaptation strategy to adjust various economic activities to climate change. Adaptation, however calls for an in-depth country study/research to assess vulnerability of various systems to climate change.

As per the Kyoto Protocol to the UNFCCC the industrialised countries (Annex I countries) have committed themselves for an aggregate GHG reduction of 5.2% below their 1990 levels by 2012.

3.4 Protection of the Climate Through the Use of Alternative Energy Sources

Different mitigation option as identified by the IPCC to reduce emissions of CO_2 and other greenhouse gases from human activities are:

- efficiency improvements in energy supply, conversion and end use;
- fuel substitution;
- increasing carbon sink and/or sequestration;
- reduction in GHG emissions by introducing alternate/efficient technologies;

Renewable energy sources are capable of contributing significantly in each of these areas.

In a recent study commissioned by the Ministry of Environment, Government of Germany titled "The protection of the climate system through the use of the renewable energy,"

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1 See Giovannini, 2000

concluded that alternative energy sources are already well developed and stressed that the future provisions of energy must be accompanied by economical energy consumption, better building insulation and technical innovation, if CO_2 emissions are to be drastically further reduced.

3.5 Sustainable Development

Besides avoidance of GHG emissions and clean energy, the renewable energy projects also contribute to the four pillars of sustainable development (economic, social, environment and technological sustainability) in different local and regional contexts.

Sustainable development (SD) has been defined as a development process that "*meets the needs of the present without compromising the ability of the future generations to meet their own needs*", (Brundtland Commission/World Commission on Environment and Development, 1987).

The following processes are involved in dealing with sustainable development studies:

1. the analysis of the existing situation and of its natural evolution (business as usual scenario);
2. the discussion of the goals of sustainable development using "Participative Techniques" with the stakeholders;
3. the establishment of strategies: the "how to get there" and how to link the development activities with sustainable development goals;
4. measuring progress towards sustainable development goals set through participatory techniques.

An acceptable tool for measuring sustainability is the quantifiable sustainable development indicators (SDIs) of UNDP (UNDP, 2000). We adapt this tool under the four pillars of sustainability, social, economic, environmental and technical sustainability (IISD, UNEP, 2000).

<u>Four Pillars of Sustainability</u> (some indicators for illustration)

- Social Sustainability:
  - Availability of:
    - safe drinking water
    - adequate employment opportunities
    - basic health facilities
  - Equality to women
  - Equity
  - Public participation in decision- and policy-making
- Economic Sustainability
  - *increase in per capita income*
  - increased flow of Foreign Direct Investments (FDIs)
- Environmental Sustainability
  - improvement in carrying capacity (local, regional/ agricultural/ soil, air, water)
  - improvement in local/global environment
- Technological Sustainability
  - replicability of projects using renewable technologies
  - *host-country driven technological transfer*
  - reduced, recycled and re-used waste products

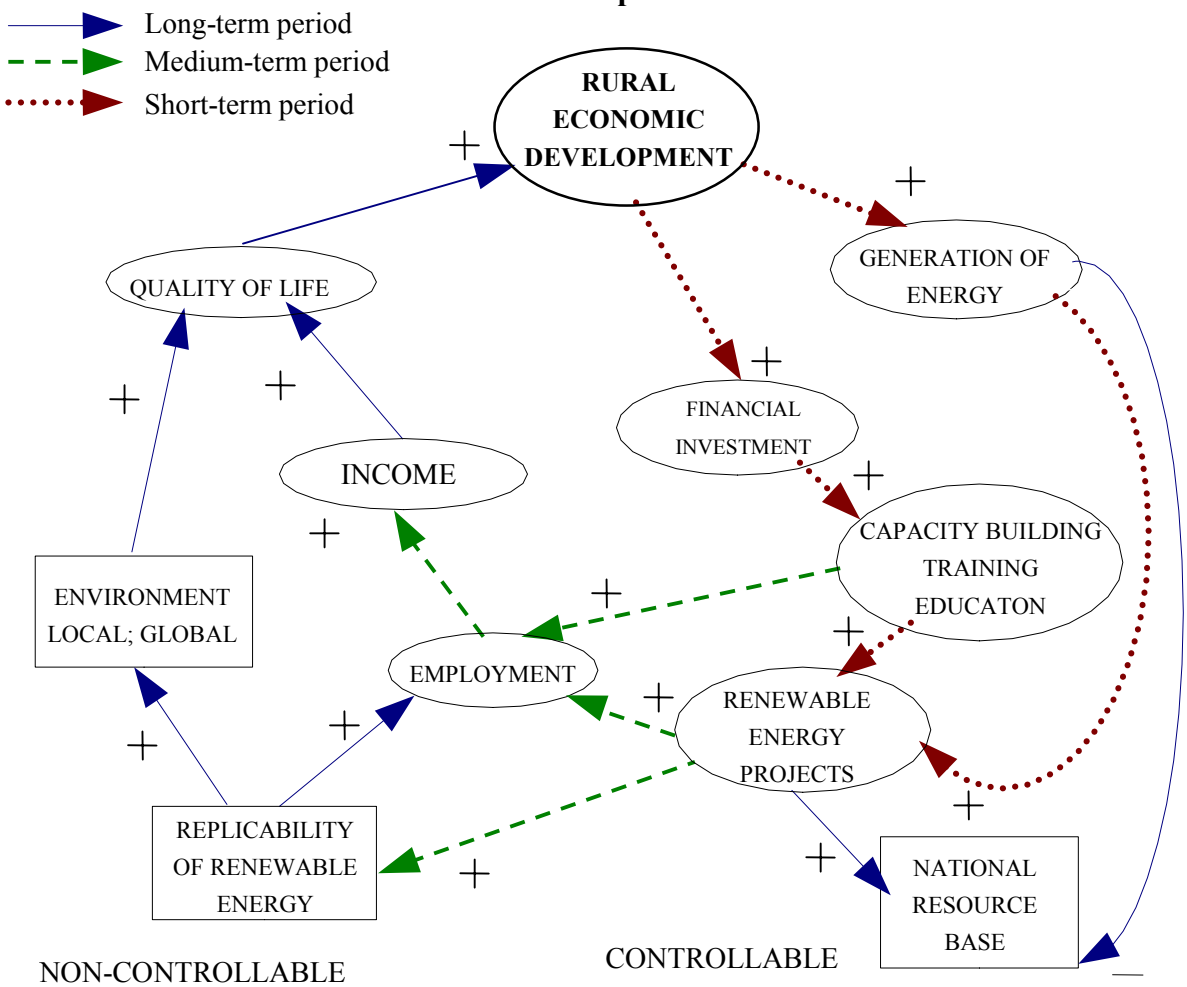
3.6 The Driving Force or the Motor to Implement the Project Successfully

In the development of renewable energy projects, it is necessary to identify if there is a "motor" for driving such activities, what are the different issues involved and their linkages, and also to identify important loops (Espejo et al., 1996). Eventually, it is necessary to specify time horizon viz., long-term, medium-term and short-term and distinguish types of variables such as:

- non-controllable
- controllable
- important indicators

A qualitative model was used to examine the above aspects of the renewable energy projects (Figure 3-1) for a better understanding in the complexity in this system.

Figure 3-1: A Qualitative Model For Decision -Making in the Field of Rural Economic Development



NON-CONTROLLABLE

1. Environment
2. Replicability of RE
3. Natural resource base

DECISIONS

1. Enabling policy by state/government
2. Best practices on RE technologies
3. Public awareness
4. Participatory process in the rural areas
5. Sustainable financing

CONTROLLABLE

1. Renewable energy projects
2. Income
3. Employment
4. Investments
5. Generation of energy
6. Quality of life

INDICATORS

1. Number of employment generated
2. Number of RE projects implemented
3. Improvement of land, air & water quality
4. Increase in biodiversity

3.7 Global Potential of Renewable Energy with Particular Reference to Mini/Micro Hydro Power and Generation of Power Using Agro-wastes (Bagasse etc.)

The World Commission on Environment and Development (WCED) has stressed in its report "Our Common Future" the need to develop the renewable energy potential which should form the foundation of the global energy structure during the 21st century. In this paper we will be mainly discussing the mini/micro hydro power and generation of power/electricity using agro-wastes.

Mini/Micro Hydro Power: Advantages and Potential

Mini/micro hydro power generation results in no direct emission of greenhouse gasses or air pollutants, and unlike the big hydro power generation, the mini/micro hydro power does not cause widespread displacement of local population and has the least impact on biodiversity and forests. Small hydroelectric power generation, on well chosen location and with a low density, has an environmentally low impact. Power from small hydro projects can provide energy for remote rural and hilly areas and is most suitable for developing countries and countries with economy in transition. In India, for example, 127 such small hydro power stations have been commissioned each with capacity of 3MW and 115 more similar projects (with capacity up to 3MW) are under construction.

Biomass

The present biomass consumption for energy purposes is estimated at 40-50 EJ (14*10 Joules) per year or 12% of the world end energy consumption. China consumes about 500 million tonnes of biomass annually and accounts for about 80% of the energy used in rural China. In India the current annual demand of fuelwood is of order of 240 million m^3.

Agricultural wastes includes agricultural residues and agro-industrial wastes. Agricultural residues such as rice husks, coconut shells, cotton stalks, coconut husks, nut hulls account for approximately 88% of total biomass residues. Energy value of different types of biomass varies considerably depending on the type of biomass (Table 3-1).

Table 3-1: Energy Value of Certain Non-commercial Fuels and Agro-wastes

Fuel	Energy content in MJ/kg
Bagasse (30% moisture)	14,6
Coffee grounds	13,4
Corn cobs	19,2
Nut hulls	18,0
Rice husks	17,6
Cotton stalks	15,8
Coconut husks	18,1
Coconut shells	20,1

3.8 Project Planning Cycle: Stages, Tools and Issues for a Successful Implementation

In general, the identification, development, implementation and evaluation of a renewable energy project (such as biomass using for example agricultural wastes) involves a process that follows the project management cycle. Of course, this cycle and the decision making can vary if the initiator and main actor is a private company or a public investor. The key stages of this cycle consist of the following (Figure 3-2):

1. **Project Conceptualisation**: The cycle starts with the identification and development of a general concept or idea of a renewable energy (RE) project that harnesses biomass or mini/micro-hydro power. The concept basically describes the nature and type, its key elements, scope, as well as the objective(s) it seeks to achieve.

2. **Identification and Organisation with Target Groups**: Under this stage, the target groups are identified and consulted at the earliest possible stage of the proposed biomass energy project.

3. **Participatory Project Development**: This stage involves the elaboration of the general project concept or idea to translate set objective(s) outlining the key strategies or approaches as well as activities to be undertaken. This process utilises various tools and techniques for participatory community resource assessments (e.g., village resource mapping, problem tree analysis) and project development involving the target groups. Such an assessment will yield baseline information on the renewable energy resources of the local community to serve as basis for determining the appropriate technology.

Likewise, a stakeholder analysis is important. This analysis provides an understanding of the stakeholders involved, their respective positions or arguments and interests and conflict resolution tools and the critical factors that will bring about success to the RE project. Table 3.2 provides an example of this analysis.

Also, at this stage, the conduct of a pre-feasibility or a full-blown feasibility study of the proposed RE. Such a study will seek to determine the economic, financial and technical viability as well as the environmental and social soundness of the RE project. Here, consultation with involved actors, including the target beneficiary groups is encouraged. At this stage, sustainable development criteria (ecological, social, economic and technological) are defined and clarified to ensure the adequacy and consistency of the project with sustainable development principles and concepts.

4. **Project Financing**: This particular stage involves the identification and sourcing of funds for the proposed RE project. Normally, project funds cover such budget items as capital costs, running costs as well as the local counterpart funding that the recipient organisation needs to put up. Project funds can be accessed from various sources including the government, non-government, private foundations, multi-lateral development institutions and financial/banking institutions either through grants, soft loan concessions or credit. Based on practice, memorandum of agreements (MOAs) are executed by and between the involved parties.

Critical to the success of RE projects is the setting-up of a sustainable financing mechanism that would harness private investments towards decentralised energy and electricity systems.

5. **Project Planning**: This stage of the project basically involves defining and incorporating the sustainability goals into the biomass energy project plan. Planning for this type of project must be country- and site- specific considering the energy resource endowments of a given locality within a particular country. Specifically, the plan should define what activities to be done, who, how and when to do it based on the set goals and objectives of the project. Under this phase, a Project Operational Plan is produced by the Project Implementing Team and the target beneficiaries as well.

6. **Project Implementation**: This project stage entails the actual operationalisation of the Project Operations Plan. In particular, this stage, involves the hiring and training of needed technical and administrative staff, the setting up of the project monitoring, evaluation and management information system (M&E/MIS), the acquisition of needed logistical requirements of the project, among others. The M&E system must establish and incorporate an emission baseline data against which progress in emissions reduction will be measured. This system must include an agreed time frame, a monitoring and verification arrangement and the organisation or entity responsible for monitoring the project effects and outcomes, including its contribution to emissions reduction. At the target group level, key activities include group formation, capacity-building and training activities and the actual implementation of the biomass project

7. **Periodic Project Monitoring and Evaluation**: This particular stage involves the regular conduct of project monitoring and evaluation (M&E) activities that will measure the performance, effects and impacts of the biomass project. In particular, the expected overall impacts are the reduction of emissions and increased income and employment opportunities for the target groups. Under this stage, corrective measures are identified in order to make necessary adjustments on the project to achieve set objectives. Project M&E tools that are generally used under this phase include regular meetings, project progress reports, assessment and summing-up reports.

8. **Project Completion and Replication**: This phase covers the formal turn-over of the project to the target groups who shall have acquired the necessary capacities to manage their own project. At the project team level, assessment and summing-up activities will be undertaken to determine the actual effects/outcomes of the biomass project. It is hoped that replication of the project to other localities will take place.

It must be noted that the entire process of project development and management for renewable energy projects is cyclical and iterative in nature as indicated by the arrows connecting the different phases of the project to each other.

Figure 3-2: Project Cycle

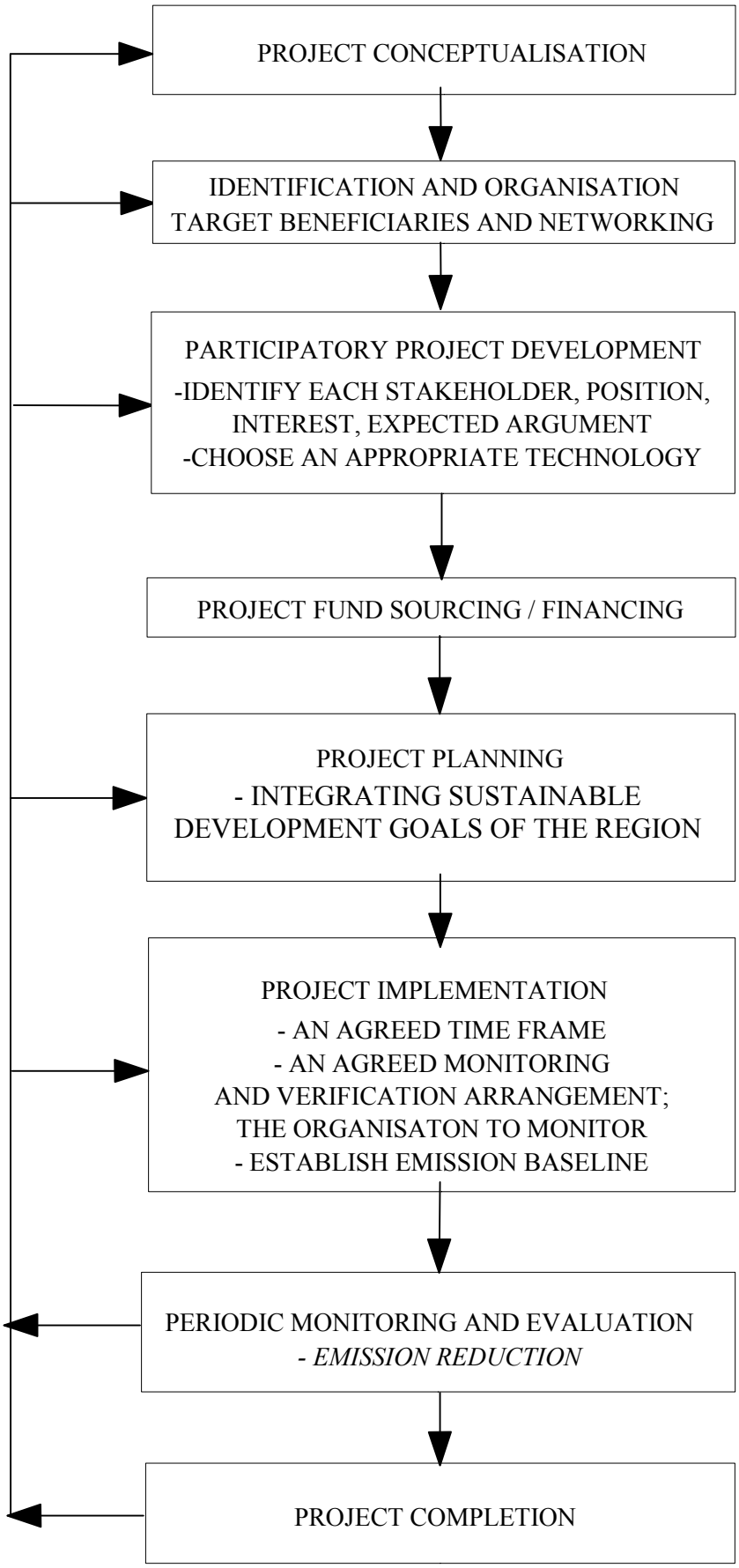


Table 3-2 Stakeholder Analysis

STAKE-HOLDERS	POSITION	INTEREST	EXPECTED ARGUMENTS	POSSIBLE TOOLS FOR CONFLICT RESOLUTION	CRITICAL SUCCESS FACTOR
1. Renewable business sector	Large number of economically profitable RE projects, Need government incentives & benefits, market development	Maximise profit	People's acceptance of the technologies, Lack of government incentives	Pilot/demonstration project to demonstrate benefits, Economic/financial incentives	Best practice technologies
2. Rural communities	Need development Lower electricity bills Safer environment	Domestic use, jobs	Sustainable livelihoods, Lack of government support and services	Pilot/demonstration project to demonstrate benefits, participatory projects	Awareness creation among people
- Farmers	May not share biomass and water resources	Domestic use, irrigation purposes	Own needs	Education and training	
3. Government	Rural development, More private sector participation and investments	Catalyse renewable energy	Address government plans and programmes for rural development and poverty alleviation, limited budgetary resources	Rural community/NGO consultation with government, effective policy proposals	Environment-friendly policy
4. Entrepreneurs	Better opportunities and support for small & medium scale economic activities	Economic gains; livelihoods	Not convinced, Lack of government incentives and support	Pilot/demonstration projects, Education and training	Creating an enabling environment
5. Non-Government Organisations	Awareness and promotion/replication of RE technologies	Social/ economic service	Government must provide proper legal, policy and institutional framework for RE promotion and poverty alleviation	NGOs may play the facilitative role, Government policy and institutional changes	Large-scale acceptance by society/government
6. Financial institutions	Ready to lend if there is profit	Profit	Investment in rural development will improve their green image, give them leadership role	Economic and technical viability of project	Creating enabling climate
7. Environment	Maintenance of life-support system and environmental integrity	Preserve and protect environment and natural resources	Vital for all life forms on Earth	For sustainable development, resource conservation and improvement of the local environment is a must	Awareness generation among people and society

Table 3-3 Examples of Implemented Projects in Five Countries

Project Nr.	1	2	3	4	5	6
Project name	India	Philippines	India	Kazakhstan	Georgia	Poland
Project type	Mini-hydro	Micro-hydro (village-level)	Bagasse Co-generation (Sugarcane)	Mini-hydro	Mini-hydro	Biomass Co-generation (Straw)
Leading Institution		Philippine Rural Reconstruction Movement				
Project size	3 MW	3 kW	350 kW	1000 kW	1500 kW	1 MW
Project cost	$ 5.07 Million	$ 0.003 Million	$ 0.436 Million	$ 0.28 Million	$ 0.9 Million	$ 0.6 Million
Project life	10 years	Operational since 1996	10 years	3 years	8 years	4-5 years
Carbon benefit	Clean energy & no CO_2/GHG emissions	Clean energy	Avoidance of CO_2 emissions	CO_2 mitigation	GHG emissions mitigation	Avoidance of CO_2 emissions
Non-carbon benefit	Availability of electricity for small enterprises at remote areas	220 Volt lighting + power supply for woodcarving, blacksmithing and handicrafts	Waste minimization, income generation, human health	Energy savings, jobs opportunities (10)		Waste minimization, income generation, human health
Availability of raw material	Available	Available	Available	Available	Available	Available
Economic viability of the Project	Yes	Yes	Yes	Yes	Yes	Yes

3.8.1 General Issues: issues that need to be looked into during the project planning

- What would be the effects of external influence such as mass media influence and television influence?
- What would be the impact on the rural economy due to outside investment?
- What are the coping mechanisms that need to be developed for the new situation?
- How the availability of electricity would influence the gender equity?
- How to manage the transition?
- How the life patterns/lifestyle would be changed or influenced by the introduction of rural electricity?
- Would the single renewable energy system be sufficient for meeting the electricity needs round the year in relation to renewable energy resource availability or a combination of renewable sources viz., wind/solar with biomass and/or mini hydro?
- In the case of mini hydropower: how different conflicts are resolved or addressed to such as: fishery, interest of fishermen and water conservation?
- What would be the issues that need to be resolved for mini hydro power utilising water-head and water-flow in hilly areas and in systems using river water?

3.8.2 Specific Issues: issues that need to be looked into during the project planning

Mini-hydro (Table 3-3)

1. Georgia

- How to create enabling environment in Georgia to attract investment for energising the existing mini-hydro systems which are lying inoperative due to lack of funds and Government policy;

2. Philippines

- How to influence public and private sectors to take initiative for implementation if mini hydro power projects in Philippines;

3. Kazakhstan

- How to attract public/private finance for new as well as existing mini hydro power units which are inoperative due to lack of funds;

4. Poland

- Problems/issues are similar to Kazakhstan;

5. India

- How to influence the private sector for maximizing their investment in the RE sector
- How to reduce delays in execution of projects;

Biomass (Table 3-3)

1. Georgia

- How to attract investment;

2. Philippines

- How to influence/attract private sector participation and investment;

- How to influence government to provide incentives and enacting the required measures;

3. Kazakhstan

- In the absence of sufficient biomass resources how to generate power using alternative renewable sources;

4. Poland

- How to create awareness and provide information on technology and funding sources to the business sector;

5. India

- How to create interest in the entrepreneurs/business sector to initiate and implement more projects for energy generation from agricultural wastes.

IV. MINI/ MICRO HYDRO POWER PROJECT AND CASE STUDIES

4.1 Micro / Mini Hydro

Electrification of the remote and rural areas is a key success factor in achieving *sustainable rural development.* Availability of electric energy defines the potential for growth. All kinds of economic activity may start as the result of providing electricity to these areas. However, many rural areas are not connected to the grid, and small hydro projects could provide an electricity supply to these areas. That is why the interest in the development of mini/micro hydro power projects has increased in the recent years. Bringing the electricity to population, especially in the rural and remote areas, is a critical problem to be solved by developing countries.

Objectives of the Project

In general, the objective of this project is to examine the viability and sustainability of mini/micro hydro power as a renewable energy source that will help to reduce GHG emissions into the atmosphere as well as contributing to the alleviation of rural poverty. The specific objectives are to provide (1) technical principles description; (2) cost description; (3) sustainability of the whole projects and of the activities within and outside of the projects; (4) the description of benefits stakeholders get from the project, and (5) evaluation of the application possibilities with the help of a case study from the Philippines.

Technologies, Capacity Building and Infrastructure

Small hydro power is one of the earliest known renewable energy sources. The micro-hydro power projects have already been developed and implemented in many countries. The globally accepted classification for hydro is in terms of power output (capacity). Though the norms may vary from country to country the following designation is often used.

Size	Unit size	Capacity
Micro	Up to 100 kW	300 kW
Mini	101-1000 kW	2000 kW
Small	1001-6000 kW	15,000 –20,000 kW

It should be noted that the small hydro technologies as well as all the other renewables should be country driven, and may vary a lot depending on the site. However, the main principle remains the same.

Head (or fall) and water flow are the two key variables which determine the siting hydro system. The head refers to the height of the falling water from the head-water (above the drop) to the tail-water (below the drop). This falling action exerts pressure which converts the kinetic energy in the water into useful mechanical energy by rotating a turbine shaft. In addition connectivity of the project site and the load center are also important for siting decisions.

However, the installation of small hydro systems is not enough for successful project implementation. The small hydro systems like other renewable energy systems should be accompanied by capacity building activities so that rural population can operate and maintain the system. Those may include:

- information dissemination. Increasing public awareness on RE systems is an important success factor in promoting small hydro projects.
- education and training of the local staff.
- support in the form of hardware and software as well as in the training of personnel is needed.
- enhancement of entrepreneurial skills.
- strengthening of research and development. A sound and newest technological base is essential for rapid progress in the development and application of renewable energy technologies.
- establishing standards and certification. Assistance will be needed in the areas of equipment specifications, standards, and certification procedures.

In short the beneficiaries must feel as the owners of the project.

Benefits

Carbon benefits

The biggest advantage of small hydro power is that it is a clean, renewable and reliable energy source available all the time.

The generation of hydro power produces no greenhouse gases or other air pollutants. It also does not generate any waste products which might require special handling or disposal. The water used for hydro power generation is always recycled without any substantial loss to the water resource.

Hydro power helps improve air quality. Only for the United States, 1997, hydro power made possible to avoid burning 143 million t of coal, 20 million barrels of oil, and 471 billion cubic feet of gas which in turn avoided the release of an additional 83 million metric tons of carbon equivalent into the atmosphere.[2]

Non-carbon benefits

Besides the carbon benefits small hydro power contributes many economic and social benefits. First of all water from rivers is a naturally recurring resource, not subject to cost fluctuations, transportation problems and scarcity issues which may impact other power generating industries.

Small hydro power plants (SHPs) are designed to use only part of the total water flow, so that the minimum stream flow is always maintained for environmental reasons. Moreover small

[2] NHA, 2000

hydro systems allow the passage of both resident and anadromous fish. SHP is a low-cost alternative. It hardly requires population relocation and deforestation. Low costs energy attracts industry and jobs, and stimulates the economy.

Regarding sustainability, small hydro are highly favourable as they meet all the four pillars of sustainable development. They create employment opportunities in the rural areas that would bring social benefits, promote education and training of the local people and thus contribute to literacy improvement. SHPs do not disturb fish migration, the water reserves can be used for irrigation. At least the roads can be build to provide the access to the power plant.

At the same time the income of people will increase because of job opportunities. Also small hydro plants as it was already mentioned do not require large-scale replacement of inhabitants and deforestation, and contribute GHG emission reductions. Thus the air pollution decreases.

It is advisable to involve local people in communications and development of the project since their participation will facilitate the implementation (see the table on issues for project planning).

Costs

Like most energy technologies, the cost of a hydro power system depends upon the site and system chosen and the power output of the installation. Futhermore, cost depends on the technological transformations required. In general cost vary between $0.5 and 1.5 million.

Barriers

Barriers to develop mini/micro hydro projects mostly belong to financial and legislative set of barriers. Effective financial, legal and institutional framework could promote the implementation of small hydro projects. Though the barriers may vary from country to country the key barriers to wide small hydro use might be as follows:

taxation policy and tariffs. Incentives should be provided through tax and subsidies for the development of mini/micro hydro projects;

lack of funds to build (or rehabilitate) mini/micro hydro projects and necessary infrastructure. Actions to overcome this barrier include the establishing of financial mechanisms and incentives to attract private sector participation;

lack of legislative regulations on electricity purchase as well as attraction of investments to mini/micro hydro development;

lack of detailed data on hydro resources;

availability of newest technology is not assured.

Time Frame

The life frame of the particular project depend on the technical transformations needed. If the project is aimed at rehabilitation the lifetime (as well as costs) will be much less than if the new plant is to be built. Normally the life frames of the small hydro projects vary within 3 to 10 years.

Replicability

There are a few countries in the world which do not possess the hydro resources to implement the small hydro projects. In many countries hydro power (and particularly SHP) is the main source of energy. However, the appropriate funding and governmental support are required to ensure the viability of the project.

4.2 CASE STUDIES

As one can see from the matrix (Table 3-3) small hydro power is an object of interest in many developing countries, and projects have been already developed and implemented. In this part the particular case studies from India and Philippines is considered as an example of success story in small hydro power system introduction. A general project setting scheme has been developed by the working group (Fig. 4.1).

Project A: India

Mini Hydro

Stakeholders involved:
- The project developer
- IREDA

Possible conflicts have been listed under general and specific issues (Table 3-2 and 3-3)

Technology :

Nature of project:	Mini hydro project set up in Karnataka in Southern India
Project Description:	3 MW hydro power at Madhav Mantri Anicut
Brief Technical Description:	The mini hydro scheme is envisaged at the toe of Anicut. Water overflowing the Anicut and differences of head on upstream & downstream of Anicut will be utilized for power generation.
Project Life :	Initially for a period of 30 years (may be extended by another 20)

Project B: Philippines

Micro Hydro

THE DRAGONFLY MICRO-HYDRO SYSTEM: The Philippine Rural Reconstruction Movement (PRRM) Experience

The Dragonfly was named because it is a natural take-off of the Firefly, being also a technology that PRRM helped to generated locally but bigger in size. Basically, Dragonfly systems either produce direct electricity in the form of 220 Volts as opposed to the 12 Volts that the Firefly produces or are capable of powering post-harvest equipment such as mills and grinders directly, without producing any electricity. This technology is more correctly known as micro-hydro power (MHP) whereas the Firefly exists in the pico-hydro range. The history of MHP development in the Philippines has been quite recent. Despite the first system established in 1910 and a few schemes put up during by American technocrats and foreign missionaries in the 1940's, 50's and 60's especially in Benguet, community-based MHP only decisively took off in the early 1990s. At the forefront of initiatives have been community and grassroots organisations composed of NGOs, POs, as well as the Non-Conventional Energy Centers of the DOE. Such groups have a certain level of organisation and consolidation that enables them to undertake MHP projects and successfully manage and sustain these.

Gode 3kW Micro-Hydro Direct Electricity Project (PRRM, 1999)

PROJECT LOCATION:	• Gode, Bangbang, Hungduan, Ifugao
PROJECT ADOPTER:	• Gode Farmers Organisation
NO. OF BENEFICIARIES:	• 24 households and Elementary School
BENEFITS GAINED:	• 220 Volt lighting and power supply for woodcarving, blacksmithing and handicrafts. • 25 people in technical training programmes.

HYDRAULIC POWER:	• 11 meters head and 62 liters/sec water flow
MACHINE POWER:	• 3 kilowatts at 220 Volts
DATE OF PROJECT:	• May 1996 - November 1997
PROJECT COST:	• US$ 3,090.00

The micro-hydro machine developed is a hybrid design, borrowing principles from Francis turbines for the casing and draught tube, cross-flow turbine and radial pump design for the runner and motive power units for the flywheel. It is a unique design, scraped together from old textbooks and Louis' intuition. It did require some minor modifications after installation, but now operates successfully with careful management of water and loads.

Gode is a typical Ifugao village: reached only by mountain trails, set in steep topography with beautiful rice terraces and native huts scattered in the forest areas; but with intractable problems such as the difficulty of farming the rugged uplands, a poor health situation and lack of livelihood opportunities due to distance from markets. However, this does not deter people from engaging indigenous trades such as blacksmithing, woodcarving and handicrafts, the rough cuts of which they have to sell to middlemen for finishing in Banaue or Baguio City.

The Micro-hydro Electricity Project has always been aimed at these livelihood activities of the Gode people. The power available from the micro-hydro machine is transmitted along 3 kilometres of double cables to the school and housing settlements around the village for lighting people's evening work. Also, small electric tools such as blowers, planers and grinders can be used during the day for finishing the local indigenous products and increasing their value and ultimately increasing incomes.

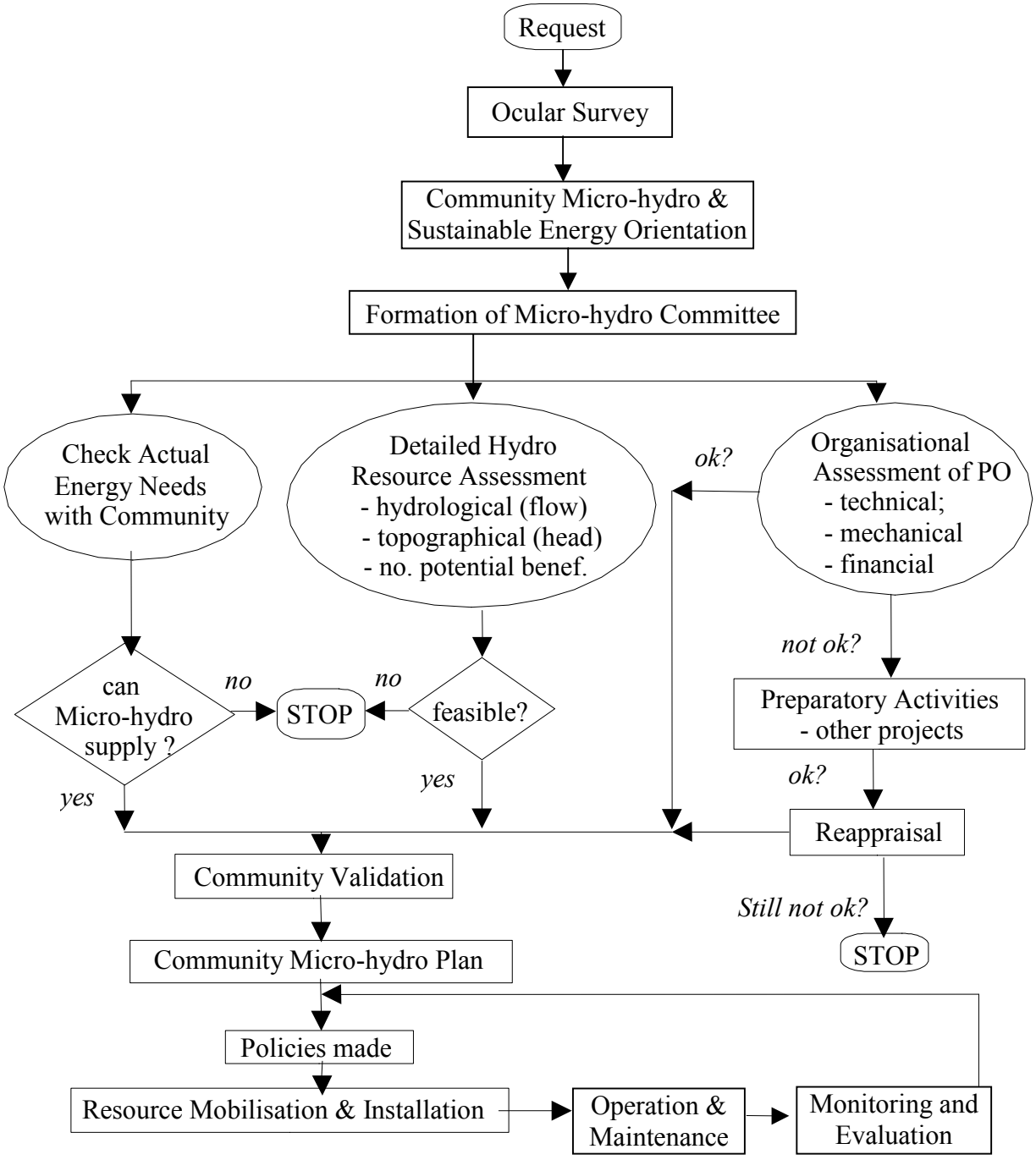
The strategy in implementing this project was to first strengthen the People's Organisation in the village to handle the operation and management side of the micro-hydro. Thus the Gode Farmers Organisation was established and this group has decided on a monthly rate for their electricity and how to manage the water resources that the micro-hydro depends on.

Five operators have been chosen to work alongside the local technician in maintaining the technical parts of the machine and to date one electrical training has been given to 25 farmers. Through meetings held by PRRM and the 200 days free labour given by the community a sense of solidarity has built up around their project, unifying people's purpose in using micro-hydro electricity.

Not only does micro-hydro demonstrate the cheap and clean production of energy for development of village industries, but it has an inherent link to the management of natural forest resources. With the support of the assisting NGO the importance of the water source has been stressed to the people. This has encouraged them to plant more trees in the watershed areas of the micro-hydro through the setting up of a community nursery.

All in all the Gode Micro-hydro Direct Electricity Project serves as an excellent pilot site for this type of appropriate technology in the Philippines, where local people themselves have realised a dream with a minimal amount of cost, using local materials and skills to tap a local resource in a environmentally friendly and socially beneficial way. Furthermore, with local government officials involved in the project and its press coverage, a certain amount of advocacy for micro-hydro has been achieved as it is a technology that could be very useful for many other remote barrios for their sustainable development.

Figure 4-1: Model/Scheme of a Process for setting up a Micro-Hydro-Power Project



V. POWER GENERATION FROM AGRO WASTES AND CASE STUDIES ON BAGASSE CO-GENERATION

5.1 Introduction

Biomass gasification, which involves generating energy from domestic waste products, has caught renewed interest in view of the energy crises that marked the past two decades or so.

Specifically, biomass is used as fuel for steam turbine-based combined heat and power (CHP) generation in the forest-product and agricultural industries of many countries. The residues of the primary products of these industries comprise mainly the biomass used as fuel. Co-firing coal-fired plants with supplemental biomass inputs is now increasingly being adopted (UNDP, 1997).

Importantly, the possible effects of wide-scale use of biomass must be viewed from a broader perspective, including aspects not usually within the purview of conventional economic analysis. The reductions in air pollution and carbon dioxide and diversification of fuel supply are the most commonly associated benefits of biomass energy development. In addition, biomass energy utilisation provides job opportunities in rural areas, even for unskilled workers.

5.2 Objectives

General:

The primary objective of the project is to analyse and demonstrate the potential viability and sustainability of biomass, particularly agricultural wastes (e.g., sugarcane bagasse) as fuel for power generation, while alleviating poverty in rural areas. The project is designed to help reduce the phenomenon of global warming by reducing carbon dioxide emissions that would otherwise be produced by conventional thermal generation. It also aims to establish a globally replicable, commercial-scale demonstration technology for co-generation of electricity.

Specific:

- Examine the importance of biomass energy utilisation in relation to climate change and sustainable development ;
- Analyse the potential benefits and costs of biomass energy technologies, specifically, agricultural wastes such as sugarcane bagasse, as fuel for energy production;
- Examine and analyse the existing barriers-policy, technological, financial, socio-economic and market as well as the sustainability requirements and structural transformations required of biomass (such as sugarcane bagasse) energy systems.
- Identify existing best practices in biomass energy utilisation for replication possibilities.

5.3 BIOMASS TECHNOLOGIES AND INFRASTRUCTURE REQUIREMENTS

Biomass Technologies

Biomass Integrated Gasifier/ Combined Cycle (BIG/CC) technology

The Biomass Integrated Gasifier/Combined Cycle (BIG/CC) is an advanced technology that could make possible for electricity derived from plantation biomass to compete with coal in power generation. This can be supplemented by less costly biomass residues.

Although BIG/CC technology is not as advanced as coal integrated gasifier combined cycle

(CIG/CC) technology, a number of demonstration projects are now being undertaken in several countries.

Infrastructural Requirements

A biomass (e.g., sugarcane bagasse) co-generation system is normally established within the sugar-mill where agricultural wastes such as bagasse abound. Any surplus power generated by the system will be given to the grid.

Time Frame

Normally, the full-cycle for developing and implementing a biomass energy project takes a period of five to ten years.

Cost

Technological improvements and a shift toward cheaper crops have contributed to reductions in the cost of biomass projects since the 1970s. Further cost reductions can be expected. Costs of electricity from biomass generation compare favourably with those of fossil-fuel generation and even hydro generation.

5.4 CASE STUDY (INDIA)

Climate Change Mitigation Projects - The Development Alternatives Experience

Biomass Projects (Name of the project: Project A, India (Table 3-3))

The Stakeholders

Generically speaking, the different stakeholders for the biomass based power projects are as follows:

- The project developer.
- The funding agency. At this stage, two issues are important. For co-generation projects that generate power through biomass combustion, obtaining funds are not difficult since the raw material (sugarcane bagasse and/or rice husk) is generally available and the cost of production is also lower. The main agency that provides financial assistance in India is IREDA. For biomass based power projects that use Gasification Technologies, the numbers are usually less positive (costs are higher) and although they are environment friendly, they usually face more implementation problems. IREDA does not have a separate window for such projects and the rate that they charge (12.5% - 13%) is generally considered high. As such, the role of IREDA is fairly contradictory from the environmentalist's point of view.
- Other energy consumers. When the energy generated by a co-generation plant is more than its own needs, it either sells the excess power to the grid, or to third parties. A good example of how this is done is the Sree Papers case, which is selling the excess power, up to 2.5 Mw in the off-season, to the other paper and other factories in the nearby vicinity. There are some official clearances that need to be done before such an arrangement can be made. (Details can be provided if required.)
- The concerned State Electricity Board. This is the agency that finalises the operational modalities of any energy project in its own state. In matters of third party arrangements or selling off of the excess power to the grid, the SEB has the final say.
- Other financial institutions. These include banks (State Bank of India, for example). They do not subsidize loans as IREDA does. However, most operators find banks less of a hassle than IREDA.

- The climate change financier. Yet to enter the picture.

Conflicts

Case Example

The technology provider for the project is PRM Inc., a multinational engineering firm with a forceful presence in the biomass field. However, the technology, although very environment friendly, is expensive. Hence the return on capital is lower than expiated, accompanied by a high capital installation cost. This is withholding the implementation of the project, although they seem to have secured a loan from IREDA. Resolving the stalemate is being tried through the introduction of a climate change financier, who would ideally give a loan against the carbon offsets. Additional point which need to be looked to during the project planning are mentioned in the Table 3-2.

Details on the Technology:

Project Description:	Co-generation Project for a Sugar Mill	
	Capacity:	32.8 MW
	Raw Material:	Bagasse and coconut shell
	Product:	Power and process steam
	Customer:	Sugar Mill & Electricity Board

Project Details:

Nature of project:	Sugarcane bagasse based cogen plant
Brief project description:	Installation of a 30 MW sugar mill co-generation power plant on Build-Own-Operate-Transfer (BOOT) basis
Capacity:	5000 Tons of Cane / day (TCD), or 208 TC/hour
Average annual sugarcane crushing:	1100,000 Mt
Average season days/year:	200 days
Average bagasse generation:	31% on cane
Avg. Mill bagasse for power generation:	330,000 Mt
BOOT period:	20 years
Power reqt. at Mill & site:	6. 4 MW in season, 0.6 MW during off-season
Total power generation by the plant:	24.48 MW during season months & 28.00 MW during off-season

5.5 BARRIERS AND STRUCTURAL TRANSFORMATIONS REQUIRED

Legal, Policy and Institutional

In general, the lack of an enabling legal, policy and institutional framework particularly in many developing countries, is one major obstacle to renewable energy development. Existing energy policies and strategies are incoherent and biased against the promotion of new and renewable energy technologies. Many developing countries are committed to centralised grid, fossil fuel-based power expansion. Inadequate incentives are provided to those involved in

this particular technology. Also the lack of effective and efficient co-ordination between and among government agencies mandated to develop this particular sub-sector is another concern that must be addressed.

Technological

As a consequence of the lack of an enabling policy environment, current research and development in biomass energy development is relatively weak. There exists a glaring need for financial and institutional support. While there have been successful attempts at demonstrating the technical viability of biomass co-generation system, its further replication is hindered by this particular constraint.

Market Development

Given the current barriers affecting the renewable energy sector, market opportunities for its further development are consequently restricted. Its expansion largely depends on the private sector support and investments. Hence, proper incentives including economic must be provided by the governments in order to encourage its commercialisation. The establishment and maintenance of a level playing field by eliminating permanent subsidies and reflecting external (social and environmental) costs of fossil fuel-based power projects must be considered to catalyse renewable energy development.

Financial

Current global trend of re-designing electricity and energy requirements toward a decentralised system will certainly benefit renewable energy. The lack of a sustainable financing mechanism for renewables impedes the full development and commercialisation of these technologies. Existing power contracts in many developing countries are biased in favour of fossil fuel-based power generation.

Carbon Benefits

Among the benefits associated with biomass co-generation are the reductions of air pollution and carbon dioxide and diversification of fuel supply. Biomass contains less sulphur and is much more reactive than coal.

Non-Carbon Benefits

An important non-carbon benefit related to renewable energy systems such as biomass co-generation is its potential to reduce poverty in the rural sector. The wider-scale replication of this technology will bring about an increase in income and employment opportunities among the rural poor as they expect to generate value-added from their produce (e.g., peanut sheller, processed food, etc.) and micro-enterprises.

Replicability

Given adequate funding support, a biomass energy project expects to generate adequate revenues that will ensure the sustainability and viability of the plant. In the longer term, the proposed biomass-based project will become technically, financially and economically viable, as the proposed technology is refined and becomes competitive with other alternative energy sources.

VI. CONCLUSIONS AND RECOMMENDATIONS

Lessons Learned and our Recommendations

1. Participatory process from the project concept stage
2. All the primary (investor, host-partner, government and civil society) and other stakeholders depending on the project and site are to be involved in project planning and development from the beginning
3. Strong pro-active role on the part of government and private business sector
4. All the concerns and conflicts that could arise have to be identified and resolved through iterative consultation processes
5. Funding sources must be identified and involved
6. Renewable resources availability in the project site and around must be assessed clearly with data
7. Local people involvement not only in project planning cycle but also for implementation and beyond. A sense of ownership with the different stakeholders particularly the local population is very essential for the success of the project and for the sustainability of the project beyond the project life.
8. A very clear and sound monitoring and verification process has to be agreed upon and integrated into the project.
9. All the economic, social, environmental and technological benefits and costs must be assessed in the beginning of the project and verified during and after the project
10. Influence in government for enacting the necessary measures and legislation
11. A risk assessment of the project needs to be initiated by investor and the host-partner
12. Continuing research and development is crucial to the sustainability of the renewable energy sector
13. Each country must formulate its own renewable energy policy, plan and programmes (short, medium and long-term) and implement them
14. Availability of electricity in the rural areas may have some impacts on the social power structure in the village. This must be carefully studied and solutions found.

VII. ACKNOWLEDGEMENTS

The Summer Session 2000 has provided a unique opportunity for the participants and particularly the WG on renewable energy to learn considerably in the technology and process for project development in the RE sector for achieving rural sustainable development and in the use of "Participatory Technique."

The invited experts have provided us many innovative ideas and analytical methods for conflict management and sustainable development objectives under the four pillars of sustainability viz., social, economic, environmental and technological.

VIII. REFERENCES

Asian Development Bank (2000): Philippines Country Environmental Policy Integration Analysis Report. (http://www.adb.org/Environment/AEO/PUB/documents/philippines.pdf) Manila.

Bundesumweltministerium (2000): Climate Protection Programme 2000. http//:www.bmu.de, Berlin.

Chatterjee, K. (2000): Advances in Global Change Research. Climate Change: An Integrated Perspective. New Delhi.

Espejo, R., Schuhmann, M., Schwaninger, M. and Bilello, U. (1996): Organisational Transformation and Learning. A Cybernetic Approach to Management. New-York: John Wiley and Sons.

Giovannini, B. (2000): Introduction into Participative Methods in Sustainable development, Paper presented in the Summer Session 2000, Hamburg.

IISD – International Institute for Sustainable Development, UNEP – United Nation Environmental Programme, Ecologistics Int. Ltd. (2000): Capacity Building for Integrated Environmental Assessment and Reporting. Training Manual, by Pinter, L., Zahedi, K. and Cressmann, D. Winnipeg.

IPCC (1996): Climate Change 1995. The Science of Climate Change. Cambridge: Cambridge University Press.

IUCN – International Union for the Conservation of Nature (1997): An approach to assessing progress towards sustainability: Tools and training series, IUCN, Gland.

NHA – National Hydropower Association (2000): Hydro facts. Washington; www.hydro.org, United States of America.

Overend, R. (2000): State of the art: Biomass and Bioenergy; in: Energy 2000 - State of the Art, L'Aquila: Balaban Publishers, 23-45.

PRRM – Philippine Rural Reconstruction Movement (1999): Gode Micro-Hydro Case Study. Manila.

UNDP – United Nations Development Program (2001): Development Watch. Monitoring Progress on Sustainable Development. (http://www.undp.org/devwatch/reports.htm), New York.

UNDP – United Nations Development Program (2000): Human Development Report 2000. (www.undp.org), New York.

UNDP – United Nations Development Program (1997): Energy After Rio: Prospects and Challenges (Executive Summary) 35pp., New York.

World Resources Institute (1992): World Resources Report 1992-1993: Dimensions of Sustainable Development. New York.

Worldbank (2000): Project Database (http://www4.worldbank.org/sprojects/), Washington.

ENERGY EFFICIENCY IN THE BUILDING SECTOR

Working Group Report

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ABSTRACT

The energy use in the building sector (heating and also cooling) is a major part of the energy budget of many countries. This is mainly due to insufficient insulation. In our report "Energy Efficiency in the Building Sector" we show measures towards a more sustainable situation and we describe a nation-wide strategy to introduce those measures, even if national governments are not interested.

The key barriers in the building sector are the high investment costs, the lack of information and the lack of highly skilled personal with management experience. The measures we recommend to the governments as first steps are relatively cheap and simple (introduce awards, use public buildings as good examples, build demonstration areas and small pilot projects, install a steering committee, launch an awareness campaign, fund independent NGO's and implement technical measures like a metering system and a thermostat directive). The central measure we want to achieve is a thermal standard for new and old buildings. This standard has to be respected and implemented, whenever it comes to the renovation of a building. Therefore, an independent control group is needed. To speed up the modernisation process, we recommend additional measures and incentives such as a financing model (including owner, tenant, industry, local and central government), an energy tax (included in a general approach with a concomitant reduction of other taxes), a different tariff model and a certification model. In order to achieve the introduction of these standards by the different governments, we propose a participatory bottom-up approach, which should start a "building standard discussion" in the respective society.

Our general approach can be used in different countries, although additional points will have to be added in all countries. We recommend a database - worked out by research and development institutions to provide basic information on the existing building situation - resulting in a status report (including future scenarios and energy saving potentials) and in a national conference. Simultaneously expert groups (civil engineers, architects, urban planners, etc.) have to be involved in the process of developing the national (local) standard, likewise a network among all interest groups has to be established. Most important is that the industry is part of the network. Further, there is the need to raise public awareness and to create a vision by NGO's, media, universities and schools. Therefore, a funding system is needed. In our report all the participants (from six countries) define individual starting points, describe the main problems in their respective countries and develop their proper solutions. Our final idea

is to form a small network among the Summer Session 2000 participants (especially among the Energy Efficiency Group) to encourage our respective governments to implement a building standard.

I. INTRODUCTION

During the Summer Session, the participants agreed on the fact that there are only two major ways for emission reduction and a sustainable development in the energy sector. One is the support and implementation of new renewable energy infrastructures, the other is the augmentation of energy efficiency in the existing structures. The energy use in the building sector (heating and also cooling) is a major part of the energy budget of many countries and it leads to large CO_2-emission. This is mainly due to inadequate insulation. In our report "Energy Efficiency in the Building Sector" we show measures towards a more sustainable situation and we describe a nation-wide strategy to introduce measures, even if national governments are in the first phase not interested in the discussion process.

The background of the world's energy problem is clear: Humans use too much energy (in all different sectors). The target is also clear: We have to achieve sustainable development and reduce the greenhouse gas emissions from private and public buildings. This is a long term process and the goal of our report is to start the discussion on innovative implementation ideas. The important measures in the building sector are also clear (from the scientific point of view). Our goal was to find strategies to implement agreed measures.

The overall objective of this report is the conservation of energy. We try to increase the energy efficiency in the building sector by identifying appropriate political measures. In our opinion it is not enough to define measures. The question is how to implement them or how to urge the governments to introduce those measures.

The energy reduction potential is different in all countries, and often the energy reduction potential is poorly investigated. These are some of the reasons why we are not discussing the energy saving potential or the CO_2 reduction potential in our countries.

In our report we describe the actual situation, the stakeholders involved and their positions. We analyse the barriers existing for higher energy efficiency which prevent the use of efficient technologies. We also search for key success factors which could change the present situation. These key success factors lead to the opportunity analysis. The creation of a positive feedback loop is in the centre of a complex system analysis. The description of the recommended surroundings (for a positive feedback) lead to the chapter where we describe the measures we recommend to the governments. These measures consist of starting, central and additional measures. We will search for different solutions from a technical, political, financial and social point of view and we will adapt these solutions to different target groups. In chapter 4 we develop strategies to push the government into the measures proposed. We call it the common response strategy of the working group. For all countries represented in the working group we define specific solutions and starting points. We conclude with lessons learned by us.

II. ACTUAL SITUATION

2.1 ANALYSIS OF BARRIERS

As in other sectors, barriers also exist in reaching energy efficiency in the building sector. These hinder the well functioning of the entire system. The key barrier in this particular sector

is the high energy use in households, whose members do not behave in a sustainable manner.

Table 2.1 defines the barriers and ways to overcome the problem.

An unfavourable definition of central government energy policy could be a barrier, depending on the country and its government. If, in addition, a government does not apply the concept of energy efficiency in the building sector, this would be a problem for the credibility of the government and thus for the development of the entire energy sector. An energy efficiency network would play a key role in the entire process, since it promotes the dialogue and information exchange among all actors involved. The development and dissemination of a comprehensive database could be the primary step in this process. On this base, projects could be started as policy makers could make the proper choices.

2.2 ANALYSIS OF THE INVOLVEMENT OF STAKEHOLDERS AND KEY SUCCESS FACTORS

It is important to define the stakeholders involved in the complex system of decision making in the sector of energy efficiency in buildings (Table 2.2) and to analyse their positions, as this is a key sector for an economically, politically and socially sound development. For the analysis of the system we defined four main aspects for each stakeholder:

- Position
- Interest
- Expected argument, that stakeholder will provide when he is confronted with the problem
- Success factors for a better action.

Consumers play a key role in the decision making process, they have a decisive place within the "causes to impacts chain". The central government has a crucial role in the system as well, as it designs, develops and implements the laws (at financial and social levels), that have an important impact on the behaviour of the consumers. This complex "game" includes additional actors, like industry, local government, R&D institutes, experts, NGO's and the environment.

There are many success factors that could improve energy efficiency related decision making. From our point of view, there is no excuse argument not to implement key elements of a sustainable strategy in the housing and building sector. Respective aims and elements are:

- Energy saving attitudes must be widely adopted
- More responsible and more pro-active energy consumers are needed
- Since the consumers are the most decisive actors it is important to define measures that give an incentive for changed consumer behaviour
- Lower energy use has to give benefits for the consumer
- Implementation of political measures in the building sector needs a specific national energy efficiency programme that emphasises consumer involvement
- Improved information on energy use and potential savings from energy efficiency measures
- Information on energy efficiency opportunities needs to be systematically collected, analysed and distributed world-wide. This information can help governments to understand better the improvements needed to start or strengthen their energy efficiency programmes
- Allow and encourage initiatives by citizens and enterprises for local sustainable energy policies
- Public private partnerships for the identification of investment opportunities
- Improvement of energy services by improved skills of all stakeholders involved in the energy efficiency.

Table 2-1: Barriers for the Energy Efficiency in the Building Sector and Potential Solutions.

Barriers	*How to overcome the barriers?*
High energy use through inadequate consumer behaviour (this is the key barrier)	Motivate the consumers to accept the energy problem as a key factor for the quality of life of future generations Improve/develop ways of influencing a person's awareness (increase the price of end energy use)
Non-sustainable energy policy of the central government	Citizens and NGOs should create pressure to obtain better conditions (comfort at less consumption) in the buildings Private sector could play a key role in this process as it could stimulate a new market, with profit for the sector
Lack of funds	Create a specific fund. The financial resources, for example, could come from those industry sectors with economic interests in renovation and rehabilitation activities
Lack of experts with knowledge on energy efficiency	Motivate the building and housing sector for the problem of the energy efficiency Develop guidelines and best-practice database Offer training courses related with the subject i.e. build capacity
High investments needed for project implementation	Incentives, for example tax exemptions given to energy efficiency markets, changed laws, e.g. asking for better insulation This will lead to growth and/or evolution of the energy efficiency market
Lack of highly skilled personal	Offer training courses (capacity building) and improve information dissemination
No energy efficiency network	Connect the different energy sectors, build a network that improves not only the intra but the inter-relations between the different departments and stakeholders. This leads to transparency, higher quality and better information
Poor information on energy in the building sector	Create a comprehensive information system via a comprehensive database From good statistical information, successful measures can be derived

Table 2-2: Energy Efficiency in the Building Sector: Stakeholders, their position, interest and arguments; potential success factors

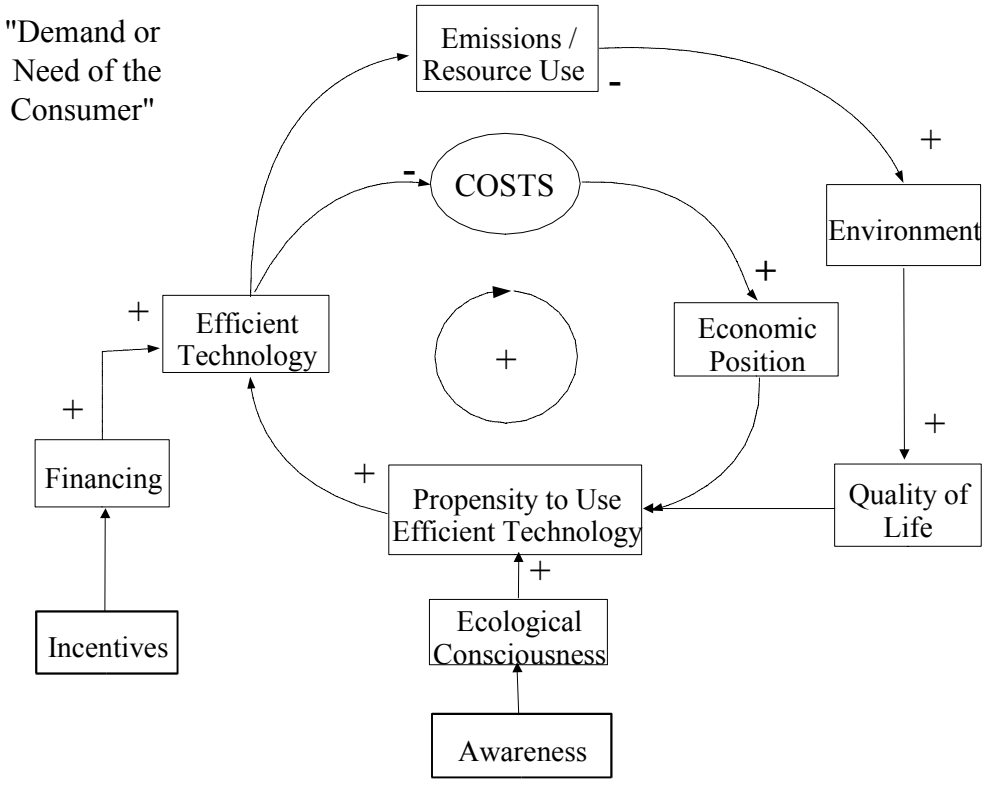
Stakeholders	Position	Interest	Expected arguments	Success Factors
Consumers	Lower costs for the same consumption rates Improvement of indoor comfort, higher quality of life	Equal opportunities, low cost techniques	We need government incentives	Awareness → + Behaviour Information
Local government	Improved conditions of buildings within its jurisdiction, more comfort for families	Social stability, local development, more jobs	We want local independence and government incentives for our projects	New guidelines; More independence for local decisions, capacity building in the region
Central government	We have to meet peoples needs, to develop the building sector, to give incentives for the investments	Stimulus for higher energy efficiency in the building sector	Definition and improvements in the planning of the energy building sector Lack of money	New laws, energy or ecological tax without increase of general tax burden, new investments
Industry	We want to stay in the market and grow	New markets with chance for more profit	We cannot lower prices without changed boundary conditions	New laws that lead to better standards; use of best practices
Research and development institutions	We develop better technologies and improve skills through capacity building	Improved understanding, research funding, better education	We need more funds for research	New investments; introduction of energy issues in training courses
Experts	We improve buildings through better standards	Achieving more efficient energy practices	Implement best practices and co-operate with other sectors	Raised awareness, better information and creation of networks
Environmental NGOs	We create awareness and help approach sustainable development	Conservation of nature	Survival of the planet is at stake	Investment in energy efficiency
Environment	Resources have to be kept for the biosphere	Low level of emissions	Keep the biogeochemical cycles intact	Awareness leads to more resources and finally to a more sustainable use of natural resources

III. ANALYSIS OF OPPORTUNITIES

3.1 COMPLEX SYSTEM ANALYSIS

There are many factors which prevent the use of efficient technology in the building sector (see Fig. 3-1). The most important obstacle are investment costs. This chapter deals with that problem and tries to give a solution. It is necessary to create a market-based positive feed-back loop, which stimulates the use of efficient technology.

Figure 3-1: System analysis of energy efficiency in the building sector



First motive or driving force is the "Demand" or "The Need of the Consumer", which creates a market for energy. Through incentives and awareness we recommend to stimulate a positive feed back loop so that the consumer uses more frequently efficient technologies. The incentives described in the chapter on proposed measures have to lead to an attractive financing model in the building sector. These efficient technologies will reduce the energy costs for the individual and strengthen the individual economic position, although the high investment cost in the beginning has weakened that position. The gross national product will increase because of the growing reconstruction economy. In summary the propensity to use energy efficient technologies will increase.

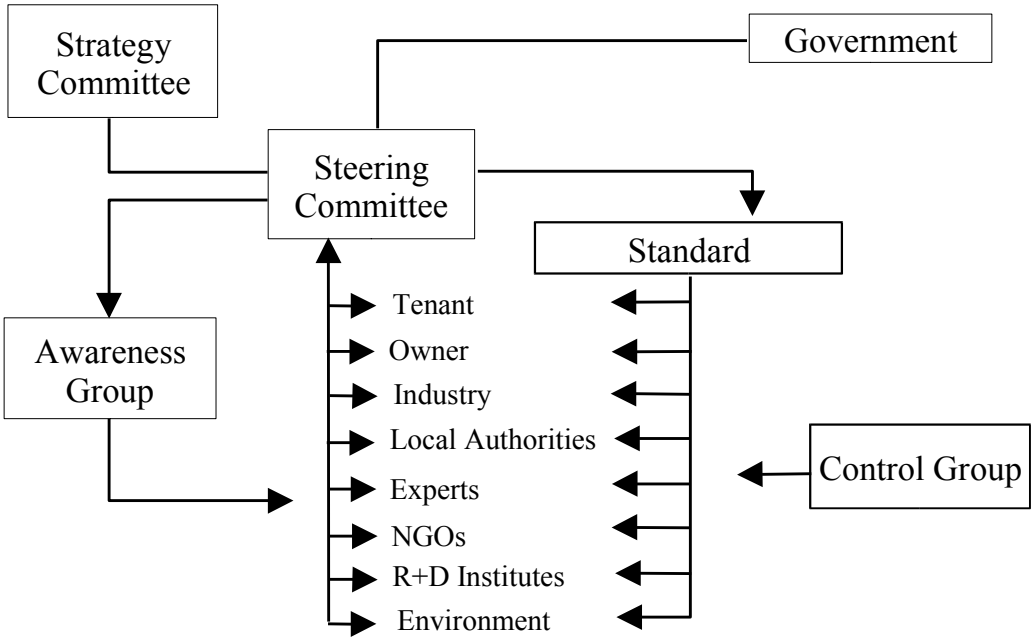
A second positive feed back loop is created by reducing the emissions and the use of resources, which is positive both for the environment and the quality of life. The propensity to use efficient technologies increases further.

The propensity to use efficient technologies can also be stimulated by all the measures which create awareness. Awareness campaigns will raise the ecological consciousness among the consumers. At the end a positive feed back loop is created and the use of insulation and other energy efficient measures will become an important sector of the construction market.

3.2 THE RECOMMENDED SURROUNDINGS FOR THE IMPLEMENTATION OF AN ENERGY EFFICIENCY STANDARD

This chapter describes the ideal situation as an objective to be achieved with an adequate national policy design (see Fig. 3-2). We recommend the central government to create the following institutional structure:

Fig. 3-2: ***The recommended structure for decision making***



The first and central part is the introduction of a steering committee (like a stewardship council), which is responsible for the development, organisation, co-ordination and administration of all issues related to the implementation of a thermal building standard. The steering committee should be interdisciplinary and include private, governmental, administrative and NGO experts. This committee should be a permanent institution. Its task should be: to communicate with all stakeholders, to develop together with all experts the standard, to introduce the standard into a valid and achievable legislative format, to write guidelines for the public and the experts not involved, to solve the tenant-owner conflict, to integrate industry and small businesses into a financing model, eventually to propose and introduce an energy tax, to stimulate and co-ordinate all research and development activities and to co-operate with the local administrative level.

The steering committee should also install and support an awareness group. Their responsibility is to organise an adequate awareness campaign and to control an awareness fund. This fund could sponsor independent NGO's and R&D institutes. Their goal should be to create support for the standard in the society.

The steering committee would be supervised by a strategy committee, which is responsible for the overall vision and the long term perspective. It will consist of experts from the control and the awareness groups, the steering committee, private consultants and representatives of industries, local and central governments.

The last point is the first constitution of a total independent control group with a strong nation-wide character. It will be an administrative body, which controls, audits and monitors all processes (e.g. all cash flows of the funds, checking of renovated and new buildings). The control group has the responsibility to identify all persons, companies and institutions who do not follow the standards.

IV. PROPOSED MEASURES

The proposed measures can be structured into three levels of importance. First come the easy to achieve, although basic importance measures, then our central measure, the thermal building standard, and finally, to achieve the goals faster, we propose additional measures.

4. 1 STARTING MEASURES

The first measures in order to achieve energy efficiency in the building sector must be simple and cheap. Visible results must appear within the first years. Only with early progress the programme has a chance to be continued and to become a success story.

1. The easiest measure we recommend are giving awards for the best and the most innovative projects in the building sector. This awarded projects can be used for demonstration and scientific purpose.
2. The first principle to be achieved is the "Consumer Pays Principle": The consumer has to pay exactly for the amount of energy he uses. This leads to two relative simple measures. Firstly a metering system for every household and, secondly, to an individual regulation of any single radiator by a thermostat.
3. The government shows that it is really interested in energy efficiency and therefore goes ahead with good examples. That means a thermal reconstruction plan for all public buildings and starting an example.
4. Next a steering committee should be installed. The project organisation, co-ordination and administration are under its responsibility. This steering committee must not include only public administrator. It should be multidisciplinary and include private and governmental experts as well as participants from NGOs to guarantee speakers for the environmental committee. A strategy committee and a strong control group could follow. The strategy committee is needed for the long term perspective or the overall vision. It should be carefully selected and encompass a broad range of interest groups. The control group has to be absolute independent. It has the responsibility to audit, to monitor and to control all local funds and to spot check the reconstructed or certified buildings. A body of administrators seems to fit best.
5. To support the measures the awareness of the public needs to be raised. Therefore, a fund could be created and administrated by the local authorities. We recommend to install an awareness committee, which is responsible for the fund and has to start an awareness campaign (e.g. on correct ventilation). This fund also sponsors independent NGOs. This public sponsoring should remain free from interest and objective and must not lead to directly paid and therefore dependent NGOs.

4.2 CENTRAL MEASURES: TECHNICAL ISSUES AND STANDARDS

4.2.1. Introduction

Achieving energy efficiency is a major objective in each national climate change programme. By encouraging the use of clean and appropriate technologies in the design and construction of buildings (residential, public and commercial), energy can be used more efficiently. These practices will minimise impacts on the environment, reduce natural energy waste in the building sector. They will also help to produce healthier living and working spaces, improve comfort, enhance quality of life, and ensure cost effectiveness.

Technical aspects and solutions are tools to assist the local government by promoting and implementing its strategy on energy conservation and energy-environment regulations.

Energy efficiency is achieved by determining the appropriate technologies for local and specific conditions. These consist of: building design, building form, technologies for building materials, technologies for construction, building engineering, technologies for appliances inside the buildings, use of renewable energy, etc.

4.2.2. Setting of technical standards and guidelines for new/old buildings

Establishing technical standards for new houses is the key instrument for achieving energy efficiency. (We recommend a close look to the standards in Sweden as well as in the Netherlands.) To construct new buildings according to these standards is a basic principle for sustainable development in the building sector. If this principle is not applied in a new building, the "polluter pays principle" entries into force and penalties will be imposed on the designers and the construction companies.

For old houses, it is difficult to apply a new standard. Due largely to recent advances in building technologies, it is possible to renovate a house with only little additional care, time or cost, and allow in a fast way a better energy efficiency performance of the construction than before. Thus a guideline for old buildings should be developed and its propositions applied. When the old house will be renovated, it should come close to the standards for new buildings.

In principle, the new standard should help to reduce the waste of energy in a house, minimise energy consumption related impacts on the environment, while producing healthier and more comfortable living and working spaces. Applying energy efficiency in buildings should also be affordable. It can focus on thermal insulation of the envelop, roof, wall, door, window of the buildings by introducing appropriate building materials and good design (Wuppertal Institut, 1996). In the standard, the adoption of renewable energy sources like solar technologies, passive solar heating, thermal use of biomass, geothermal heat as well as wind energy use, can be supported, depending on the local situation. A good metering system is necessary, and often also a good ventilation should be considered.

Technical standards should be formulated by experts and professionals. The associations of engineers can play an important role in setting such standards. Technical standards should differ between countries and areas. For example, in cold areas, more attention has to be given to heating systems. While in tropical areas, "green shelter" (trees in front of houses to prevent direct sunshine) may be the best for saving energy for air conditioning.

4.3 ADDITIONAL MEASURES

4.3.1 Energy tax

One model for the implementation of higher energy efficiency could consist in an energy tax. Fig 4.1 displays this idea for three tax types.

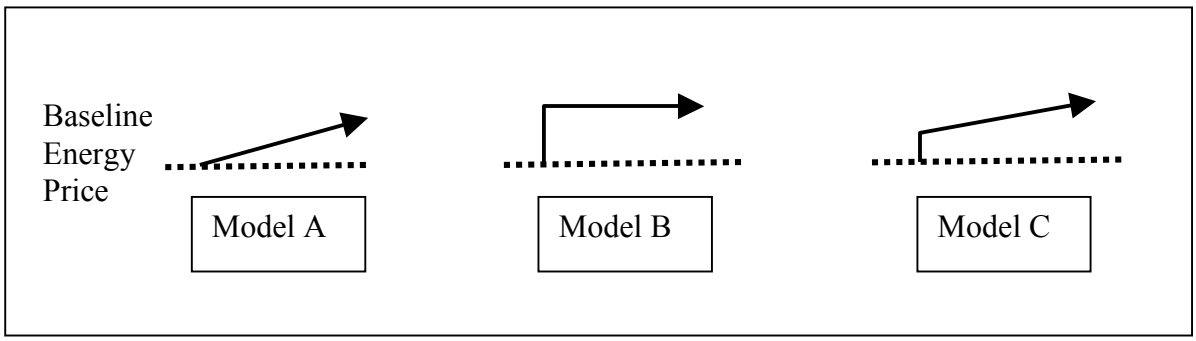
In model A the consumers have to pay a fixed amount on top of the price for energy that increases each year by the same amount (e.g. 1 up to 5% tax increase per year).

In model B, the end-users have to pay a larger tax at once (e.g. 10 to 20 %), but then this tax remains fixed.

In model C, the consumers have to pay first a tax like in model B and afterwards model A is used.

The tax policy can be a driving force to achieve Sustainable Development through energy efficiency, because it will increase flexibility, for example it could support the introduction of renewable energy sources, or give incentives to improve the energy efficiency in many fields including the housing sector.

Fig. 4-1: Three models of energy tax



4.3.2 Energetic Certification of Buildings & Certification Model Proposed

4.3.2.1 Energetic Certification of Buildings

The overall objective of the European Council Directive N 93/76/CEE is the limitation of the CO_2 emissions trough the increase of energy efficiency. This directive has six domains and one of these is the energetic certification of buildings. With regard to this point the directive defines that each member country should develop and implement programmes related to the energy certification of buildings.

The directive understands the energetic certification as a detailed definition and report on the energetic characteristics of a building, and should provide the potential user with information related to the energy efficiency. If possible, the certification should include potential measures that allow improvements of these characteristics.

The energetic certification of buildings can be seen as an eco-label for a specific product - a building. A certification label in a building could constitute an important information tool but also a mean to promote the energetic rehabilitation activities in buildings. The energetic certification scheme applicable to the majority of the buildings, new and existing, could become a good instrument for changed policies at local or regional level.

The objectives of an energetic certification are:

Direct objectives:

- Provide objective information about the energetic characteristics of a building
- Promote transparency on the real estate market
- Provide information that encourages investments in the field of the rational use of energy

Indirect objectives:

- Reduction of the national energy bill
- Reduction of air pollution levels
- Promotion of employment in the emerging sector of energetic rehabilitation of buildings

Complementary objectives:

- Improvement of technical qualifications of those working in the field of energy efficiency
- Production of new analysis tools by the implementation of new databases
- Provision of a source of information for regional energy planning
- Improvement of statistical knowledge on existing buildings and their equipment.

4.3.2.2 Certification Model Proposed

The second step after the implementation of an energetic standard should be the energetic certification of buildings.

Separate energetic certification should be developed for new and old buildings. New buildings are better suited for the implementation of a certification, since one of the certification systems should be implemented in accordance with the energetic standard for new buildings.

As stated before, the energetic certification to be given to a certain building would represent an important asset for the potential buyer.

An energetic certificate should include the following information:

- Thermal characteristics of the environment of the building
- Thermal characteristics of the complete energetic system of the buildings (heating and cooling systems, lightening, ventilation, hot water supply and energy management)
- Expected energy consumption levels
- Relationship between energy consumption and CO_2 emissions.

Here four levels of standard classification are considered:

A+

Above the required standard including use of renewable energy generated

A - Excellent

Standard of a reference building with very high efficiency is met

B - Good

With some drawbacks but with acceptable levels of energy use per unit area, still above the national average

C - Acceptable

The energy use level is above those presented in the planning of the building but satisfies standard.

In an initial phase the energetic certificate will be voluntary. The owners may ask for certification, if they want to. In a second phase, with the change in behaviour, the system should be coercive for all new buildings. Concerning existing buildings, the system should always be implemented on a voluntary basis, but new measures may be developed by the central or the local government, in order to push this attitude. It could represent a step forward for the real estate market, both on local and national levels.

We recommend the definition and institutional design of an independent managing entity – Certification Institute – responsible for the whole duration of the certification process, from the early moment of application for certification, to the emission of the certificate, and also for the control and monitoring actions. The partners involved in the certification process should maintain continuous co-operation and dialogue.

The validity of the certificate has to be renewed, if its thermal characteristics change during a decade (e.g. through changing the heating system).

The costs of the certification process should be calculated at the beginning of the process, otherwise it could become an obstacle to the functioning of the system. The costs of the certification process should be provided in large parts by the applicants for the certificate. In

addition, some financial support should be given by the state energy administration. The certification costs should be as low as possible, to allow and promote the implementation of this kind of system among those who are interested.

It would be extremely important to develop a strategic marketing process, since the interests of all stakeholders, from owners to architects, real estate managers or administrative agents must be harmonised.

4.3.3 The financing model for the energetic modernisation of old buildings

The proposed financing model consist of three major parts: the involvement of all relevant actors (e.g. in an investment committee), the reduction of repayment time (of at least 50%) and the creation of a win-situation for all stakeholders.

Our financing model is a first idea of speeding up the renovation of houses in a country. We propose to create a situation, where the major obstacle for an implementation of a renovation strategy – the high investment costs – could be lowered. One have to keep in mind, that many components have to be integrated for the decision to renovate a building. The thermal insulation is just one of the necessary elements (other are design, quality of materials and equipment, etc.). When it comes to renovation, one has to influence all parties involved in order to achieve an energetic renovation according to the new standards and, if possible, with the objective to obtain a good certificate too. So far the idea that every renovation has to include heat insulation. But the additional investments needed might lead to the postponing of renovation activities.

In our proposed model, all parties (local and central government, owner, tenant and industry) pay a certain part of the investment cost, and thus the owner of a building has not the only burden. The pay back period should be over 20 or 30 years, perhaps only over 10 years. A win-win-situation has to be achieved.

In our model the government releases the value added tax (typically 10 to 20 percent) for insulation material and energy efficiency related working hours and investments. The plus points are a growing economy, more jobs and investments, a better position in the international economic competition, an attractive location. The problem might be that any reconstruction in the building sector is declared as heat insulation and it seems very difficult to prevent that point. The government has to care about other structural conditions (financial and as well social and environmental). Without a new framework, there is only a chance for some pilot projects and not for a country-wide success.

The consumer has a win situation. He gets a better quality of life, an improved living standard and less energy costs. In our model he pays back one half of his energy costs reduction to the owner or the investor (50:50 model). To realise this model, a change in national law might be needed and it could complicate the situation.

The owner has to invest and should be able to get his money back within 10 years. His win is a higher value of the real estate, a higher resale price and a better overall quality of the house.

The first interest of all the different industries related to the housing sector (construction, spare parts, windows,...) is to have orders. In our model the industry plays a major part. The industry has to push the government to get better standards, so that houses have to be modernised. There is no reason why industry should not take some part of the investment costs. This could be the interest rates, general lowering of the prices, or paying into a fund to support house owners who are willing to renovate their buildings. The wins are more orders, more qualified work and more jobs.

This model can also be seen as a kind of contracting with more than two parties. Everybody should gain profit. This might not be a short term financial profit, but a social or a long term

financial.

It must also be possible to create a carbon benefit model. Under the forthcoming ratification (at least in some OECD countries) of the Kyoto protocol people have to think about carbon taxes in advance. Even under today's conditions, a scenario on how to conduct a pilot carbon project is realistic. For example a construction company could make a contract with the owner of a building. The company renovates the building under today's financial conditions (with a reduction of e.g. 5% of the price) with optimal thermal standards. When the Kyoto protocol will entry into force, the contract becomes valid. The company gets half of the money from the sale of carbon certificates (the carbon certificate might be probable in the range of 5-10 US $ per emitted or reduced ton of carbon). In this way it seems possible to accelerate the renovation of some buildings. The company and the owner have a short and a long term profit. The owner has a lower price for his investment. After Kyoto ratification he has to pay only the half of the carbon tax. The company has potentially more profit through increasing orders. In the future it profits from the carbon tax via the owner.

After general introduction of the carbon tax and therefore under a new regulated situation, a higher carbon reduction is possible in all ratifying countries. Under these conditions and incentives the energy prices and the carbon tax (and the other proposed incentives) may reach a level where building renovation gets the needed kick. Under Kyoto conditions a new, rapidly growing market will be established and many new companies could be created.

In both models, an energy tax could easily be included. This money could flow also into a fund or be dedicated to interest rates of loans (e.g. dedicated to people with lower income). The local authorities have anyway the responsibility for the use of the funded money.

4.3.4 Two different tariff models for the residential sector

During the recent years, energy use in the residential sector continued to grow. In the Russian Federation, for example, the share of energy use in the households was in the years 1996 to 1998, respectively, 9.2%, 11.1%, 12.3% (Papkov & Osminushkin, 2000). Parallel to this situation, the energy providing sector as a traditional source of financing municipal infrastructure and stabilising local budget, needs new inflow of investments. Additionally, increased energy efficiency became an urgent matter.

One of the measures used to regulate energy demand is a proper tariff policy. Until now, only a few of the newly introduced financial measures aimed at changing the consumer behaviour, most of them were introduced mainly for fiscal reasons. But the objective of the tariff policy should be to stimulate suppliers and consumers to save energy. And at the same time the structure of tariffs must reflect the real socio-economic situation of the population and take into account technological aspects.

A transfer to a differentiated tariff scheme might bring a good result (different tariffs during the day, during the year, different tariffs for different consumer types and for different levels of consumption).

One of the possible instruments is a double tariff system, in which the price of 1 kWh will rise when the demand of a family exceed the defined limit.

In fact, the energy use is higher in those houses, that were constructed without taking into account the requirements of energy efficiency. Differentiated tariff models could engage inhabitants not only to reduce energy use during domestic activities, but also to push some renovation including energy efficiency measures.

The process of setting tariffs means the search for a compromise between technical possibilities and financial demands of the service suppliers, on the one hand, and energy demand of consumers, on the other hand. Balancing the differing interests of the diverse

groups is the key objective during the elaboration of a tariff system.

Assurance of a balance of interests in the tariff regulation requires transparency of the monitoring procedure, the preparation and implementation of a new tariff system.

The reason for this is that transparency and predictability of the tariffs revision increase the consumers' confidence and make the energy efficiency projects more attractive for investors. In addition, the cost of borrowed capital can be lowered.

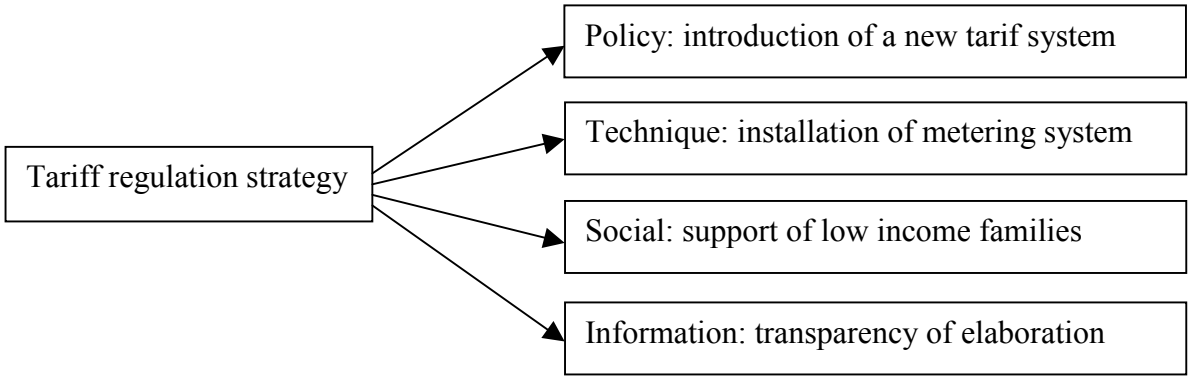
Correct tariff policy should also have the objective to reduce emissions and achieve sustainable development. According to these principles, not only the economic substantiation of tariffs, but also its social soundness, are to be kept in mind. Low income families who will pay real cost for energy have to be supported by subsidies. Information on rational energy use will reduce the need for subsidies from local and federal government.

Another problem for the implementation of a new tariff system is a technical one. The installation of a new metering system, suitable for a multiple tariff system, is required for many countries in each social housing building.

After introduction of the new tariff system, all people would know their real energy use for which they have to pay and can see immediately the financial results, if their react with technical adaptation and adequate consumption behaviour.

To raise the level of acceptance for this change, it is very important to keep all consumers informed on the necessity of a new tariff system and on the exact financial advantages of being more efficient. An energy service might be organised for the supervision during the operation of energy metering equipment. Specialists employed by this service should be highly skilled professionals, equipped with control devices for indoor and outdoor equipment. The consultation of lawyers with respect to energy use and payment might be arranged in addition.

Finally, owners of the heat meters will be satisfied, when they pay for the energy actually used and will perceive the result of energy-saving measures.



4.3.5 Information and public awareness campaign

The most common barriers to introduce any energy efficiency project are these two: lack of information, lack of highly-skilled personal or managing experience.

The development of an energy efficiency strategy is often slow and inefficient due to a limited access to information on innovations and experience in other regions and countries. A comprehensive information system is required for a successful operation of each energy efficiency project.

Access to information accelerates the spread of innovations and stimulates businessmen and

officials to launch energy efficiency projects, including the housing sector.

The development of computer technologies enables presentation of information in an easily accessible and convenient form. Due to new technical capabilities and the high expansion rate, Internet became the main information channel between different actors and plays a very important communication role inside countries and over the world.

A necessity for improving the informational exchange is recognising now at local and central level. In spite of the creation of information centres in many countries, there is still a huge amount of information that has to be spotlighted. An information system needs a clear structure and a special navigator.

The useful information might be divided into five subsections:

- programmes and plans;

- laws, rules and regulations;

- workshops and exhibitions;

- centres and agencies;

- companies dealing with energy efficiency technologies.

Actual support for the concrete solution of an energy efficiency problem is normally available, if full information on a corresponding organisation is presented, including precise title, basic objectives, partners, etc.

The formation of the database and information centre is only a first step. The inflow of new information and the attraction of new participants are also needed. When more people are involved in the process, the problem is how to link them.

If non governmental organisations are included into this process, better projects are often the result. The real power and influence of NGOs have risen strongly during the last decade, especially in countries of Central and Eastern Europe and the former Soviet Union. NGOs serve as an information channel and help to improve communication between different actors: decision-makers, private companies, engineers, experts and the public.

No policy will work without the involvement of the public.

The first steps for raising public awareness or to let people know, is the information about motives, i.e., why energy efficiency is necessary and what the benefits are?

Some important motives are listed below:

1) Energy efficiency is a prerequisite for sustainable development. Low energy efficiency causes waste of energy that leads to more emission of CO_2 into the atmosphere, causing the acceleration of global warming and stronger impacts of climate change. In addition high energy efficiency also reduces the depletion of natural resources. Results like less coal mining are clearly very useful for environmental protection;

2) Energy efficiency turns energy shortage into sufficient supply. In many developing countries, energy supply is usually insufficient. Energy efficiency at least diminishes shortage. It is good for the consumers and raises the comfort level. Also the money saved by avoiding additional power plants can be used for education, culture, social programmes;

3) Energy efficiency is profitable for all consumers. Less energy use means less money for energy in households, offices, etc.

In order to raise public awareness, the involvement of media like TV, radio, newspapers, magazines, and textbooks in schools and universities are very important. In some developed countries, media are already in action. But in other countries, especially in developing

countries, there is still a long way to go. It is the task of scientists, NGOs, and the others to make the media realise the importance of energy efficiency. That is the starting point for public awareness.

Demonstration of high energy efficiency in existing or planned buildings is also a useful way. The model house can be seen as an energy efficiency "museum". Here, explanations can be written in the places where technical measures of energy efficiency are used. So visitors can compare it with their own houses and find out what the problems are in their own houses, and what measures they can take to raise energy efficiency. The most important task of the "museum" is to show the data about how much energy (thus how much money) a "low-energy" house will save as compared to an ordinary one. There exist some traditional knowledge in housing sector which is not energy efficient. One role the museum can play is to show people that it is actually not good and should be given up in building new houses or in renovating old houses. The extra costs of an energy efficiency house like the "model house" should be affordable by private persons. That cost is expected to be paid back soon by lower energy bills.

If the public awareness campaign is successful, a better social/people behaviour can be set up. For example, people would choose a low energy house, and will use for the appliances in the building the most efficient types, sometimes even with higher prices. Public awareness is the best booster for energy efficiency, that can give pressure to governments and lead finally to a sustainable way of energy use.

V. RESPONSE STRATEGIES, STARTING POINTS AND GENERAL POLICY RECOMMENDATIONS

5.1 COMMON RESPONSE STRATEGIES OF THE WORKING GROUP

The question is: How to push the central government of a state forward to introduce the central parts – standards – of our measure? We developed a common strategy for many countries on how to achieve the introduction of standards in the building sector. In each country additional individual points may be added.

First we recommend to develop a strong nation-wide database for the building sector and, if a national database is not feasible, then to start with a pilot database for a certain area. The database has to include all relevant information about the national building situation. This database should lead to a status report to the central government, which shows the reality of the building situation and energy saving capacity and future CO_2 scenarios for the country. This report could lead to a national or international conference. The database, the status report and the Energy Efficiency conference could be the starting points of a discussion between the different society groups in the country.

A parallel strategy is to involve different groups of experts in the process of developing a standard, like we proposed (chapter 4.2). We recommend to build interest groups among e.g. civil engineers, architects, urban planners, and others and as a next step to build a network among these groups. In the interest groups a standard for the certain country has to be discussed and developed. These groups and their network is the base for an Energy Efficiency lobby, which should exist in the final stage on the administrative, institutional and personal level. Also the data and information exchange between the different groups has to be of high quality. The idea is to develop a standard in the interest groups and to form a network.

This could lead to guidelines for experts form which a standard could be worked out and the not involved experts could be informed.

The next group which has the strongest interest in achieving a building standard is the private industry. Surprisingly the construction industry (and related) seems not to be interested in that discussion, although it is/would be their chance for expanded and new markets. It is the idea to work with private enterprises or their representatives (trade unions) and to include them into the process of achieving building standards. They could be a strong ally. Also the local authorities have to be included, because of their major important role in the future implementation and control of the standards.

The next major important topic is the awareness in the society. NGO's play a central role in this discussion process. They not only have the role of catching the public and starting the discussion, the are also supposed to be the driving force, the organisation and the networker of the process. To raise the public awareness media people seem to be predestined. Perhaps a new medium can be created for this topic. Or a NGO releases a newsletter to inform the network. In universities and in technical schools capacity buildings is required. Create a vision is the basic goal for society groups. A back-casting approach can be used in the scientific society. Further good examples and demonstration areas are needed to show that energy efficient houses can be build and do not cost more than conventional buildings. For the mentioned activities the financial resources have to be founded. A fund must be created and be sponsored by privates, the industry and all other interest groups and the local authorities. A co-ordinating group, e.g. a NGO, has to administrate this fund.

The last recommendation is to form a small network like our in the Summer Session 2000 established group. Also small, but active networks can possible achieve major importance in the international discussion process.

5.2 SPECIFIC SOLUTIONS AND STARTING POINTS FOR DIFFERENT COUNTRIES

5.2.1 In China

One of the biggest problems concerning energy efficiency in China is about the metering of heat supply. In Northern China in winter, heating is necessary because of the cold weather. Central heating is used widely. Hot water circled in all the heaters in buildings to warm the rooms. But none of the heaters has a switch nor a meter to control or monitor the hot water. So it happens quite often when people go out for some days, the heater will still work with nobody in the room. Such case happens everyday when people go to work with no one at home. The energy used for heating usually comes from burning coal. That causes unnecessary emission of greenhouse gas, also causes air pollution.

In the past, there used to be no electricity metering system in households in China. Setup of the electricity metering system could allow the country to save a lot of primary energy. It can be easily seen that introduction of the metering system in heating will save more energy.

The first step for the participant from China in the energy efficiency group, when back to China, is to write papers for the public, show the necessities of energy efficiency and present ideas on behaviour and techniques to use energy more efficiently. Later on maybe to make a web page for discussions and publications on energy efficiency. As an advanced scientist in the global warming issue, then write a report to inform and maybe convince the government that using energy efficiently is a very good and easy way of implementation for the reduction of CO_2 emission.

5.2.2 Most burning problem in Russia

New advanced energy efficiency technologies are hardly introduced because of financial problems and lack of management. Information shortage is also a serious barrier for spreading

of innovations. That's why the organisation and development of training programmes (included market-oriented sector: integrated resource planning, benefit analysis, private-public partnership) are extremely important. To involve public in this process NGO's can play a key role.

5.2.3 Starting point in Portugal

In Portugal a standard (for old buildings) already exists, which define the minimum thermal characteristics of the surroundings of a building. The problem with this standard is related to the level of exigency, it means that the energetic requisites (e.g. warming and cooling requisites) could be more narrow. Only 62% of the total of new buildings fulfil this standard.

It would be interesting to develop and implement a new standard, but not on a national level, which would be difficult to achieve, but on a small scale. There are private building companies that are interested in the development of a better standard for their buildings, which will apply for better thermal conditions, with high levels of energy efficiency exigency. It would be interesting to address the definition of eco-design[3] (often used for products) to buildings, a product of the building construction. This would be an interesting research project, that could be developed in the university with the orientation of a professor for a private company.

At the present moment the participant from Portugal is working for a local government in a collaboration with the university. In this context she would like to propose two different, but very connected, projects:

Improve the statistical data related to the building sector. For these it will be necessary to develop a methodology that covers all information concerning these important sector, which could provide support to future actions in the sector (e.g. definition of measures, technical support for policy makers):

Definition of a certification system (methodology, technical aspect, implementation, different kinds of impacts) for old and new buildings, but at a local level. In this way it will be possible to demonstrate, in a small scale, how to implement this kind of system, with the advantages and disadvantages of a small project.

5.2.4 Individual starting point and most important energy efficiency problem in Austria

The participant from Austria's personal starting point is his forthcoming employment in a private enterprise. He wants to find a way to push the Austrian government to legislative measures (most important: a thermal standard for old buildings and its implementation during any renovation). The first need is a network with different companies and all interest groups in the housing sector.

5.2.5 The very first steps to start implementation of energy efficiency projects in Albania

Description of the key topics of the Summer Session and the results useful for the implementation of projects for sustainable development.

The participant will submit this information to:

- Ecological Club of Albania, Friends of Nature;

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[3] Ecodesign means that 'the environment' helps to define the direction of design decisions. In other words, the environment becomes a co-pilot in product development. In this process the environment is given the same status as more traditional industrial values such as profit, functionality, aesthetics, ergonomics, image and overall quality. In some cases the environment can even enhance traditional business values.

- Ministry of Environment, where he will discuss the need to start the project for energy efficiency in the building sector;
- Institute of Hydro–Meteorology, which he likes to engage in this project of energy efficiency in the building sector.

He will also meet some key people in:

1- Faculty of Civil Engineering, Department of Environmental Engineering, Energy Sector

2- Institute of Urban Planning

in order to engage them in energy efficiency projects in Albania.

VI. CONCLUSIONS AND LESSONS LEARNED

In many countries (especially in the developing countries) the level of consumption in the building sector is expecting to have a huge increase in the next 10 years. In this context it is very important to start development strategies that could permit this increase in a sustainable way. After six weeks of diverse working steps on the problems of energy efficiency in the building sector, we define some key factors (general and specific for each country) that could lead to improvements in this sector. The discussions among the working group members and the lectures during the Summer Session provided the following lessons.

Lessons learned

- "Sustainable Development" is the goal, even if the conception might change in content in the next decades.
- The energy efficiency problem has to be understood as a complex system, with a huge amount of variables (e.g. consumer behaviour, economic aspect, position of the central government, other actors and barriers) with positive and negative effects. It has to be analysed systematically.
- It is important to define the positions of all actors involved in the system. This allows a better understanding of the problem and a better allocation for the different interests and arguments of them all.
- We recommend to the government the following starting measures: introduce awards, use public buildings as good examples, build demonstration areas and small pilot projects, install a steering committee to create the needed surrounding, launch an awareness campaign, fund independent NGO's and implement technical measures like a metering system and a thermostat law.
- The central measure we want to achieve is a thermal standard for new and old buildings. This standard has to be strictly respected and implemented, whenever it comes to the renovation of a building. Therefore, a strong and independent control system is needed.
- To speed up the modernisation process, we recommend additional measures and incentives such as a financing model (including owner, tenant, industry, local and central government to create a Win-All-Situation), an energy tax (included in a general approach, with a reduction of other taxes), a carbon tax under Kyoto conditions, a differentiated tariff model and a certification model.
- The central government has to agree with a legislative framework in accordance with international agreements and conventions.

- Incentives and awareness can launch a positive feed back loop.
- The key barriers have to be faced: the investment cost, the lack of information and the lack of high skilled personal with management experience.
- Start to correct the energy prices.
- Create conditions under which it is possible to make profit with heat insulation.
- Include from the beginning all stakeholders in the discussion and decision process.

In order to achieve the introduction of the central part or our recommendation - standards - by the different governments, we propose a participatory bottom-up approach (we call it the common response strategy), which should start a "building standard discussion" in the respective society. Our general approach can be used in different countries, although additional specific points will be added in each country.

- We recommend a database - worked out by research and development institutions to provide basic information on the existing building situation - resulting in a status report (including future scenarios and energy saving potentials) and in a national conference.
- Experts groups (civil engineers, architects, urban planers,...) have to be involved in the process of developing the national (local) standard.
- A network among all interest groups has to be established. Most important is that the industry is on board of the network.
- There is the need to raise the public awareness by NGO's (Newsletter), media, universities and schools. Therefore, a funding system is needed.
- Create a vision. (The scientific community is asked to use a back-casting approach.)
- Stimulate the research in the building sector. Traditional housing is a neglected, but important part, as also biological heat insulation materials.
- Good examples, pilot projects and demonstration areas are needed to show that energy efficient houses can be build and do not cost more than conventional buildings.
- The discussion will take at least 10 years. Start it.
- Find an individual starting point and proper solutions for your country.

Our final idea is to form a small network among the Summer Session 2000 participants (especially among the Energy Efficiency Group) to encourage our respective government to implement the building standards.

VII. REFERENCES

CATANIA, P. (Ed.) (2000): Energy 2000. The State of the Art. Publ. Balaban International Science Services, L'Aquila, Italy.

CONTI, F. (1995): Building Energy Certification. State of Progress and Implementation Problems for Southern European Countries. European Seminar on Energy Labeling of Buildings in Southern European Countries, Sevilla.

INSTITUTE FOR PRODUCTDESIGN (1999): Ecodesign Manual.
http://mimm137.maskin.ntnu.no/ecodesign/sider/0_0a.htm. Trondheim.

NOORMAN, K. J., UITERKAMP, T. S. (1998): Green Households? Domestic Consumers, Environment and Sustainability. Earthscan Publications Ltd., London.

PAPKOV B. V., OSMINUSHKIN, A. V. (2000): Development of Model of Tariffs for Electric Power. Electrotechnika N 2 and www.electro.nizhny.ru. Moskow.

RISTINEN, R.A., KRAUSHAAR, J.J. (1999): Energy and the Environment. John Wiley & Sons, Inc., New York.

SWISS ENERGY OFFICE (1999): E 2000 – 9th Annual Report on the Energy 2000 Action Programme. Bern.

WUPPERTAL INSTITUT (1996): Energiegerechtes Bauen und Modernisieren. Wuppertal Institut für Klima-Umwelt-Energie im Wissenschaftszentrum NRW und Planungs-Büro Schmitz Aachen GmbH (Hg.), Birkhäuser-Verlag, Basel.

PRESS-RELEASE: ENERGY EFFICIENCY IN THE BUILDING SECTOR

The achievement of sustainable development must be a key priority for all governments, a priority which requires the integration of economic, social and environmental objectives in all areas of policy making.

For six weeks we attend an intensive course with training and lectures during the morning and discussions on working groups in the afternoon. The main objective of the working groups was to develop a project which assess one sustainable problem. There were seven different working groups in different fields, e.g. Sustainable Urban Development, Renewable Energy and Energy Efficiency in the Building Sector.

Sustainable energy is a key factor on the sustainable development. It is very important to change the course on energy subjects, following sustainable energy paths is therefore imperative and it is also feasible. Energy efficiency can be interpreted as a pollution prevention technique and as a key resource for sustainable development on a local, national, and global basis. In this way we worked on a project related with the energy efficiency in the building sector, because the buildings acts like a living organism; in place of food, it uses energy and materials, and also produces outputs into its environment.

The impacts of the built environment on the planetary environment make it necessary to make informed, environmentally responsible choices during the construction process and during the lifetime of the building, regarding this to the responsibility of the consumers (end-users of energy).

Our environment and its limited natural resources are growing concerns for all of us. Energy efficiency is now universally recognized as one of the quickest, most cost effective ways to reduce energy related emissions associated with global warming, climate change, acid rain and smog. Improved energy efficiency can reduce the environmental impact of the built environment, improve economic well being and promote global stability.

Buildings (old and new) that incorporate energy efficiency technologies are typically more comfortable, have lower utility bills, and have minimal impact on the environment. In this way it is important to promote the awareness, education and development within the communities and experts.

SUSTAINABLE URBAN DEVELOPMENT: PUBLIC PRIVATE PARTNERSHIP IN INNER-CITY REDEVELOPMENT

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ABSTRACT

The main focus of this study is to explore the issues of initiation/promotion of public private partnership (PPP) in inner-city redevelopment towards sustainability in developing countries and countries with economies in transition.

In order to achieve this objective SWOT (Strength Weaknesses Oppurtunities Threats) and complex system analyses have been used as tools for identifying various aspects and gaining a common understanding of the development strategy. To simplify the analysis, three key stakeholders in the process of inner-city redevelopment were selected: the city government, private sector, and community.

As different interests of the stakeholders may often result in conflicts, the conflicts between them are identified, and ways to resolve them, as well as areas for creation of win-win situations are suggested. As a result, a broadly applicable procedure for launching PPP in inner-city redevelopment is formulated. Possible applications of this procedure for different countries is also given.

The main conclusion of the study is that public private partnership can play an important role in increasing effectiveness and impact of ongoing local initiatives through broad-based participation, mobilising and leveraging resources, and monitoring local progress for timely feedback for policy and strategy adjustments.

Keywords: urban development, inner-city, public private partnership, win-win situation, stakeholders, conflicts, communication

I. INTRODUCTION

> *"We recognize the imperative need to improve the quality of human settlements, which profoundly affects the daily lives and well-being of our peoples. There is a sense of great opportunity and hope that a new world can be built, in which economic development, social development and environmental protection as interdependent and mutually reinforcing components of sustainable development can be realized through solidarity and cooperation within and between countries and through effective partnerships at all levels..."*
>
> *AGENDA of the UNITED NATIONS CONFERENCE on HUMAN SETTLEMENTS (approved in Istanbul, 3-14 June 1996) (UNHCS 1996)*

For many centuries of the human history, cities and towns have been engines of civilisation. They are the place where culture and knowledge have been developed and concentrated. They are also the main areas for political and economic activities.

Nowadays, globalisation of the economy and rapid urbanisation present both opportunities and challenges for the urban development. The globalisation contributes to advantages of urban areas, which are usually associated with the economic and social progress, promotion of education and greater access to social services. At the same time, many countries, particularly developing ones, experience the lack of legal, institutional, financial, technological and human resources to respond adequately to rapid urbanisation.

According to some estimations, more than three billion people - approximately one half of the world's population - live and work in urban areas. Thus, an answer to the question "How can we make cities safer, healthier, more liveable and productive?" is of crucial importance for sustainable development. Proper planning and management of urban areas (or, in other words, possible support of a large number of people while limiting their impact on the environment) will allow simultaneous social and economic development and the preservation of natural resources.

Urban areas are facing problems of a multidimensional nature. These inter-linked problems require continuous and successive efforts to ensure economic development, social development and environmental protection, which are the three pillars and the three reinforcing components of sustainable development.

To improve the quality of life within cities and towns, mankind must combat problems that have reached crisis proportions in some cases. The most serious problems include, among others, excessive concentration of population, increasing unemployment and poverty, growing insecurity, lack of basic infrastructure and services, degradation of the environment. The situation is aggravated further by inadequate planning and management capacities, lack of investments and technologies/innovations, insufficient amount and inappropriate allocation of financial resources.

To achieve sustainable urban development and provide appropriate quality of life and basic services for all, partnerships among all actors from public, private, non-governmental sectors are essential. These partnerships facilitate independent initiative and creativity, increase opportunities through sharing knowledge and skills, pooling capacities and resources, diminish threats and risks through sharing responsibilities.

Public private partnership proved to be one of the most effective and efficient approaches to solve urban problems. The integral and crucial part of its general strategy is the creation of win-win situations. It is of special interest for developing countries and countries with economies in transition which have no or insufficient experience in co-operation between government and growing private businesses. In some cases the relationships between these two sectors are characterised by mutual suspicion and distrust, as well as by lack of communication. Thus, it is important to explore the advantages of public private partnership for these countries and suggest ways to initiate such a form of co-operation for sustainable urban development.

This report is divided into six chapters. In the second chapter the main objective of the study is defined, the description of terms and analytical tools are given as well. The third chapter is devoted to general analysis of public private partnership in the inner-city redevelopment. In the fourth one, specific sectors of inner-city development in certain cities are discussed. The fifth chapter deals with problems of initiating public private partnership. It discusses and summarises experiences from different cities in order to gain a general understanding of the existing situation. The lessons learned during the study and recommendations are given in the sixth chapter.

II. GROUP OBJECTIVE, DEFINITIONS, METHODOLOGIES

2.1 GROUP OBJECTIVE

In the process of urbanisation, growing cities in developing countries and countries with economies in transition are facing a number of serious problems. Urban planning and management often does not cope with the new challenges of rapid transformation and changes. The natural advantages of inner-city areas are being shaded by problems of decay and degenerating.

Public private partnership (PPP) is a useful tool to create win-win situations for urban development, especially in case of limited resources. However, young governments in countries with economies in transition often face difficulties in co-operation with the newly established private sector.

Therefore, the work of the group was aimed at investigating opportunities of and barriers to public private partnership for inner-city redevelopment and working out ideas/recommendations for local authorities on how public private partnership can be activated.

The objective of the study is as follows:

To elaborate recommendations for improving or establishing public private partnership in inner-city redevelopment towards sustainability.

2.2 DEFINITIONS

2.2.1 Public Private Partnership

Public private partnerships (PPP) are arrangements between government and private sector entities for the purpose of providing public infrastructure, community facilities and related services. Such partnerships are characterised by the sharing of investment, risk, responsibility and reward between the partners.

The reasons for establishing such partnerships vary but generally involve the financing, design, construction, operation and maintenance of public infrastructure and services. The

logic for establishing partnerships is that both the public and the private sector have unique characteristics that provide them with advantages in specific aspects of service or project delivery. The most successful partnership arrangements draw on the strengths of both the public and private sector to establish complementary relationships (or synergy).

PPP is one of a number of ways of delivering public infrastructure and related services. It is not a substitute for strong and effective governance and decision-making by government. In all cases, government remains responsible and accountable for delivering services and projects in a manner that protects the public interests.

2.2.2 Inner-city

The term "inner-city" appeared in the vocabulary of architects and urban planners in the 1950s. Inner-city means one or several quarters within a city (usually located in historical districts, including non-residential and residential land uses) facing a whole set of social, economic and other problems. This part of the city is completely unattractive to investment and, therefore, the problems are not solved for a long period of time, aggravating and reinforcing each other. This results in dislocation of residents and decay.

2.2.3 Win-Win Situations

A win-win is a situation in which two or more parties succeed at the same time in a common project or measure. A win-win situation can be created when it is defined, for example, in terms of reaching a goal or meeting certain criteria. The strategy of transforming win-lose situations which are rather usual into win-win ones may consist in increasing a number of rewards or dividing a single reward into smaller pieces. Both of these ways result in receiving rewards, which are of the most benefit for a certain party. Finding out/creation of win-win situations is especially important in cases when resources or fields for compromise are limited.

2.3 METHODOLOGIES

The analysis of PPP in the inner-city redevelopment was mainly carried out with the use of two tools - SWOT analysis and complex system analysis.

2.3.1 SWOT Analysis

SWOT analysis is a method of identifying existing strengths and weaknesses of an area/sector and examining opportunities and threats it faces. SWOT analysis is used in strategic planning for identification of the potentials/priorities and for creation of a common vision of the development strategy.

Strengths are values or factors which give a competitive advantage and attractiveness to the area or sector.

Weaknesses are factors or trends which create obstacles in economic and social development, as well as in environmental protection. Weaknesses can be of social, financial or legislative nature. Three main questions to define weaknesses: What could be improved? What is done badly? What should be avoided?

Opportunities are external factors which represent good chances in the future or positive trends.

Threats are unfavourable trends for development which lead to decline of the area/sector advantages. They can also include obstacles/barriers for development.

2.3.2 Complex System Analysis

The methodology of complex system analysis was used in accordance with lectures delivered and materials provided by Prof. M. Schwaninger (Schwaninger 2000, 1997).

Its main objective is to gain understanding of driving forces running the system, to define indicators, barriers/obstacles and possible places for intervention. The main steps are as follows:

- to define key actors, their goals and success factors;
- to map a qualitative system dynamic model and to identify self-reinforcing and self-stabilising loops;
- to define barriers/obstacles hindering the improvement of the system.

III. GENERAL ANALYSIS OF PUBLIC PRIVATE PARTNERSHIP IN INNER-CITY REDEVELOPMENT

A lot of cities are facing similar problems and challenges. Therefore, first of all, the group held the brainstorming session to define the burning problems of the participants' cities to have a common ground for further discussion and starting point for analysis. The results of this exercise is represented in sub-chapter 3.1 "Actual situation".

Then, the strengths, weaknesses, opportunities and threats for public private partnership are analysed to give the first overview on the subject. A system view tries to describe the motors and rules that are running the current development in the inner-city. It is important to understand the system first in order to develop possible mechanisms for improvements. Finally, the evaluation of the system gives ideas of possible levers for change. Existing barriers and hindrances are discussed.

3.1 ACTUAL SITUATION

As a result of the brainstorming, we compiled a list of the problems confronting our cities. They include:

- Poor (or improperly managed) infrastructure
- Lack of finances to be allocated for development/redevelopment programmes
- Insufficient water supply
- Poor waste-water treatment
- Poverty and lack of employment opportunities
- Lack (or insufficient amount) of medical and educational facilities
- Vulnerability to natural and man-made disasters
- Improper policies and regulations
- Inadequate and deteriorating housing stock and basic services
- Environmental problems (air and water pollution, noise, solid waste, etc.)
- Growing insecurity and crime rate
- Traffic congestion

As these problems are inter-related, it is important to choose priorities for consideration (i.e. the most burning problems of our cities). These problems include:

- Poor (or improperly managed) infrastructure
- Poverty and lack of employment opportunities
- Inadequate and deteriorating housing stock and basic services

They should be addressed primarily, while moving towards sustainability. Moreover, they are strongly linked together and, that is why, should be resolved within the common framework. It should be also noted, that the task to combat poverty and unemployment requires great and continuous efforts of the government and local authorities. Namely these three problems gave the start to group discussion on a possible tool to solve them. As a result of this discussion, we made the conclusion that PPP seems to be one of the most appropriate strategies for this purpose.

3.2 SWOT ANALYSIS FOR INNER-CITY

Hereafter, strengths, weaknesses, opportunities and threats for public private partnership in inner-city redevelopment are given (Table 3-1). While considering these points, an emphasis was placed on the possibility to achieve win-win situations.

Table 3-1: SWOT Analysis for PPP in Inner-city

STRENGTH	***WEAKNESSES***
Access to private sector finances, experiences, management opportunities, equipment, innovations and labour relationships.	Communication and understanding between public and private sectors are difficult in some cases.
Local authorities have got a possibility to guide private investments strategically.	Corruption may take place.
Flexibility in structuring contracts, which ensure and guarantee interests of both sides. If the contract is well structured with the private partner, local authorities can retain a certain control over standards and performance without incurring the costs of ownership and operation. Thus, the local authorities can control design, siting requirements, operational objectives, as well as maintain its control over the level of services and prices. If the contract is well developed, there is an opportunity to terminate agreements if service levels or performance standards not met.	Starting economic situation affects significantly the availability of private investments. A certain level of infrastructure development is also required.
Sharing of risks with private sector.	Well developed legislative and normative base is required to prepare and conclude a sound contract.
If the private partner purchase a facility (building), the local government can receive significant financial resources.	Contract must be written well enough to address all future eventualities.

Local authorities have got the opportunity to choose the most appropriate investor.	Reduced control and ability to respond to changing public demands by incorporating desirable features to the contract when it has been concluded.
A lot of "start-up" problems are addressed by the private partner.	There is no possibility to regulate the price of the service, when the property (facility) is sold to the private.
Private sector operates the service in a more efficient manner, both in the short-term and long-term scale.	In the absence of competition between possible investors, there is a need to introduce additional rules and regulations for operations and price control.
OPPORTUNITIES	***THREATS***
Government can create conditions for facilitating private investments (incentives, simplified procedures).	Deviation from the development strategy and the agreed project as a result of "weak" laws and poor-developed regulations.
Creation of new jobs.	Possible poor representation of interests of the community by the local government.
Potential improvement of the service quality and efficiency.	Private sector may be able to determine the level of user payments, which they may set higher than when being under control of the local government.
Opportunities to have additional innovations and cost savings.	Difficulty in replacing a private partner in the event of bankruptcy or poor performance.
Long-term entitlement to operate facility is incentive for private partner to invest significant capital.	In case of project failure, there is a risk of transferring functions of service provider or responsibility to upgrade the facility back to local authorities.
Access to private sector experience, management, equipment, innovation and labour relationships may result in cost savings.	

3.3 SYSTEM ANALYSIS OF PUBLIC PRIVATE PARTNERSHIP

In this sub-chapter we tried to embed the inner-city redevelopment and public private partnership into the complex system that contains various actors involved, their goals and interests, their interactions with each other, as well as political, social and economic framework and environmental aspects.

In order to approach the system, the key actors are identified and their goals and success factors while initiating or participating in PPP are listed (Table 3-2). The success factors determine whether the goals can be reached or not. They are also the variables being used for mapping a system dynamic model.

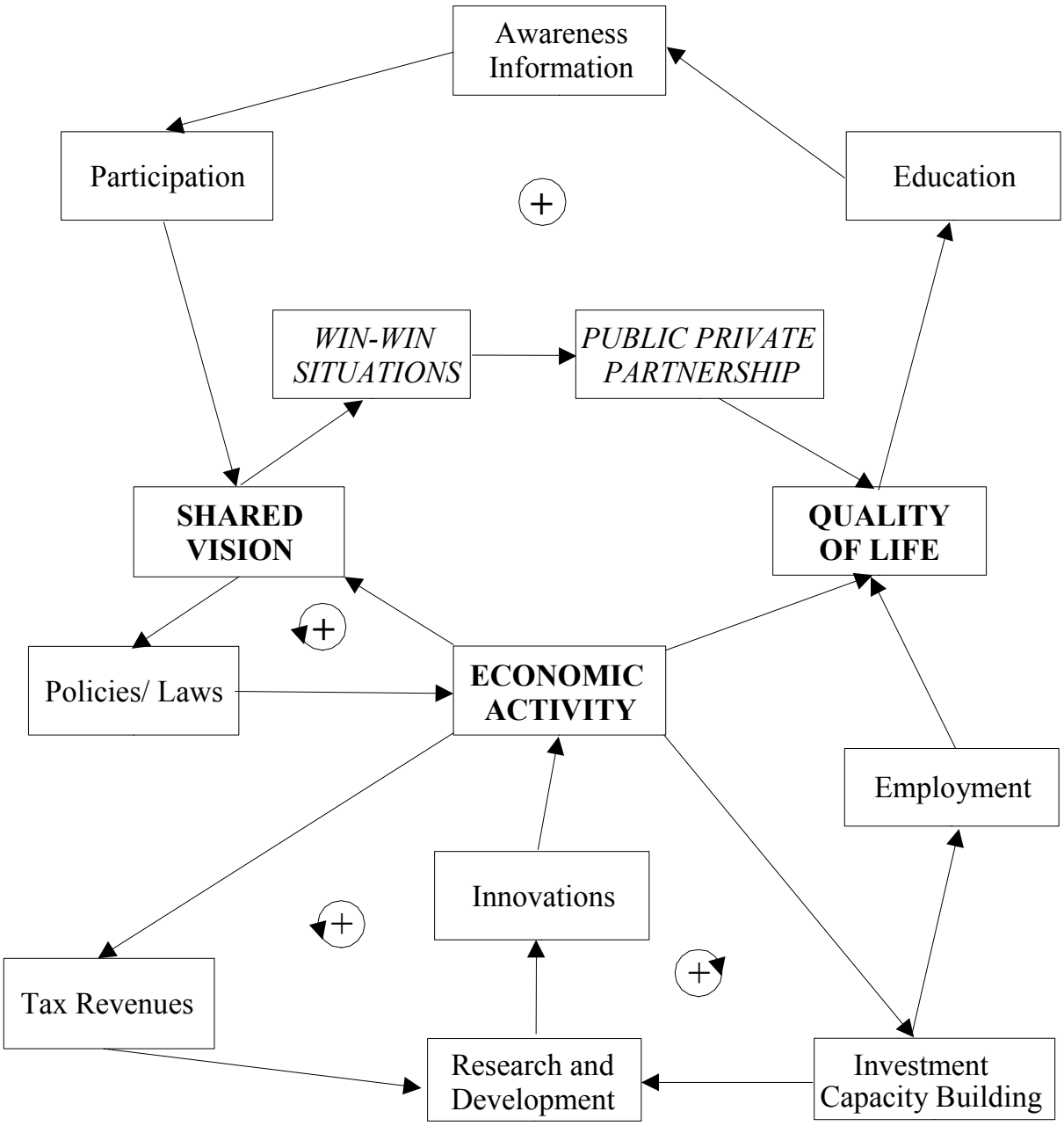
Table 3-2: Key Actors, Their Goals and Success Factors

Key actors	Goals	Success factors
Local authorities	• To care for and meet demands of citizens • To guide and control redevelopment; • Enhance economy and employment • Environmental protection	• Good regulations and practices • Communication with other actors • Vision
Private companies	• Profit • Viable business, increase of the "presence" in a city • Stable frame conditions (legislation for investing, business activity, etc.)	• Communication with local authorities • Motivation • Stable frame conditions
Citizens	• Improvement of life quality (quality of the environment, living conditions, security, etc.) • To have more and better job opportunities in the area	• Education • Awareness/information • Organisation and representation
Central government	• Enhance economic development and employment • Rational use of natural resources and environmental protection • Establishment of legal framework • Enforcement of legislation • To be re-elected	• Stable political and economic conditions • Vision • Consensus about future development
Experts	• Development of innovations and bringing them into life	• Qualification • Financial and material resources allocated for research and development

The following diagram shows the most important variables in the inner-city redevelopment system and their interdependence. This model helps to understand the motors and rules that run the system. Not all links were established in the different cities that have been used as examples. The model shows a more or less ideal situation that enables public private partnerships and the creation of win-win situations.

The model has three key functions (*economic activity, shared vision and quality of life* marked with bold capitalised letters) and four loops. One of these loops (*economic activity -> shared vision -> policies/laws*) is a driving force for the development of public private partnership.

Fig. 3-1: The system dynamic model of PPP in inner-cities



We tried to design this diagram in such a way that it covers all the four pillars of sustainability (social, economic, environmental and technological ones). Thus, the following variables relate to the social pillar: employment, quality of life, education, awareness, participation, shared vision, policies/laws. The economic pillar is mainly represented by economic activity which has rather broad meaning. Importance of up-to-date and environmentally friendly technologies for sustainable development is illustrated by two bottom loops ("+" means self-reinforcing character of a loop). The bottom-left loop shows research and development process from the side of a state, the bottom-right one displays opportunities of the private sector.

Although, it may seem that environmental issues are not clearly represented in the diagram, we considered and discussed them as integral parts of two variables - quality of life and policies/laws.

From our point of view, quality of life includes, apart from economic and other features,

important environmental aspects relating to the pressure exerted by man on the natural environment (air and water pollution, solid waste, transformation of landscape, high energy consumption resulting in increasing anthropologic burden on the nature).

As an integral part of national legislation, environmental laws, regulations, and policies represent a state's strategy of environmental protection and conservation of natural resources. This strategy is influenced by international obligations taken by the state, government's vision and consensus on the environmental issues in the society.

The loop "*economic activity -> shared vision -> policies/laws"* shows the driving force of this system. A high level of economic activity and shared vision of key actors are the preconditions to public private partnership. Moreover, the shared vision facilitates the difficult, but very important, process of changing relations based on "win-lose" rules to co-operation aimed at looking for and creation of win-win situations. This process leads directly to the initiation of PPP and implementation of relevant projects.

To make the system more assessable, it is important to define indicators representing quantitative aspects (or characteristics) of variables.

Table 3-3: Indicators for Variable Assessment

Variable	***Indicators***
Public private partnership	Number of PPP projects initiated/implemented Total cost of initiated/implemented projects
Awareness/Information	Coverage rate with mass media
Participation	Number and size of NGOs
Education	Adult literacy rate School enrolment rates
Employment	Unemployment ratio
Innovations	Number of patents and publications
Tax revenues	Sum of collected taxes
Economic activity	Net turnover of enterprises per year Number of state/private enterprises in the city Share of small- and medium-sized business in the net turnover
Research & development	Financial resources allocated for research & development Number of qualified researches working in this field
Investment capacity	Net income of enterprises
Quality of life	Residential density Floor area per person Life expectancy at birth Under-five mortality rate School classrooms Hospital beds Income distribution Public space per habitant

Variable	***Indicators***
Quality of life *(continue)*	Household connection levels (percentage of households connected to water, sewerage, electricity, telephone) Infrastructure expenditure (ratio of total expenditures (operation, maintenance, capital) by all levels of government of infrastructure services (roads, sewerage, drainage, water supply, electricity, garbage collection) per year) Waste-water treated (percentage of all waste-water undergoing some types of treatment) Solid waste treatment ratio (including data on disposal methods and availability of regular collection service) Crime rate

The next step is to define barriers and obstacles which disturb the system and can prevent it from working properly. The following table gives a list of the most common barriers.

Table 3-4: Barriers for Public Private Partnership

Categories	***Barriers***
Quality of life	• Increasing poverty and unemployment • Segregation
Economic activity	• Inadequate legislation hindering economic activity and making the area unattractive to investments • Absence of competitive environment
Employment	• Lack of investments • Stagnating economy
Participation	• Political indifference of citizens • Poor communication competence of participants • Participation with the emphasis on acceptance rather than real negotiation
Awareness/ Information	• Experts/citizens dilemma (different languages, approaches, experiences)
Policies/Laws	• No will to reforms • Corruption • Non sustainable environmental laws • Lack of or insufficient regulations supporting within PPP
Innovations	• Lack of innovations • Poor research and development capacities
Tax revenues	• Stagnating or depressing economy
Shared vision	• Inefficient administration • Narrow competence of actors • Concentration on implementing the rules rather than discussion and negotiation
Win-win situation	• Consensus decision more difficult than majority decision • Tendency to think in terms of win-lose rather than win-win
Education	• Poverty

The most difficult task in analysing this model results is to find out places to intervene with the appropriate levers. We recognised shared vision as the possible starting point for intervention and leveraging. We do understand that in many cases it is far not easy to reach consensus between different players.

People or organisations do not often tend to change their minds and strategies as the situation requires because of lack of or insufficient communication with other actors, lack of awareness in modern discussion techniques and conflict-solving methods, etc. Nevertheless, there is a whole spectrum of opportunities and tools to change existing opinions and strategies. But in many cases, one who wants to do this has a long way to go.

That is why, in the fifth chapter we tried to consider opportunities and ways of bringing public private partnership to the focus of local authorities and facilitating the negotiation process to find out or create win-win situations.

IV. CASE STUDIES OF PUBLIC PRIVATE PARTNERSHIP

4.1 CASE STUDY OF VIETNAM: UPGRADING OF HOUSING CONDITIONS IN HANOI

4.1.1 Objective

Improvement of public private partnership in upgrading housing conditions in the inner-city of Hanoi, Vietnam

4.1.2 Introduction

Vietnam is on the way of rapid political and economic changes influencing the society in all spheres of life. Vietnamese cities, including Hanoi, are exerting high pressure onto the city centres which are exposed to the dilapidation processes. Thus, conservation (as well as relevant regulations) is required to save cultural heritage in line with the solution of the housing shortage problem.

The aim of this case study is to discuss upgrading housing condition in the inner-city of Hanoi and the possibilities to use PPP in inner-city redevelopment towards sustainability.

4.1.3 Existing Situation with Housing in the Inner-city

General issues

- High density of buildings (including houses of historic, cultural and architectural values)
- Small green areas in residential quarters
- Insufficient open space
- Degradation of buildings
- Overloaded infrastructure
- Pollution: water, air, soil and noise
- High population density

Buildings

- Diversity of building typology (The building types vary greatly depending on the period when a building was constructed. In the inner-city of Hanoi, most of the houses in the ancient quarter are of traditional tubelike type, but in the other quarters they are of different types)
- There are a few common building structures (that related to the building types of certain historic periods)

- There is a differentiation in these elements because of the use of different technology in different historical periods
- The diversity of the building in the inner-city built in various historic periods creates a special urban quality and worth to be preserved
- The inner-city buildings have several types of functions: residential, commercial, hotel, office and public services, etc.
- There are three main types of ownership for houses: state ownership, private ownership and mixed ownership

4.1.4 Sub-objectives

- Reduce the high density of population
- Increase the norm for the green surface per inhabitant
- Increase the norm for living area per inhabitant
- Readjust the standard in housing, formulate new requirements for facilities
- Preserve intact or restore the buildings that have historic, cultural and architectural values

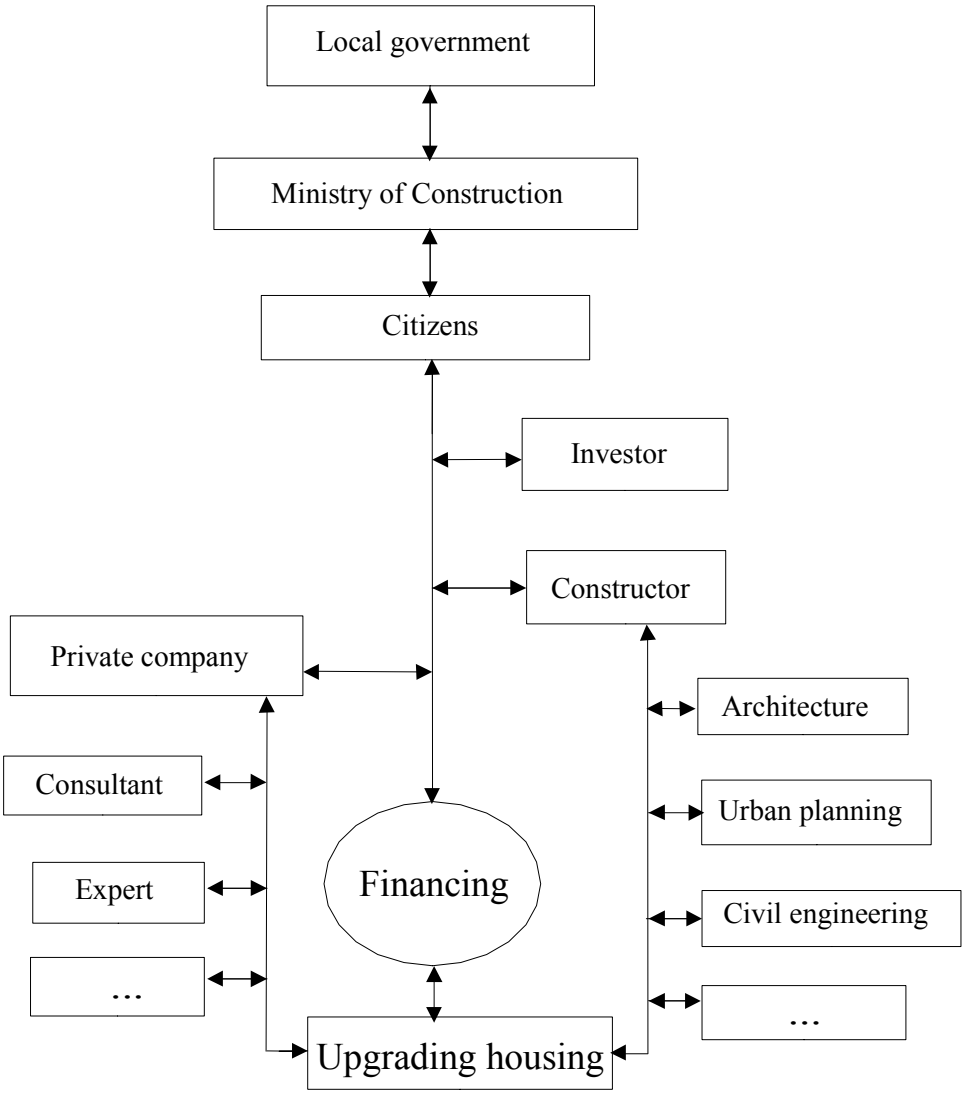
4.1.5 System Analysis of Public Private Partnership in Hanoi

The following table gives an overview of various actors involved in the process of upgrading housing.

Table 4-1: Actors Analysis for Public Private Partnership in Hanoi

Key actors	***Goals***	***Success factors***
Local authorities	• Meet demands of citizens • Balanced development in inner-city • Stable economy and employment	• Good practice/laws; • Good communication • Vision
Ministry of Construction	• Experts • Enforcement of legislation • Establish framework	• Good law • Vision • Skill, experiences
Private companies	• Profit • Consultant	• Good communication • Stable economy and employment • New technologies
Constructors, Contractor	• Profit • Innovative ideas • Consulting, design	• Stable economy and employment • Experiences, new technologies
Key actors	***Goals***	***Success factors***
Tourism, Neighbourhood	• Sound environment • Good facilities • Leisure	• Satisfaction with the environment
Citizens	• Improve housing condition • Job opportunities	• Agreement • Awareness • Organisation

Fig. 4-1: Structure Analysis on Upgrading Housing Conditions in Hanoi



4.1.6 Tools

- Local strategy for improving public private partnership in inner-city redevelopment (in housing sector)
- Provide measures for housing redevelopment in the inner-city
  - Regulations for redevelopment
  - Regulations for the protection of historic buildings
- Specify the requirements for construction management
  - Administrative regulations for construction permits
  - Regulations for new buildings and land use (including percentage of density and border line, height of new buildings, public spaces, etc.)
  - Typologies and standards for new buildings
  - Restrictions for the use of land in some specific parts of the inner-city
- General and detailed construction planning schemes for the inner-city (housing development)
  - The master plan should provide the basic for the detailed development plan in the

inner-city

- A detailed plan should be worked out for each pilot project
- The deadline for implementation should be set in each 5 years

4.1.7 Lessons Learned

- In city planning, the city government should take into account the opinions of the private sector and the citizens. Communication need to be reinforced not only in the process of PPP but also in the process of city planning.
- Conflicts between the key actors of inner-city redevelopment can be solved or at least partly solved on the basis of interest-oriented discussion and negotiations.
- PPP seems to be a good instrument for fund raising for the inner-city redevelopment. It is a task for the city government to develop concrete mechanisms and normative base for this process.
- As a stable and predictable condition required for developing co-operation between public and private sectors, the enforcement of laws and regulations in Hanoi should be enhanced.

4.2 CASE STUDY OF SENEGAL: IMPROVEMENT OF WASTE MANAGEMENT IN DAKAR

4.2.1 Preamble

Senegal is the country situated in West Africa, on the coast of the Atlantic Ocean. It has an area of 196,722 km². The country has hot and dry climate. The dominant winds are: the trade winds, the harmattan and the monsoon. In 1998 the population was 9,037,906 inhabitants. The population density is 42 /km², and the urban population growth rate is 3.7%. The population density differs in various areas of the country: 3,400 inhabitants per square kilometre in Dakar district and 6 inhabitants per square kilometre in Tambacounda region in the east of the country.

In 1998 the economic growth rate was more than 5%. The greenhouse gases are mainly emitted by: energy industry, agriculture, industry processing, waste and forest.

Methane (CH_4) is the main greenhouse gas produced by solid and liquid waste in Senegal.

The degradation of the economic conditions in rural areas, heavily affected by the climate change, results in the concentration of the population in Dakar area, where main industrial activities are concentrated.

Senegal faces the problems of soil contamination, followed by degradation of surface water quality (lake and littoral) and ground water pollution due to the accumulation of toxic substances from industrial enterprises and waste landfills.

4.2.2 Objective of the Case Study

General objective: to improve quality of life through more efficient waste management.

Specific objectives:

– to understand the complexity of waste management system in Dakar better

– to improve public private partnership in the waste management sector

– to reduce negative impacts of the waste problems in the inner-city area.

4.2.3 Existing Situation

The major environmental problem in Dakar relates to the inefficient waste management that results in the insalubrity of the streets and public places, health problems, aesthetic and image problem. Cultural traditions and the lack of education regarding waste disposal are a part of the social dimension of this environmental problem. It is a real equation with complex variables which has to be solved by joint efforts of the community.

Many strategies have been developed, but they delivered insufficient results. At first, waste management was run by municipalities. Then the partnership between the local government, a private society and basic economic organisations was established. But since 1996 the Code of Local Collectivities gave the responsibility for waste management to different local authorities. A new strategy to establish partnership between the region municipality, the private sector and the NGO sector until the next year has been recommended since July 2000 by the Government of Senegal.

Waste management is actually included in the urban environmental management, which is organised by a multitude of sectorial arrangements.

The adopted global strategy for the urban environment management, as a part of the human settlement management, is based on many factors, but the strategic orientations are not enough implemented through concrete, evaluated and planned actions.

The main instruments of intervention used by the central government are legislation and rule setting. The main sectorial laws and rules related to environmental management are aimed mainly at:

- Public health (law 83-71 on 05th of July, 1983) on hygiene code;
- The household waste management (rule 74-338 making rules on evacuation and landfills);
- The transfer of competencies for the environmental management issues to the local authorities (law 96-07 from 23rd of March, 1996 on the competence transfer to regions, communes or rural communities).

A number of ministerial sectors are responsible for the preservation and the improvement of the urban settlement quality, but their actions are often insufficiently co-ordinated.

The application of environmental education curricula is in the beginning phase and concerns mainly the conservation of natural resources. But the impact of the awareness instruments remains limited. Economic instruments are almost not used in urban environmental management.

Experience of NGOs presents a significant support for the administration in many fields of urban development, including waste water treatment and household waste management. In some projects aimed at improving the quality of life, NGOs obtain good results for example, in projects related to open waste water channels, household waste collection and sensitisation of the population. At the community level, the "*set-setal*" operation ("be clean and make clean" in local language *wolof)* initiated in 1988, was an interesting experience of citizens on waste management and on control of the environment. These implemented projects, oriented towards waste disposal in public areas, were recognised as good practices by the local authorities of the Urban Community of Dakar (CUD), by the High Authority for the Tidiness of Dakar (HADP) at the Environmental Ministry and at the General Agency for Public Building (AGETIP). A number of private societies are also responsible for waste management and sewage treatment in the urban community of Dakar. But the removal and treatment of the household waste remains the main problem for the responsible authorities due to a permanent lack of funds.

The uncontrolled landfill of *Mbeubeuss* receives three hundred tons of solid waste daily. It provides an opportunity for recycling sectors and for garbage collectors.

To integrate all these fields of actions and the different actors involved in urban waste management, the central government suggested a new public private partnership since July 2000. In the following tables, we analyse the situation and suggest some improvement for this case study.

Table 4-2: SWOT Analysis for Case Study in Dakar

STRENGTH	***WEAKNESSES***
• Local authorities got the possibility to guide private investments strategically; • Structuration of the PPP contract allows the local authorities to obtain a certain control over standards and performances; • Possibility for the development of a mobilisation strategies with high public acceptance.	• Communication and understanding between public and private sectors are sometimes difficult; • Weak organisation of the waste management sector; • Lack of efficient equipment for waste collectors; • Irregularity of services; • Lack of health security; • Solid waste is not sorted, scropted, or incinerated; • Only one uncontrolled landfill; • Some recycling activities are hand-made by the dustmen; • Difficulty for the workers to get their salaries; • Absence of competition between investors in the waste sector; • Open channels for sewage are not controlled; • Local government did not define rules for industrial waste management.
OPPORTUNITIES	***THREATS***
• Finding jobs; • Selling hand-made, useful or decorative objects; • Attraction of tourists to the cleaner inner-city area; • Possibility of composting and recycling biological waste in agricultural production.	• Environmental education is in its beginning in the sector; • Lack of economic means; • Problems due to opposition between members of the municipal team; • Difficulty to induce better environmental behaviour; • Accentuation of environmental deterioration by spontaneous housing.

Table 4-3: Analysis of Actors Involved in Public Private Partnership in Waste Management in Dakar

Key Actor	*Goal*	*Success Factors*
Local Authorities	• Meet demand and care for citizens • Guide and control redevelopment • Enhance economy and employment.	• Good Policy/laws • Communication • Vision • Partnership • Self contained
Private Companies	• Profit • Viable business • Strengthen position in city • Stable frame condition • Employment.	• Good communication with local authorities and central government • Stable frame condition • Possibility to diversify and extend activities.
Central Government	• Enhance economic development and employment • Control the financial management • Guarantee investment • Elaborate laws and status.	• Stable political situation • Vision • Partnership
Citizens	• Housing improvement • More job opportunities • Well being.	• Education • Organisation • Information • Sanitary awareness • Representation • Relation
Experts	• Realisation Innovation • Prospective studies	• Qualification • Financial and material resources
Banks	• Project • New opportunities for investment	• Economic and political stability • Good financial law and policies • Foreign and local investors

4.2.4 Lessons Learned

1. The connection between economy and environment is not systematically established by the different actors in the ongoing public private partnership process; it is not evident for the actors that the environmental deterioration will affect in its turn their production basis;

   Therefore, we need:

   - further participative development and implementation of information strategies for the awareness of the population on the importance of environmental protection;
   - definition of the main problems resulting from the negative trends and from obstacles for the efficiency of the environmental system;
   - general development of environmental education for basic groups, including the informal sectors, for all the levels of the society and for all regions.

2. Activities are too much sectorial and we observe a lack of connection between the different actors. There is a need for:

   - improved dynamics in co-ordination in the waste management sector for preventing

possible lacks;

- definition of rules for the management of different waste types (household, sewage, medical and industrial waste) by the central government and expectation of punishment, particularly in the industrial sector;
- promotion of the technical development of the waste management system and the analysis of its improvement potential.

3. The dynamics in partnerships between public (local authorities), private (waste management company) and community (basic economic organisations of inhabitants) sectors is unsatisfactory; therefore, we need:

- definition of a clear reference basis (laws, rules, agreements etc.) on a common vision for a new partnership between these three sectors creating win-win situations including the expectation of dynamic and accepted punishment actions against the violators of the agreement;
- creation of efficient conditions for the continuous remuneration of the involved actors and the reinforcement of their motivation and availability;
- reinforcement of supporting institutions for waste management by consulting the actors and asking them about their actual needs and avoiding eventual lacks.

V. HOW TO LAUNCH PRIVATE-PUBLIC PARTNERSHIPS IN INNER-CITY REDEVELOPMENT

Table 5-1: Key Actors and Their Interests & Contributions

Actors	Interests	Contributions
City government	• Improve quality of living conditions • Attract tourists • Control of investors • Conservation of historic character • Improve conditions for business development	• Technical/architecture expertise • Master plan with amendment • Finance • Regulation/ legal framework • Land surface
Private sector	• Viable businesses • Profit • Clear perspective of future development • Building permits	• Jobs • Investment • Taxes • Infrastructure improvement
Community	• Privacy • Income/jobs • Environment • Infrastructure • Transport • Parking places • Security	• Compliance with laws & regulations • Taxes • Suggestions • Public support • Labour for public good

5.1 KEY ACTORS

Partnerships among all actors within cities, including public, private, voluntary and community-based organisations, are essential to achieving sustainable urban development (Table 5-1).

In inner-city redevelopment, many different parties with different interests are involved. Of course, local authorities are always key actors. They often initiate redevelopment projects motivated by concerns for sustainability. They try to formulate plans for redevelopment. Private sector entities are also concerned about city redevelopment because they can benefit greatly from bright future development of cities. Citizens are now being transformed from mere settlers into active participants as well, and NGOs are now playing a more and more important role in many countries.

To simplify the analysis, we select three of these actors as the key stakeholders in inner-city redevelopment: city government, the private sector, and the community (inhabitants of the inner-city). These three parties derive different benefits from inner-city redevelopment in terms of their own interests. On the other hand, each can make different contributions to inner-city redevelopment.

5.2 CONFLICT ANALYSIS

Due to the different interests in inner-city redevelopment, conflicts may occur between different actors. Only after we identify where the conflicts between different groups are lying, we can find ways to co-ordinate the conflicts and develop a win-win strategy.

To solve the conflicts, we must try to find a solution based on the interests of the various parties. The fundamental method of conflict resolution is that two or more parties work together to examine their individual interests and needs, and thereafter work out a solution which should more or less satisfy all sides: this is a win-win situation. This can be done either in a co-operative way or in a competitive way, as this is typical in collective bargaining. While developing such a win-win situation, focuses should not only be placed on reaching a comparatively satisfactory solution for all parties, but also on achieving agreed sustainability in economic, social and environmental aspects of inner-city redevelopment.

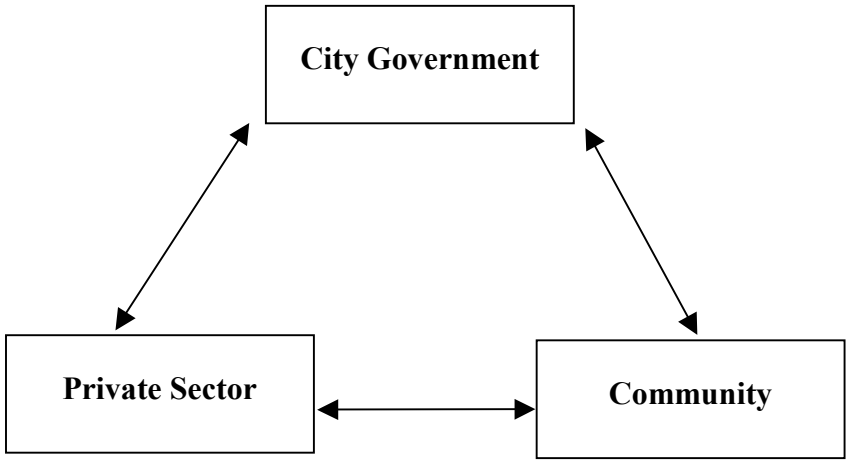


Fig. 5-1: Interrelations between key actors in inner-city

Typical conflict resolution processes are facilitated by independent moderators or mediators. Mediation is one of the several approaches to conflict resolution that uses a "third party" intermediary to help the disputing parties to resolve their conflicts. In some European countries as well as in the U.S.A., the mediator should be neutral and impartial while in some developing countries mediators are insiders. They are people who are connected to one side or the other, but who are highly respected by all sides.

Table 5-2: Conflicts and Identified Levers

Actors	*Conflicts*	*Levers/areas to achieve win-win situations*
City Government vs. Private Sector	A. Preserving heritage vs. expansion in modern way	**A. Raising attractiveness to tourists.** (Preserving historic character in line with development of modern services to increase attractiveness to (and, hence, profit from) tourists).
	B. Different land use priorities C. Different vision of development	**B+C. Development of innovative ideas to be used in planning for the future.** (Planning of future development due to consideration of the private sector's innovative ideas, opportunities, and resources. Thus, the involvement of the private sector in the planning process is important to reach more efficient and effective use of resources, space, etc.)
City Government vs. Community	A. Control over population density in the inner-city vs. citizens' willingness to live in the central area	**A. Improvement of services & infrastructure, creation of jobs outside inner-city.** (The idea is to develop quarters outside the inner-city in order to attract people to live there and, in such a way, to reduce population density in the inner city).
	B. Desire for better quality of life vs. limited resources of the local authorities	**B. Mechanism for raising funds from citizens to redevelop inner city.**
	C. Compliance with regulations	**C. Enforcement of regulations** (The primary goal of regulations is to protect interests of citizens. When regulations are violated without punishment/response from authorities, people tend not to comply with them. It is also important to take into account opinions of citizens when drafting or amending regulations).
Private Sector vs. Community	A. Increase of living costs	**A. Improvement of services, creation of jobs**
	B. "Environmental" conflicts resulted from increasing of business activities	**B. Enforcement of regulations.**
		Thoroughly worked out plan of city re-development. (While elaborating such a plan, consideration of ideas and interests of both the private sector and citizens are very important).

5.3 STEPS FOR PPP IMPLEMENTATION IN INNER-CITY REDEVELOPMENT

Generally speaking, it is very difficult to set up a universal process of PPP that can be applied in all inner-city redevelopment by all countries. However, we have tried to devise a broadly applicable procedure for launching PPP in inner-city redevelopment. Of course, some readjustment or changes should be made during applying this procedure to specific projects in different places (see Table 5-3).

Step I: Agreement within government for PPP

The *most important* starting point is to reach an agreement within the government to conduct

PPP in inner-city redevelopment. Without the agreement of the government, PPP can be hardly implemented because, in most cases, it is only the government that can provide essential support for implementing PPP, including funding, human resources, and management.

On the other hand, achieving agreement to launch PPP within the government is the *most difficult* thing. If the government has the motivation to conduct PPP, the task is easier. However, in most cases it is not the government, but rather the private sector or communities or other groups which are eager to introduce PPP into inner-city redevelopment. Under such circumstances, the process becomes much more difficult. Thus, the planning group is faced with hard work to persuade the government to initiate and implement PPP. In a bottom-up way, the initiators should use any mean they can, e.g. the media, personal relationships, reputation etc. to push the government toward the PPP process.

Step II: Sharing vision with other stakeholders

In order to establish partnerships, it is also very important to promote the awareness and enthusiasm of other actors. Otherwise, their contributions to the partnership would be lost, and subsequent implementation of inner-city redevelopment planning would become much more difficult. One of the most effective ways to increase the motivation of the other stakeholders is to implement a pilot project in a small area and to demonstrate the process of PPP. This will greatly encourage the other stakeholders to participate public private partnership in inner-city redevelopment.

Step III: Negotiation process

Interest-based bargaining is effective for interest-based disputes. All stakeholders work together to examine their interests and needs, and to work out a solution that more or less satisfies all sides. This can be done in a co-operative way or in a competitive way, as it is typical in collective bargaining. Of course, each group should compromise to some extent. Mutual understanding between different groups is also an important step towards sustainable development.

Step IV: Evaluation and alternative options

It is essential to assess the result of the negotiation. Is it sustainable? Objective criteria should be developed, including technical, economic, social and environmental criteria. There are always multiple options in inner-city redevelopment. Based on thorough discussions, alternative options for decision-makers should be proposed.

Step V: Final decision

From the proposed alternative options, the best option should be selected based on consensus-oriented discussions or opinion pools.

Step VI: Implementation

No matter how perfect, decisions or plans will be worthless if they remain only as reports or sheets of paper. Nothing will happen if no real action is taken. To our knowledge, *implementation* is always the single most difficult problem in inner-city redevelopment. To easily, effectively, and efficiently put the planning into practice, a lot of work must be done, including formulating and enforcing regulations, publicity and education, renovating institutions, capacity-building, etc.

Table 5-3 Comparison of Possible Applications of PPP in Different Places

Step	*Possible Applications of PPP (part I)*				
	Minsk (Belarus)	**Yangzhou (China)**	**Timisoara (Romania)**	**Hanoi (Vietnam)**	**Dakar (Senegal)**
I	Idea usually initiated by local authorities Project proposal can be drafted by the Department of Architecture and Construction (in co-operation with other Departments responsible for economic issues) The plan requires approval by the local government The co-ordinator is assigned from the high-level members of the local government	Idea initiated by institutes or universities Project proposal drafted by institutes Persuade local government to do PPP Approval by local government Get funding from local government Co-ordinator assigned by local government, usually from the local government Team organisation	Idea initiated by local authorities Project proposal draft by institutes of research & architecture Approval by local government Co-ordinator: high level member from local government in charge of the management team	Idea from municipality Project proposal by Ministries of Construction Approval by committee of municipality Chairman is from the municipalities	Idea from local authorities Project proposal by central government departments Plan approval by local government Chairman from the members of the municipalities
II	Dissemination of information could be done through various channels: Special newspapers/ magazines for businessmen Participation in business conferences Using the networks of business associations and the Chamber of Commerce Personal contacts	Informal contacts with private sectors and communities Inviting private sectors or citizen representatives to meetings chaired by co-ordinator Material dissemination Introduction of the ideas of the planning Willingness to do PPP	Co-ordinator spreads information by invitation and other communication channels, incl. newspaper, radio, TV, chamber of commerce, exhibition Positive feedback of willingness to join PPP from questionnaire	Information and dissemination through: • Local Radio, TV • Special newspaper • Meeting in community • Presentation exhibition • Positive feedback	Open mind to PPP Dissemination of the information by mass-media, meetings, conferences, posters, personal contacts Involvement of NGO's and private sector

Step	***Possible Applications of PPP (part II)***				
	Minsk (Belarus)	**Yangzhou (China)**	**Timisoara (Romania)**	**Hanoi (Vietnam)**	**Dakar (Senegal)**
III	Presentation of projects by local authorities Negotiations on how to share responsibilities, risks, etc.	Meeting and presentation of planning by experts Debates and suggestions Compromise Consensus	Meeting in plenary, working groups & debate till to consensus of majority on PPP	Meeting and presentation of planning by committee with experts and consultants Adjustment Presentation of result Consensus	Meeting of the experts on the planning Meeting of all actors Debate for consensus Recommen-dations
IV	Evaluation by the local government (participation of experts from the Ministry of Architecture and Construction is also possible) It can be also announced a tender for participation in the project	Criteria for evaluation (economic, technical, env.and social factors) Evaluation by team Alternative options developed by experts based on the suggestions of stakeholders	Based on specific criteria, evaluation by management team Development of alternative options by the management team with help of consulting group	Evaluation by supervisor of municipality Development of scenarios Evaluation by teem	Evaluation by experts or by team supervised by local government Alternatives proposed by evaluator
V	Final decision is usually made by local government with consideration of a position of the private sector	Presentation in conference Best option oriented to sustainable development	Presentation in conference Best option towards sustainable development	Presentation in conference of the concerning actors Best option on consensus	Presentation at meeting with all actors Final option on consensus
VI	The main step is conclusion of a contract with a private company to implement a certain project Control over the project implemen-tation rests with local authorities	Approved by People's Congress Enforcement of the planning, for instance, issue permits to private sector, resettle citizens	Measures for implementation Contracts with private sector Implementing of the project	Contract with a private sector Consensus implementing team Measures and control of implemen-tation	Sensibilisation of community about project Conscious implementing team Control by local authorities

To compare the different PPP steps in the different countries, marks were given based on the following principle:

4 very difficult
3 difficult
2 with some problems
1 not difficult

Table 5-4 Comparative Analysis and Evaluation of Different PPP Steps

Cities / ***Steps***	Minsk	Yangzhou	Timisoara	Hanoi	Dakar	**Total**
I. Agreement within Government for PPP	2	4	2	4	2	**14**
II. Sharing Vision with Other Stakeholders	2	2	1	3	2	**10**
III. Negotiation Process	3	3	2	3	1	**12**
IV. Evaluation and Alternative Options	2	2	2	2	2	**10**
V. Final Decision	3	2	1	3	1	**10**
VI. Implementation	2	3	2	2	3	**12**
Total for Each City	**14**	**16**	**10**	**17**	**11**	

Based on the figures given in Table 5-4, we can perform some simple comparisons.

- The row “total” in the table indicates the relative difficulty of implementing different steps of the PPP process. The highest mark (14 points out of 20) is given to Step I (Agreement within Government for PPP) . This indicates that it is the most difficult as compared to other steps. Secondly, we can qualitatively define it as being situated close to "difficult". Thus, it is the key point in carrying out PPP. Moreover, this result indicates that in developing countries and countries with economies in transition there are still certain barriers between authorities and private sectors (e.g., gaps in legislation, lack of awareness, psychological obstacles). More efforts should be made to promote awareness of PPP and, thus to exert influence on authorities to induce them to accept PPP gradually. We may have a long and difficult way to go, but it is still possible.

The marks given to other steps indicate that all are easier to implement (but all marks are still situated between "with some problems" and "difficult").

- The column “total” indicates the difficulty of implementing PPP in different cities. The highest mark (17 out of 24) was given to Hanoi (Vietnam). This means that the implementation of PPP in Hanoi is very close to the mark "difficult". Qualitatively: the situation in Timisoara (Romania) and Dakar (Senegal) can be estimated as "with some problems" but "not difficult"; and for Minsk (Belarus) and Yangzhou (China), it lies between "difficult" and "with some problems". The main reasons may lie in social systems, management styles, development/influence of the private sector, "open mind" to co-operate with other stakeholders, public awareness and NGO’s activity/role, etc.

VI. LESSONS LEARNED AND RECOMMENDATIONS

1. To increase their chances for success in inner-city redevelopment, it is essential that local authorities not only care about the implementation of their plans, policies or decisions but that they should also focus on, strengthen and, above all, co-ordinate local policies in close co-operation with other stakeholders from the very beginning of planning or design.
2. Public private partnership can play an important role in increasing effectiveness and impact of ongoing local initiatives through broad-based participation, mobilising and leveraging resources, and monitoring local progress for timely feedback for policy and strategy adjustments.
3. For those countries where city governments have never tried to include public private partnership into redevelopment projects, it is required to undertake step-by-step actions to influence the city government and prove the advantages/benefits of public private partnership. External facilitation and the new framework are useful for overcoming old conflicts.
4. From the very beginning, much attention should be paid to avoid complicated and long-term PPP projects. It is preferable to initiate small-scale pilot projects with simplified procedure to increase motivation and to encourage participation and commitment of the stakeholders.
5. Integrated participation cannot be developed without transparency in the ongoing processes (activities). To limit misunderstanding between different parties in the inner-city, strategies for blocking and reversing destructive factors should also be considered.
6. There do exist conflicts between different stakeholders in inner-city redevelopment. But it is still possible to find a solution that more or less satisfies all parties - a win-win situation.
7. In promoting public private partnership, it is also important to increase awareness of PPP through efficient use of mass media and educational resources.

VII. REFERENCES

European Commission, Directorate XI (2000): Database on good practice in Urban Management in sustainability, Brussels.

Gassmann F. (1997): Komplexe Systeme"- in: Naturforschende Gesellschaft in Zürich, J. 142. Heft 2., 43-59.

Giovannini, B. (2000): Introduction into participative methods in sustainable development. Paper presented at the Summer Session 2000, Hamburg.

Günther, B. (2000): Introduction to Conflict Management. Paper presented at the Summer Session 2000, Hamburg.

Hoang, H. P., Nishimura, Y. (1990): The Historical Environment and Housing Conditions in the "36 old streets" Quarter of Hanoi, Division of Human Settlement Development, Asian Institute of Technology, Bangkok.

Kessen, St. & Zillessen, H. (2000): "Leitbilder der Mediation"; in: Studienbrief Umweltmediation - eine interdisziplinäre Einführung, Bonn.

Mega, V. (2000): The Civilisation of Sustainability. Harmonising Policy Objectives in the European Urban Archipelago: 3rd Biennal of Towns and Towns Planner in Europe, Berlin: SRL Schriftenreihe 46, 83-118.

Ministère de l'environnement (1997): Report on "Plan National d'Actions pour l'Environnement", Dakar.

Ministère de l'environnement (1999): Report on «Deuxième Communication Nationale du Senegal sur la Convention Cadre des Nations Unies sur les Changements Climatiques», Dakar.

Quotidien National Le Soleil du 03 /08 /00. Dakar.

"Preserving Hanoi's Architectural and Landscape Heritage" (1999): Construction Publishing House, Hanoi.

Schwaninger, M. (2000): Managing Complexity – the Path Toward Intelligent Organisations; in: Systemic Practice and Action Research, Vol. 13, No.2, 207-241.

Schwaninger, M. (1997): Integrative Systems Methodology: Heuristic for Requisite Variety; in: International Transactions in Operational Research, Vol. 4, No. 2, 109-123.

UNCHS (2000): Habitat Agenda. Nairobi (www.unchs.org).

SUSTAINABLE DEVELOPMENT IN AGRICULTURE

WORKING GROUP REPORT

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ABSTRACT

Biodiversity is fundamental for the ecological stability and the sustainable development of the agricultural sector in the world. High biodiversity is endangered at present mainly by direct human activities, but also by changes in natural processes. These negative factors includes climate change, modification of the water cycle, degradation of soils. The increase of world population and human activities in rural areas, e.g. deforestation, monoculture in forestry and agriculture, overgrazing, overuse of fertilisers and pesticides cause water pollution, ecosystem degradation etc. Loss of biodiversity, as an impact of these practices, includes the extinction of up to 100 species of flora and fauna per day, and have a negative influence on soil fertility (WBGU, 2000). Therefore, to implement the concept of sustainable development in agriculture, we need to focus on the following:

- Broad look on the environmental, economic and social dimensions of agricultural techniques and management methods;
- Promotion of best practices of sustainable development in agriculture in order to keep the balance in agricultural ecosystems, assure long-term food quality and improve the human health.

The specific objectives of the working group on sustainable development in agriculture during the Summer Session 2000 were consequently:

- to evaluate the current situation and the multiple causes for the loss of biodiversity,
- to develop new measures on how to preserve biodiversity in rural areas,
- to evaluate some current agricultural practices in case studies,
- to propose strategic recommendations respectively at the international, national and local levels for governments, NGOs, the public and farmers.

The main recommendations of the Working Group are: establish new policies and legislation on the conservation of biodiversity and on agricultural production; create a large communication and diffusion system on new agricultural techniques, especially for organic agriculture in different agro-ecosystems; increase research funds for sustainable techniques.

I. INTRODUCTION

Sustainable development in agriculture means considering the long term social, financial and environmental consequence of each agricultural activity. The fertility of soils, the improvement of livestock and an appropriate policy in agriculture are prerequisites for the sustainability of agricultural ecosystems. Otherwise, some irreversible trends could cause an economic decline or induce insecurity of the food supply for future generations. Nowers (1995) defines sustainable agriculture as where productivity are promoted to levels which is economically viable, ecological healthy and cultural acceptable, through the effective management of resources and inputs in quantity, quality, sequences and timing, with the minimum damage to it's environment and danger to human life.

In developing countries, a large part of the population is working in the agricultural sector, but in developed countries, only a small percentage of the population is employed in it. Actually, there are about 2500 million people world-wide active in the agricultural sector, and they cultivate about 1400 million hectares of arable land (FAO, 2000). Due to many different reasons, unsustainable agricultural activities exist almost in all countries. Patterns of agricultural activities vary greatly between developed and developing countries. In the industrialised countries, a high amount of pesticides and fertilisers leads to high production per unit area, but at the same time degrades soils and leads to a tremendous loss of biodiversity. Further consequences of unsustainable activities in agriculture are higher acidity of soils, air and water pollution, etc. In the developing countries, the economy depends mainly on the agricultural sector. Due to the high food demand and the need for cash in order to purchase manufactured goods on the international market, farmers want to produce more agricultural products on more land. Only a few people take care of the environmental problems in the agricultural sector. Unsustainable agricultural activities cause the degradation of entire landscapes, erosion of soil and the destruction of unmanaged ecosystems. The main negative environmental impacts are coming from deforestation, overgrazing, monoculture, unadapted treatment of soils, abuse of fertilisers and pesticides.

The key components of the natural environment, air, soil, water and biosphere, are all degraded through unsustainable human activities in ecosystems. To improve these components is one of the main tasks for sustainable agriculture. For the Summer Session 2000, the working group on sustainable development in agriculture has discussed and focused its work on the biodiversity dimension of agricultural activities.

Objectives of this report

Our general objective is to contribute to:

- an improvement of sustainable development in agriculture, looking jointly at the environmental, economical and social aspects of different practices;
- a better diffusion of best practices in agricultural development for an environmentally safe and sufficient production.

Specific objectives:

- to evaluate, how to reduce the loss of biodiversity due to unsustainable agricultural practices and give examples for successful measures;
- to collect actual data and characterise the protection, conservation restoration and management techniques leading to a more sustainable agriculture and to a higher biological diversity with the help of appropriate new technologies;
- to evaluate the agricultural practices for the improvement of farming techniques;

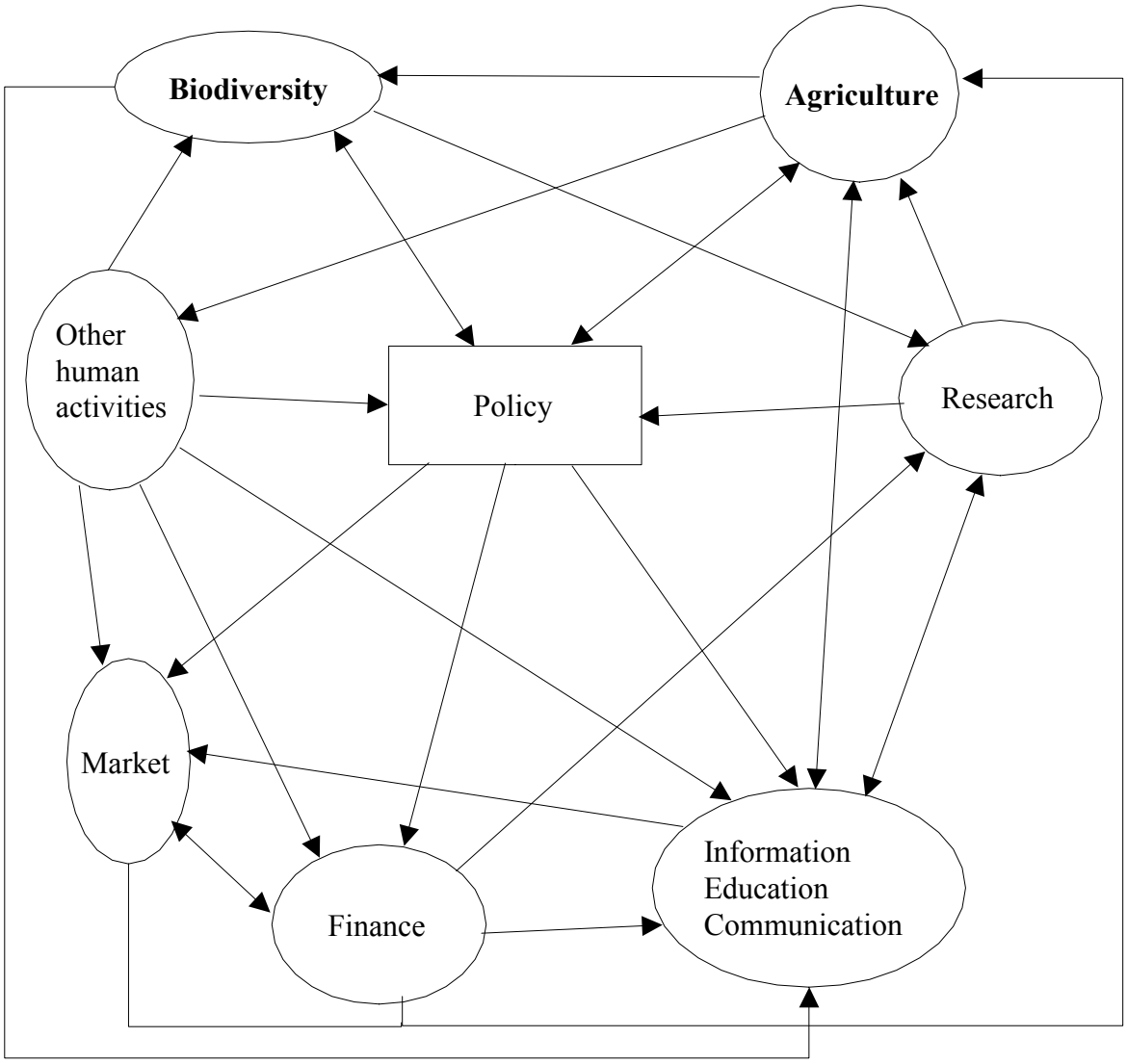
- to propose some strategies for policy makers for the promotion of sustainable agriculture.

II. ACTUAL SITUATION OF AGRICULTURAL PRACTICE IN THE WORLD

Agriculture is in many countries the basic sector for economic and social development. Due to the world-wide population growth, the demand for food is continuously increasing, leading often to unsuitable practices of agricultural field production. Now, the world's agricultural output exceeds the food demand of the global population (FAO, 2000). But hunger still exists in certain parts of the world and is due mainly to the failure of political and economic systems to distribute the food in time. Although we produce enough food at the global scale, "sustainable agriculture" is still a major concern at the levels from government level down to local people. This is, with regard to the complexity of the decision making system in this economic field, a very difficult task (Schwaninger, 2000).

What are the actual interrelations between agriculture and biodiversity on the background of the world-wide agricultural development challenges? (Fig. 2-1)

Figure 2-1: Complex system of agriculture's influence on biodiversity



Agricultural development is in many cases regionally unbalanced. In some developing

countries, very old agricultural methods, such as slash and burn agriculture, are still carried out. For example, the Middle East used to be known as the "Fertile Crescent," but now many parts of the land have become a desert. Poor land use planning combined with unsustainable agricultural practices have lead to desertification and the decline of soil fertility in that region.

What is sustainable agriculture? There are three main criteria. Firstly, it must feed the world's population today, secondly, it must permit to feed the world's population tomorrow, and thirdly, it must prevent deterioration of soil and water. These criteria sound very good, but the situation of agriculture on our earth is actually unsustainable. The agricultural sector facts are shown as follows.

2.1 UNBALANCED AGRICULTURAL DEVELOPMENT

Although the problems of agricultural development exist in both developing and developed countries, the difficulties appear in a completely different way. In developing countries, a very high percentage of the population is working on the agricultural sector, most of the agricultural practice depend on manual labour, without the use of machines, without any technical guidance, while the seed quality is also poor etc. Due to this low productivity and poor efficiency of the natural resource use, one farmer can produce food for only very few people. On the contrary, in developed countries, a very low percentage of the population is working in the agricultural sector. Most of the agricultural practices are carried out by machines. At the same time, there is a very good extension network for agricultural techniques, and it is easy to purchase some techniques, high quality seeds, fertilisers and pesticides. The agricultural productivity and the efficiency of natural resource use are very high and on average, one farmer can feed more than fifty people. The unbalanced development between developing and developed countries is a barrier for the sustainable development of agriculture in the world.

2.2 UNSUSTAINABLE DEVELOPMENT IN THE AGRICULTURAL SECTOR

To overcome the unsustainable development in the agricultural sector, we have to take into account the negative and positive effects of many types of agricultural practices on biodiversity and soil quality (Figure 2-2).

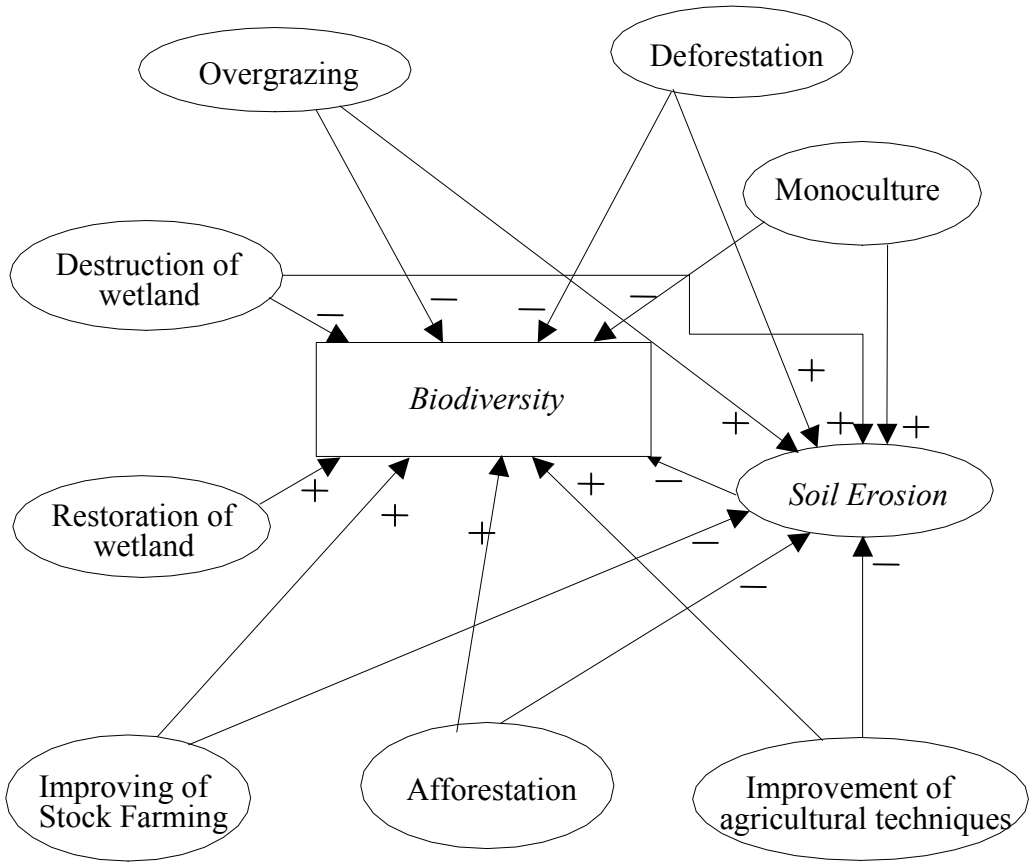
Deforestation: The exploitation of primary and secondary forests occurs everywhere on the globe. For example, in the eastern and southern parts of Senegal, most of the forests have been destroyed for the plantation of peanut crop, and in China, deforestation is mainly related to the increasing population. In West African countries such as Cote d'Ivoire, the primary tropical forest has been almost totally cut. In the world, there are 5,800,000 km^2 of surface with degraded forests (FAO, 2000).

Actually, the world forest resource base has been rapidly depleted by conversion to agricultural land, by a high demand for timber and fuel-wood and by commercial logging. This deforestation has induced an immediate loss of biodiversity. Deforestation for unsustainable agricultural activities added to the problem of global climate change through additional CO_2-emissions.

Overgrazing: Overgrazing is a global problem with strong impacts in arid regions and developing countries in Asia, Africa and Latin America. In the world, more than 6,800,000 km^2 grasslands have been degraded by overgrazing. This degradation occurs mainly around water places and is due to a high density of life stock, which lead to water or wind induced soil erosion, a destruction of the grass and the plants and to a reduction of the moisture storage capacity of soils (FAO, 2000). For example, in the north eastern part of China and in the Sahel region of Africa, overgrazing has caused the desertification of grass- and crop land.

Overgrazing strongly reduces biodiversity as well.

Figure 2-2: Causes and effects of agricultural techniques on biodiversity



Overuse of chemical fertilisers and pesticides: Many farmers are using too much chemical fertilisers and pesticides. This happens not only in developed countries, such as the European Union or the United State of America, but also in many developing countries in Asia and in Africa. Part of the chemical fertilisers and pesticides are not absorbed immediately by crops. This leads to soil and water pollution (including surface water and ground water) and also causes a loss of biodiversity.

Through the application of fertilizers in the agricultural production process, nutrients, particularly nitrates, are leached form the soil to contaminate groundwater and streams. The increased nutrient levels in aquatic systems can stimulate organic growth, such as algae, and may eventually lead to eutrophication when oxygen is depleted during decomposition. This may affect the structure of the faunal and floral communities in the water by eliminating many species and possibly favouring some. Nitrates themselves are not considered hazardous to human beings, but their secondary products, namely nitrites and nitro-amines, can cause serious illnesses in both human beings and livestock (Nowers, 1995). The major concern of insecticides is their toxicity to non-target organisms, including human beings. Even when used carefully they may kill honey bees, birds and fish, and even human life. They kill the insects and mites that are natural enemies of plant-feeders, causing pest numbers to resurge after spraying or new pesticide -resistant pests to arise. They also act selectively on populations, with the result that the latter eventually lose their susceptibility to the pesticides used against them (Nowers, 1995).

Monoculture: Due to the traditional customs and behaviour and the need for economic development, farmers always like to plant a single type of crop on their land for a long time, such as peanuts in Senegal, coffee and cocoa in Cote d'Ivoire and rice in South-Eastern China.

This monoculture is mostly export oriented, induces loss of soil fertility and biodiversity and causes in many cases shortages in the food supply of the local population. In Latin America, some countries have huge sugar cane plantations for high income, e.g. Brazil, Central America, the Caribbean Islands, or Peru. The farmers often do not plant other crops. These monoculture activities have induced a serie of problems: unbalanced nutrient cycle, dependence on imports for other crops, crop diseases and loss of biodiversity.

Destruction of wetlands for agriculture: Wetlands are very important as reproduction and regeneration habitats for endangered species of fish, birds, plants, insects, thus are a key biotope type for the protection of the biosphere. Wetlands are also an important part of the climate system. For example, the mangrove forest ecosystem is an important greenhouse gas sink (Changyi Lu et al., 1995). With the fixing of CO_2, mangrove ecosystems could partly compensate the negative effect of global change, and could damp sea level rise (Changyi Lu, 1991, Fujimoto et al., 1993). But mangrove forests, in comparison with other types of forest ecosystems on our globe, are at the same time the most sensitive to climate change and to human practices.

Due to climate change and direct human activities, wetland change occurs at global scale (IPCC, 2000). Especially in Africa and Asia, large parts of natural wetlands are already transformed into crop land. For example, in Casamance of Senegal, more than 30% percent of the mangrove forest has been destroyed and converted into rice fields. In China, about 30% percent of the natural lake areas were lost in the past 40 years, mainly due to agricultural activities.

Transgenetic crops and livestock: While the food demand of the world population increases each year, there is an imbalance between population growth and agricultural production. In some developing regions, we still have some famine. This inadmissible situation might convince the decision makers in agricultural development to carefully introduce transgenetic plant and animal in agriculture for compensation of the lack of food. The appropriate use of transgenetic plant and animal in agriculture can help to conserve biodiversity and will increase the resistance against biotic and abiotic stress and diseases. For example, transgenetic tomatoes can be conserved more than one month. However, the use of genetically modified plants and animals have to be controlled. The consequences of ethical considerations are, that we can not use at any time transgenetic plant and animal for food production. This question needs further thinking and research. We must clarify whether wildlife will be affected by transgenetic plant and animal or not.

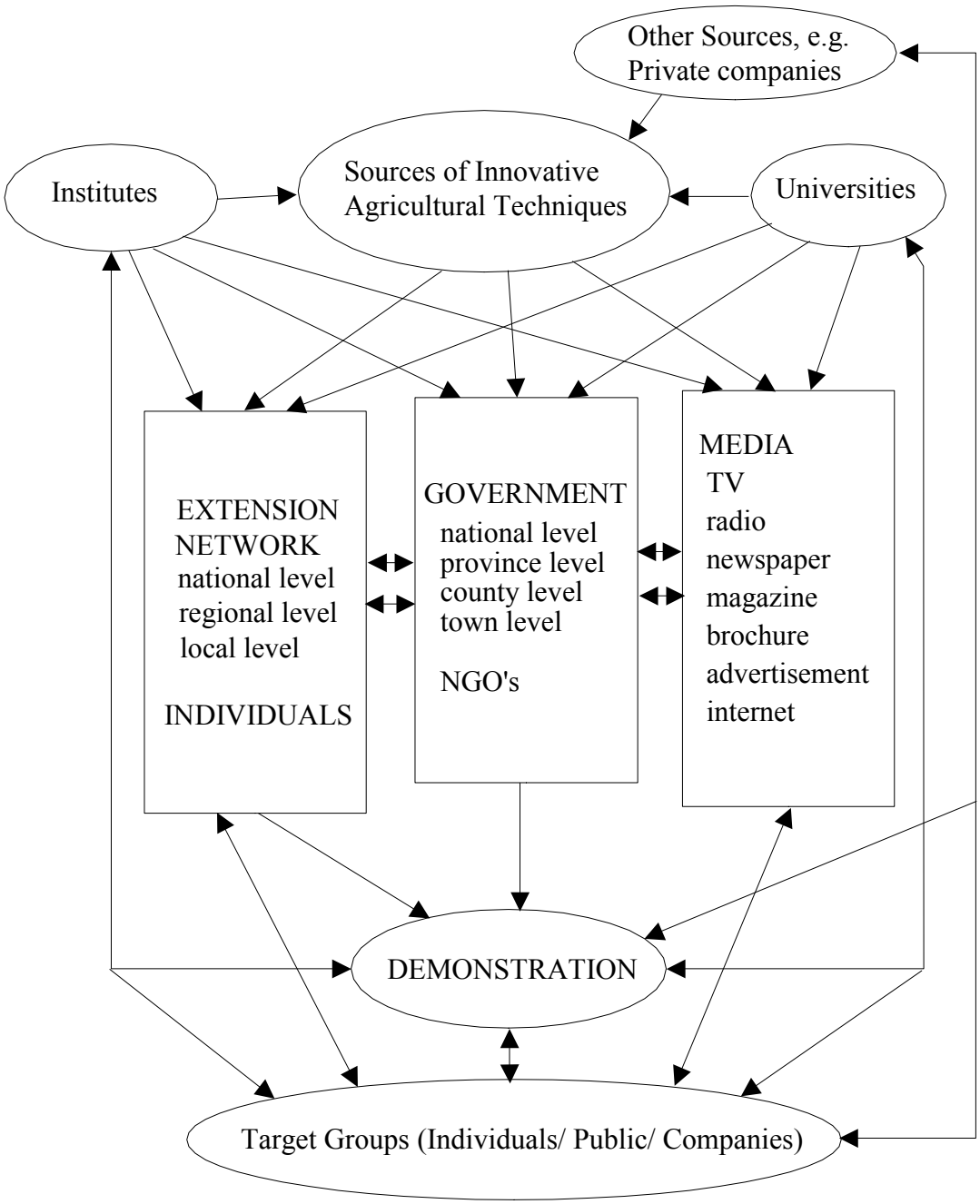
2.3 COMMUNICATION SYSTEM IN AGRICULTURE

Communication is a major strategic issue for the sustainable development in agriculture. How to rapidly and efficiently disseminate the information on agricultural techniques is an urgent task for all nations in the world. Of course, strongly different situations exist in different countries regarding communication of agricultural information, such as agricultural communication technologies, policies, extension and diffusion networks for agricultural techniques and education systems. Despite these different conditions, a communication network should include the following common aspects (Figure 2-3):

It should be supported by the government at the national, regional and local level: this kind of network helps to diffuse and transfer the information on agricultural techniques from different sources, institutes, universities etc. to farmers and the public free of charges. Generally, the information flows from the national government, down to the local administration, then to the public and the farmer. The participation of the end-user group in the decision making process on agricultural techniques is usually relative poor. This lack of participation is clearly not sustainable. For example, in China, the agricultural extension network is centralised at the

Ministry of Agriculture, and many subcenters are located at the provincial level. Below the level of the subcenters, there are different extension stations located at the county level, down to the community level. The staff of the stations teaches and guides the farmers by introducing new, various agricultural techniques by offering training to them, to companies or to those individuals, who represent the final target groups for the agricultural communication network. To involve this groups in a more co-operative and more effective communication system in agriculture would allow a better evaluation of the scientific results. This remains a challenge for the governments and the stakeholders.

Figure 2-3: Communication Network for Sustainable Development in Agriculture



The demonstration fields for specific agricultural techniques and crops, or model farms, are installed by governments, NGOs, institutes, or universities at different spatial levels.

The extension of agricultural techniques by administration centres, stations or individual persons (farmers, staff members of companies) represent another way for the diffusion and transfer of sustainable agricultural techniques. Through this kind of measure, researchers can

present, discuss and redesign their results directly with the target groups, e.g. an agricultural company, association of farmers or individual farmer. Another very important way to diffuse agricultural information is via mass media, such as TV, newspapers, agricultural magazines, brochures and advertisement. Agricultural techniques are presented in a more general form to the farmer and the broad public. Some articles, presentations inform also on where and how to get more precise information.

2.4 KEY SUCCESS FACTORS FOR THE SUSTAINABLE AGRICULTURAL DEVELOPMENT

Agricultural development depends on a good communication between different actors (farmers, government, NGOs) with their own perspectives and different objectives. Therefore, we need to analyse the complex system of actor related decision making processes to find the key success factors for a more sustainable agricultural development (Table 2.1). But in these actors perspectives, the environmental aspect is very often not included. Therefore, a special analysis for the agricultural development from the perspective of "nature" is also needed.

Table 2-1: Actors, goals, key success factors for sustainable development of agriculture

PERSPECTIVES	GOALS / INSTRUMENTS	***KEY SUCCESS FACTORS***
Farmers	Increase production in the agricultural fields Make profit Supply Food Raise living conditions Regulation of the price of agricultural products	Favourable natural condition Developed co-operation structures High quality of inputs (seeds, fertilisers, etc.) Information and education of communication among farmers Farmers' equipment Highly efficient technology
Environment / Nature	Keep ecological balance Preserve the biodiversity Improve efficiency of natural resources use	Information, Education and Communication by NGOs Appropriate technology Payment of taxes Efficient use of natural resources Use of renewable energy sources Protection of forests
Government + NGO's	Maintain food security Subsidise agriculture Improve regional viability Research on sustainable development in agriculture Support of national policies for agricultural development Domestic/ abroad market investigations.	Prediction of climatic conditions Provision of information for farmers Long-term agricultural policy (planification, perception of taxes, adequate legislation, etc.) Micro-credit (new financial models) Help to prevent and mitigate natural disasters and risks Education, research and development

III. CASES STUDIES ON SUSTAINABILITY PROJECTS IN AGRICULTURE

3.1 CASE STUDY ON DEFORESTATION IN COTE D'IVOIRE: THE AREA DEGRADED BY LIBERIAN REFUGEES

3.1.1 Sustainability problems

Ivory Coast is a West African country with a growing population of more than 14 million inhabitants in 2000, and among them 30% are immigrants. In the 1940s, the surface covered by forests was 12 million hectares. Due to large deforestation, it has been reduced to 1.5 million hectares. The climate is wet tropical in the southern part. Its agricultural economy is mostly based on the following crops: coffee, cocoa, rubber trees and palm oil.

Due to political instability, economic issues and natural disasters (drought) in the last ten years, the population migrated from the north and the central part of the country southward and there was also a strong influx from other West African countries (e.g. Mali, Burkina Faso, etc.). Many migrants settled in the southern part of Cote d'Ivoire, where the last virgin rainforest areas are located. 8.000 Liberian refugees were the last big group of migrants who arrived in this area.

These people settle at the same place as the local inhabitants and have the same economic goals: to increase the cash crop output for getting an income and also to produce subsistence food (rain rice, plantins, cassava etc.). This competition leads to conflicts. After the settlement of the new population, the environmental pressure increased, because the rural people began immediately to cut the forest and to destroy a large part of the natural vegetation, and this induced erosion. The carrying capacity decreased in direct relation to the agricultural techniques used and therefore the fragile equilibrium between population and land surface became instable.

The traditional agricultural system of the refugees includes slash and burn and is the main direct cause of deforestation. Large reserves of the South-Ivorian forest have been cut, due to the need for new land. The pressure is particularly high in places were the soil productivity has been reduced after overexploitation or extremely short fallow periods. Deforestation benefits also to farms and industrial plantations which originally belonged to the state and now to private companies. The area of virgin tropical rain forest is therefore decreasing rapidly and is replaced by agricultural land and only in small areas by secondary forests.

In addition to these unsustainable agricultural practices, there is a high demand for fuel wood. Mainly women are cutting trees in forests and plantations. The primary forest gets also destroyed by miners and companies for gold exploitation.

With the arrival of the Liberian refugees, the UNHCR and the PAM (international organisation for supporting refugees and world food programme) began also to be active in this area. Together with the local authorities, they need to solve additional resource management problems. Therefore, a rehabilitation project for the degraded area has been planned and implemented.

This large scale deforestation has further seriously negative environmental consequences: it accelerates the loss of biodiversity, changes the regional water cycle and regional climate in the south west of Cote d'Ivoire.

3.1.2 Objectives of the UNHCR Rehabilitation Project

General objectives

- to reduce deforestation

- to identify the factors causing deforestation
- to see how to improve the situation for a sustainable development in agriculture
- to rehabilitate the area degraded by refugees and the recent settlements.

Specific objectives:

- to integrate Ivorians and refugees on the same land
- to monitor deforestation and search for deforestation causes and rehabilitation measures
- to document the real impact of the growth of population on deforestation
- to find the share of crash crops and local food production to avoid further environmental degradation
- to identify the impact of deforestation on agriculture
- to promote environmental education and modify in the long term the perception of the population
- to promote energy efficiency techniques
- to develop more efficient techniques for fuel wood use
- to promote agroforestry
- to provide food for refugees
- to search for financial support.

3.1.3 Main actors involved in the project area

- UNHCR: United Nations High Commissioner for Refugees
- PAM: Programme Alimentaire Mondial (world food programme)
- NGO: Cote d'Ivoire Ecology
- Local Authorities
- Politicians
- Citizens
- Migrants.

3.1.4 Measures and tools implemented

- Mobilise the local administration
- Integrate the interests of local farmers and refugees by creating new NGO sections
- Plant trees in degraded areas with the main species of acacia (Acacia auriculiformis, Acacia mangium, and hybrid species). According to studies (IDEFORD/DFO, 1996), these species have a fast growth (1,5-2 m/year). They have also a very high capacity of biomass production (15-20 t/ha/year) and are a low nutrient concurrence for crops. They are the ideal regionally available plant for agroforestry
- Implementation and demonstration of agroforestry methods in the degraded area
- Use of mass media in local language.

3.1.5. Main results of the project

- Afforestation in some degraded areas, where the inhabitants agreed to participate in the project
- Improvement in the conditions of crop production and forest growth. The project created 1200 ha with agroforestry and 600 ha of forestry gardens. Food can now be produced on 1260 ha of rehabilitated land, that represent 70% of the 1800 ha of the entire agroforestry area. The project also converted degraded surfaces into forestry gardens by introducing coffee and cocoa plantations and useful wild species on 140 ha during 1997-2000
- Building of more efficient mud ovens and introduction of metal ovens for the production

of charcoal, which can reduce the fuel wood consumption by 20 to 30%

- Promotion of subsistence oriented agriculture
- The perspective of a diffusion of the project methods to the whole deforested area.

3.1.6 Lessons learned

Although the project of rehabilitation of the area degraded by the Liberian refugees has given good results, we could still learn some lessons:

- to promote the efficiency of a rehabilitation project, it is necessary to include all the NGO's of the area, because the lack of co-ordination can have an unsustainable effect
- after the official end of the project, further funding for the follow up of the project and the evaluation of the results is needed
- there is a need for a more efficient training on afforestation and on the use of metal and mud oven for young people and women, which represent about 60% of the population
- the conflicts between refugees and the local population have not been completely solved, thus, we should use shuttle diplomacy, train our active listening skills, and not look only for short-term results.

3.2 CASE STUDY OF GOOD PRACTICE IN AFFORESTATION MANAGEMENT IN SENEGAL: PROJECT OF CONSERVATION OF LAND CROP IN THE NORTH LITTORAL ZONE (CTL - CONSERVATION DES TERRITOIRES DU LITTORAL)

3.2.1 Problems

The afforested Niayes area is located between Dakar and Saint Louis in the western part of Senegal. The total area covers a surface of 80,000 ha. It benefits from good agro-climatic conditions and the quality of soils which allows the development of cropping systems, fruit farming and forest. It produces more than 90% of the vegetable production on the national market. In 1995, this national market production was 174,585 tons (Direction Nationale de l'Horticulture).

In the second half of the 20th century, the intensive use of chemical fertilisers and pesticides by farmers caused an increasing environmental pressure on biodiversity, soil and water.

The agricultural production of the region was limited by soil degradation, especially:

- invasion of agricultural land by sand dunes;
- salinisation;
- shortage or lack of water

The main problem was the invasion of crop land by sand dunes. This area is located in the sub-tropical zone of West-Africa, where violent winds from the Atlantic Ocean lead to the extension of coastal sand dunes. Therefore, the Senegalese government has conducted a large project of conservation and protection of the crop land. The first action of restoration and conservation of vegetable lands in Niayes began in 1948 and the programme ended in 1998.

3.2.2 Initial main objectives of the project

- to preserve the zone of vegetable and fruit production against the invasion of sand dunes
- to stabilize the coast between Dakar and Saint Louis against ocean erosion
- to promote the integration of forestry in agricultural system
- to preserve the market oriented production of vegetables and fruits in the Niayes area.

3.2.3 Methods and tools

- Plantations along the north Littoral (coast) of Senegal. The casuarina equisetifolia is the tree species that has given the best results for the protection of land near the ocean
- Education and training for farmers on topics like:
  - technology of nursery
  - technical plantations of trees
  - learning in local languages etc.

3.2.4 Sustainable Results

- Creation of a forest belt with casuarina equisetifolia (12,706 ha) in a 185 km long and 400 m wide area with 8,970,434 trees
- Biodiversity: Restoration of grassland ecosystems
- Protection of species: Reappearance of wildlife such as rabbit, partridge etc.
- Coastal protection: Stabilization of the coast line
- Protection of crop land from sand dune induced desertification
- Economy: New settlement of more than ten environmentally improved villages
- Agriculture: Secure production, fulfilment of market demand
- Capacity building: Training and education of more than one thousand farmers
- Infrastructure: Management of unpaved and paved roads
- Social effects: More than 150,000 inhabitants benefit from the plantations of trees
- Policy change: Elaboration of a land use plan for the Niayes area.

3.2.5 Perspectives: Wood exploitation and increased soil fertility

- First perspective is the wood exploitation in the afforested area, when trees are reaching maturity and part of the plantations already declines. Thus, it is important to organise the replacement of plantations and to find a suitable method for it. The Senegalese Institute of Agricultural Research works in this field.
- Second perspective: The casuarina equisetifolia is a regional well adapted variety of trees that has the capacity to drop a high quantity of litter or leaves, from 4.2 to 8 cm depth per year (ISRA/NGO Sahel 3000, 1997). Due to the decomposition of the litter into compost and organic substances, soil fertility increases in the Niayes area (ISRA/NGO Sahel 3000).

There are two ways for further use of the added value of the litter:

- use the energy of the biomass to prevent the uncontrolled cutting of trees for fuel wood. This possibility was tested but not achieved;
- the litter is used as organic fertiliser for increasing the fertility of soil. This main agro-forestry technique is not easy to introduce. In the last two years, the NGO Sahel 3000 and the Senegalese Institute for Agricultural Research (ISRA/CDH) have presented in one village a compost technology to transform the litter into humus.

3.2.6 Partners of the project

The project was financed by three main co-operative partners: the UNDP (United Nations),

ACDI (Canada) and the Senegalese Office of Water, Forest and Soil Conservation (DEFCCS, technical partner).

3.2.7 Lessons learned

The project of land crop conservation through tree plantation in the north Littoral area of Senegal have reached its main objectives that were set at the beginning of 1948, but the plantation has now to be regenerated. Nevertheless, we can draw some technical and socio-economic conclusions from the project:

Conservation of biodiversity was not included in the perspective of the project at the beginning, but it appeared as a further benefit of a good practice in the ex-post evaluation.

The seeds used in 1948 for the plantation were not tested in advance. An important quality of the main species was not considered: the male and mixed trees don't have the capacity to regenerate naturally after wood exploitation. Actually, we have noticed that plantation in this area include male, female and mixed trees, but only the female trees are able to regenerate the forest naturally. This characteristics taken into account would allow the project manager to save most of the costs for new plantations. Therefore, before taking any measures for the exploitation of woods, it is necessary to evaluate the different plant species needed.

For the next project step, clear cutting has to be replaced by selective cuts, combined with new plantations and measures to enhance the natural regeneration.

We need to diffuse and strongly persist to promote sustainable agro-forestry technology in the entire Niayes area. The future project needs improvement particularly through the large scale use of the litter of casuarina equisetifolia as a natural fertiliser in the crop fields. This measure would help to substitute chemical products and reduce the costs for inputs.

The project provides the long-term settlement of the population in areas around the plantations. Today the Niayes zone is an important economical region where a large amount of commercial exchange and information occurs between the farmers and other economical actors such as commercial enterprises or fertiliser producers.

The economic results of the project shows that, there is a sufficient technical know-how in Senegal, but the main problem for the implementation of new measures is the shortage of financial support derived from the farmers income for the relative small plantation investment. But as long as an external help is needed, there is no sustainability.

A long-term policy can facilitate the efficient participation of farmers and better include their needs in all activities of the project.

The success of the project is mainly a result of the very good international, national and regional cooperation and communication between the main actors involved. Eventually, some other actors (NGOs, farmers, organisations and others) should be better integrated into the decision making process and communication system of the Niayes area project.

3.3 CASE STUDY OF CONSERVATION FARMING PROJECTS IN SOUTH AFRICA

South Africa covers about 125 million hectares of which 74% are utilised by agriculture. The major impact of agriculture on the environment is most certainly the loss of plant and animal species. Most endemic plant species disappear as a result of cultivation and are replaced by crop species. Even in the absence of cultivation, stockfarming can reduce plant diversity through selective overgrazing (Nowers, 1995).

3.3.1 Aim

The aim of the Conservation Farming project is to study and promote farming practices that benefit the conservation of plant and animal diversity and that contribute to sustainable land use. The information gained will be fed into existing farming and conservation networks to help develop a culture of conservation farming in South Africa. In this way, the project also supports other initiatives by the national Department of Environment Affairs and Tourism and provincial nature conservation departments to conserve biodiversity and promote sustainable development, as well as programmes within the national Department of Agriculture and provincial agricultural departments to promote sustainable agriculture and to develop a national Land care programme (NBI, 2001).

3.3.2 Approach

The approach has been to focus on the lessons learned from existing farming practices in areas of South Africa that have a high diversity of native plant and animal species. There are some farming practices already in use in these areas that appear to provide clear benefits for plant and animal conservation and that may also maintain or restore natural ecosystem processes.

Farmers who have used these so-called "conservation farming" methods argue that they are more productive and sustainable because:

- they reduce the impact of environmental disasters and therefore provide a sustainable base for agricultural production,
- they generate income from alternative sources such as ecotourism,
- they result in superior yields of animal products, and
- they result in savings on capital costs and running expenses.

These farms provide ideal test cases for evaluating the costs and benefits of conservation farming and it is essential that the experience of conservation farmers and their contribution to biodiversity conservation in South Africa is documented and placed in a dynamic ecological-economic framework so that successful models can be widely communicated and applied.

3.3.3 Objectives

- To identify and evaluate the economic and ecological costs and benefits (in terms of biodiversity, carbon sequestration, ecosystem stability and resilience, and response to climate change) of apparently biodiversity-friendly farming practices compared with more widely used practices in the same region that do not take biodiversity into consideration.
- To develop and compare ecological economic models for land use and management practices included in the first objective.
- To synthesise information on conservation farming in South Africa and develop a database of information.
- To evaluate the role of conservation farming as part of national and regional strategies to conserve biological diversity in South Africa.
- To transfer information to targeted user groups (farmers, agricultural departments, nature conservation agencies).

3.3.4 Outlook: Albany xeric thicket conservation farming site

The Albany Centre of plant diversity is situated in the Eastern Cape province of South Africa. Xeric thicket occurs in the western part of the Albany Centre and has high levels of

endemism. Extensive pastoralism, mainly with angora goats, has been the predominant land use but frequent droughts and poor stock management have resulted in degradation, erosion and loss of biodiversity. Several farmers have switched to game farming as an alternative to stock farming and this appears to be a more biodiversity-friendly and sustainable from of land use. The study will focus on four paired farms in the vicinity of Kirkwood, each pair comprising one farm with game and one with goats or other stock units. Some farms in the area are in transition from goat farming to game farming and this provides an additional aspect for investigation. The Addo Elephant National Park is adjacent to the farms that will be included in the study and this provides a comparative baseline area for biodiversity studies.

IV. RECOMMENDATIONS FOR POLICY MAKERS: NEW STRATEGIES, POLICIES AND MEASURES FOR SUSTAINABLE DEVELOPMENT IN AGRICULTURE

4.1 COMMUNICATION AND LEARNING FROM EACH OTHER AMONG FARMERS

Policy makers, researchers and relevant organisations advising farmers to find the best and most economical fertilisers, pesticides and new ways of controlling diseases, should also cover management techniques to cope with any level of risks.

Sustainable strategies to improve the entire communication system and the existing training capacities are:

- To create or help farmer associations and increase the quality of contacts and exchanges between agricultural scientists, educators, farmers and other involved actors;
- To build decentralised demonstration sites of new agricultural techniques. At the same time, to organize training classes for farmers in order to allow them to study new sustainable techniques with scientists, other farmers, advisors etc., and help them to communicate on these issues and their experiences.

4.2 IMPLEMENTATION OF NEW TECHNIQUES FOR CROP PRODUCTION

With the assistance to implement emerging new techniques, it becomes easier to accumulate and integrate the knowledge and information from many sources and many facets (market situations, seeds quality, agricultural techniques, insect population control, to prevent diseases). The further implementation of new information technologies such as PC, networks, data bases, GIS will help to surmount the difficulties for spreading extensively, accurately and timely the improved farm management techniques. Due to the fact that farmers have to face a lot of uncertainties and risks, especially during the introduction phase of technical innovation, it is very important to construct decision supporting systems which allow them to minimise their risks.

4.3. PILOT PROJECTS FOR DEMONSTRATION ON SUSTAINABLE AGRICULTURAL TECHNIQUES

To promote sustainable development techniques in the agricultural sector and to guide farmers when implementing new agricultural techniques, organizing demonstration fields and/or model farms are adequate measures. It is essential to show via practical demonstrations successful sustainable techniques from the national level down to the local level. At the same time it promotes and further develops the young farmers' educational level and their knowledge on new sustainable agricultural techniques. Sub-strategies should include the

following aspects:

- Provision of widespread educational support
- Promotion of a rural micro-credit institution for helping farmers and their associations
- Collection and analysis of data from model farms and from representative farmer families
- Publication of results of these case studies and guidance of the farmer, how to take adequate decisions and adapt the general results to its specific farm management situation.

4.4 NEW AGRICULTURAL POLICY FOR PREVENTION OF BIODIVERSITY LOSSES

In the agricultural sector, the imperative need for conservation of biodiversity can be satisfied with the following new activities and policy measures:

- Installation of tools to monitor and predict biodiversity changes caused by agricultural activities;
- Data collection on biodiversity resources for research and development with the aim not to affect adversely the viability of any species or populations;
- Promotion of positive effects and mitigation of negative effects of agricultural practices on biodiversity;
- Restoration of habitats and protection of endangered species. For the conservation of biodiversity in agro-ecosystems, it is imperative to issue some strategies for in situ conservation with the following objectives:
    - to conserve the processes of evolution and adaptation of crops on their environments;
    - to conserve biodiversity at different levels: biome, ecosystems, species and genetic potential;
    - to improve the livelihood of farmers with poor resources through economic and social development projects with the help of national or international programmes;
    - to maintain or increase farmers' control over and access to crop gene;
- Further research on how to integrate farmers into the development of a national plant genetic resources system.

4.5 LAND MANAGEMENT METHODS AND TECHNOLOGIES FOR A SUSTAINABLE AGRICULTURAL SECTOR

4.5.1 Modification of sloped land to terrace land for soil and water conservation

Due to the population expansion, especially in many developing countries, it is impossible to give the sloped agricultural land back to forest use. Modifying sloped land to terrace land is a possible solution, as this investment prevents soil erosion and decelerates run off.

4.5.2 Spread of mulching techniques for soil and water conservation

Mulching of crop straw and crop residue on the soils instead of burning has many positive effects. The crop residue is an organic fertiliser, which can improve the soil fertility level. It can absorb a large amount of water and increase the soil moisture capacity, reduce run off and also avoid soil erosion.

4.5.3 Application and diffusion of advanced irrigation techniques

Unsustainable irrigation techniques have lead to soil erosion in crop land. As an example, the traditional flood irrigation remains very popular in developing countries and has not only lowered water use efficiency, but also causes the increase of water run off and soil erosion. Some advanced irrigation techniques, such as drop irrigation or spray irrigation can improve the water and fertiliser use efficiency and prevent negative long term ecological impacts.

4.5.4 Conservation tillage

Conservation tillage generally entails the leaving of at least 30% of the crop residues on the soil surface through a reduction in the use of plows and other tillage equipment. This practice is not only to the advantage of the soil but it has also been shown that conservation tillage have increased the net returns for major crops such as cotton, sorghum and corn (FAO, 2001). Less tillage means less soil compaction and lower fuel and labour costs, less wear and tear of the tractor and implements, and more time available for other activities. Also the surface cover of the crop residues shields the soil from heat, wind, and rain, keeps the soil cooler, and cuts down moisture losses by evaporation.

4.6 ORGANIC AGRICULTURE

A main objective of organic agriculture is to find the best way and pattern of fertiliser use. To find this ecologically appropriate pattern remains a very complex task.

Promoting organic fertiliser techniques: According to the field situation, different kinds of organic and inorganic fertiliser techniques and methods for N, P, K, S, Mg, Ca and Zn can be used, such as micro-organism fertiliser, mixed fertiliser etc.

Promoting techniques and methods for different crop in fields and greenhouses

Each agro-ecosystem type and each crop system needs an own organic fertiliser technique mix, adapted to many parameters like plant growth, soil quality, climate or water availability. Farmers need to adapt the amount and rate of application of organic fertiliser to the very local condition of each crop field and plant species in order to maximise the production efficiency and to minimise the adverse effects on ecosystems, water cycle or soils.

4.7 AGROFORESTRY

To modify the planting model in agriculture, one solution for the farmers is to develop an agroforestry system. Agroforestry system is a model for establishing links among crops, livestock and trees. The main objective for the large diffusion of this system is to preserve and improve the long-term fertility of soils. An agroforestry system can be implemented with two techniques.

Intercropping

This is a combination of several crops in the same field, but each covers only a certain part of the land surface. The farmers plant the crop combination with a rotation system in a yearly rhythm. In this system, it is recommended to plant different species of crops, some of which contribute to soil fertility. For example, there is a plantation model where maize and peanut are planted together. The peanut has the ability to fix the atmospheric nitrogen and make it available for the maize plant. For a sustainable intercropping system, new combinations of crops and trees in habitat adapted plantations should be explored.

Allow cropping

The allow cropping system was traditionally a tropical agroforestry technique used by Nigerian farmers. Its main principle is the systematic use of tree leaves as organic fertiliser. Before the plantation of crops, trees are cut at 1 to 1.5 m height and the leaves of trees are spread on the soil. They decompose during the growth of the crop. This way of cropping shows two advantages for the dry-field agro-ecosystem. First, it improves the soil fertility, moisture capacity, plant growth etc. and avoids erosion. Second, some tree species with rapid growth provide abundant fuel wood, an important advantage for low income social groups or for regions with a structural shortage in energy supply. In Africa, leuceana leucocephala is one of the species that has provided the best results in the allow cropping technique. However, further research is required in order to find different adapted tree species for many tropical agro-ecosystem type.

4.8 TRAINING AND EDUCATION FOR THE FARMERS

In our opinion, training for farmers is perhaps the main issue for sustainable development in agriculture. The training of future agriculturalists at college-level need to accept the fact that agriculture functions within a broader system and that it cannot be isolated from its environment (Nowers, 1998). Therefore curricula should include environmental management subjects. Farmers also need to be trained in environmentally integrated farming systems based on ISO 14001 standards. There are three complementary forms of actions: information, education and communication. For the first action the policy of government is to provide each farmer with detailed, immediately applicable information on organic biological agriculture techniques and allow them to "harvest the low hanging fruits" of the strategy of sustainable development. Secondly, a good education is necessary to enhance their basic, long-term oriented knowledge. This is the reason why we plan to organize many focal points as well as national and international seminars, to demonstrate the outcomes of the organic biological agriculture. In developing countries, where more than 50% of the population are illiterate, we need to transmit the message in different local languages. Therefore, one of the first priorities is to train translators for better results. The third type of action, the broader communication of these methods, needs to be direct and simple. We cannot forget that, among the farmers, there are laymen and specialists. We need to use existing communication tools (mass media: writing, TV, radio, web sites) and also include participative methods in seminars, training and events.

V. CONCLUSION AND RECOMMENDATIONS

5.1 CONCLUSION

Unsustainable practices in the world agriculture

Many present practices in agriculture will still lead to unsustainable development in large areas, e.g. deforestation, overgrazing, abuse of fertilisers and pesticides and the destruction of wetland for crop production. They all have negative impacts on the rural ecosystem. The imbalance of such agricultural systems induces loss of biodiversity. The causes and consequences of these problems are different in developed and developing countries. In the developed countries, the main consequences are acidification of soils and water pollution while in the developing countries it is soil erosion and loss of fertility.

Sustainable development in agriculture depends on many factors

To approach sustainable development, we need a better connection between agriculture and many external factors in physical or human subsystems. On the other hand, agricultural

activities also affect directly the quality of their local environment and induce also internal problems. For example, sustainable development of agriculture could occur only in close relationship with biodiversity protection. Unsuitable agricultural practices remains a major cause for the loss of biodiversity.

Communication plays a key role for sustainable development in agriculture

For the sustainable development of agriculture and an efficient conservation of biodiversity, the key success factor is an improved communication system about good agricultural techniques. In general, the communication system shows different patterns in the world. In developed countries, a good agricultural extension network exists, it is missing in developing countries. The diffusion of agricultural techniques and their implementation are very difficult in developing countries.

Sustainable development of agriculture needs suitable strategies and measures

Positive effects of agricultural techniques on biodiversity can be created through many strategies and measures, e.g. afforestation, intercropping and allow cropping, soil and water conservation, commercial promotion of organic fertiliser, training on organic agriculture techniques, etc. Therefore, we need a continuous further promotion of the sustainable development of agriculture at the national and local level.

5.2 RECOMMENDATIONS

1. Increase energy and resources for the sustainable development of agriculture by the government. To promote this issue, it is essential to increase the financial support for research and education. At least 3% of the budget of each agriculture ministry should be dedicated to fundamental and applied research. Training is also needed to establish natural conservation areas in different locations, to develop international co-operation and exchange of information
2. It is necessary to issue new international agreements in order to promote sustainable development of agriculture, and to avoid unsustainable activities
3. Establish a large communication network on new techniques at different levels
4. Explore the potentials for biotechnology applications in degraded or endangered areas
5. Create decentralised demonstration fields for farmers with the newest available techniques.

REFERENCES

Bemioff, R., Guill, S., and Lee, J. (eds.) (2000): Vulnerability and adaptation assessments: an international guidebook. Washington, DC, U.S. Government Printing Office.

Changyi, Lu (1991): The study on mangrove system maintenance against side of effects of global change, Symposium literature of climate change and environmental problem in China, Beijing: China Technological Press, 111.

Changyi, Lu et. al. (1995): Review on impact of global climate change on mangrove ecosystems and research countermeasure. Advance Earth Sciences, 10 (4): 341-347.

FAO - Food and Agricultural Organisation (2001): Sustaining Agricultural Production in Resource Poor Countries: Conservation Tillage Offers New Hope. Rome: FAO (http://www.fao.org/ag/ags/agse/prelease.htm).

FAO - Food and Agricultural Organisation (2000a): Statistical Agriculture Database, Rome.

FAO - Food and Agricultural Organisation (2000b): The Global Forest Resource Assessment, Rome: FAO.

FAO - Food and Agricultural Organisation (1993): Forest resource assessment 1990: Tropical countries. Fao Forestry Paper 112, Rome: FAO.

DEFCCS (1999): Conservation of land crop in the north littoral (coast) of Senegal. Final project report. Dakar.

Direction Nationale de l'Horticulture du Senegal (1995): Statistiques agricoles. Dakar.

Douka, A.M et Ouatara, N. (1997): Etude sur les potentiels contrats fonciers entre les liberiens et les populations autochtones, HCR Abidjan.

IDEFOR (1997): Agroforesterie, étude des espèces d'acacia retenues pour le reboisement (Acacia auriculiformis, Acacia mangum). Abidjan.

IPCC – Intergovernmental Panel on Climate Change (1996): Climate Change 1995 The Scientific Assessment, Report of Working Group 1, Cambridge: Cambridge University Press .

IPCC – Intergovernmental Panel on Climate Change (2000): Land Use, Land Use Change and Forestry. Special Report. Cambridge: Cambridge University Press.

ISRA/NGO Sahel 3000 (1997): Transformation of litter of Casuarina equisetifolia in compost to increase the fertility of soil in the Niayes area. Final project report. Dakar.

Isomaratne, S and Dhanapala, A.H. (1996): Potential impact of global climate change on forest in Sri Lanka; In: Erda, L., Bolhofer, W., Huq, S., Lenhart, S., Mukherjee, S.K., Smith, J.B. and Wisniewski, J. (eds): Climate Change Variability and Adaptation in Asia and the Pacific. Kluwer Academic, Dordrecht, pp 129-135.

NBI - National Botanical Institute South Africa (2001): Conservation Farming Project. http:/www.nbi.ac.za/research/consfarming.htm.

Nowers, R.J. (1998): Broadening the environmental vision of Agricultural students through training. A case study of sustainable agricultural training at the Elsenburg College of Agriculture, South Africa. Contributed paper. 1998 African Farm Management Conference, Stellenbosch.

Nowers, R.J. (1995): The development of an environmental ethic for commercial farmers with sustainable agricultural practices as aim. Global environmental change: implications for Southern Africa, Regional Conference, Pretoria.

Projet de conservation des territoires du littoral Sud (1991): Plan d'aménagement des

plantations de Filao de la grande côte Nord du Sénégal, Dakar.

Salimata, B., Mamdou, G. (1997): Evaluation du niveau de conscientisation des populations concernées par les roles socioéconomique et écologique que jouent les plantations de Filao en relation avec les activités agricoles au niveau du littoral Nord du Sénégal. Dakar.

Schwaninger, M. (2000): Managing Complexity – the Path Toward Intelligent Organisations; in: Systemic Practice and Action Research, Vol. 13, No.2, 207-241.

SODEFOR (1995): Rapport sur les forêts classées de Côte d'Ivoire, Abidjan.

WBGU – German Advisory Council on Global Change (2001): Conservation and Sustainable Use of the Biosphere. London: Earthscan.

WRI – World Resources Institute (1994): World resource 1994-1995, A guide to the Global Environment, People and the Environment. New York: Oxford University Press.

Yoro, S. (1997): Evaluation des impacts financiers du projet d'aménagement des plantations de Filao de la grande Cote Nord du Sénégal, MSc Thesis, IAMM, Montpellier.

RAISING PUBLIC AWARENESS ON CLIMATE CHANGE

Working Group Report

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I. INTRODUCTION

Climate change will be the most critical and complex environmental issues humanity is going to face in the 21 century. It will raise many energy-related questions. Current energy systems are mainly based on the combustion of fossil fuels which account for 76% of the world's primary energy. This combustion leads to about three fourths of the annual human-related emissions of the main greenhouse gas CO_2. These emissions have yet already increased significantly the greenhouse gas concentration in the atmosphere. Even if we take into account uncertainties, current energy patterns are leading to unsustainable changes for the global climate. Therefore, the ultimate objective of the United Nations Framework Convention on Climate Change is the "stabilisation of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system" (UN, 2001).

But up to now the magnitude of energy used per capita is one of the indicators of "modernisation" and progress for a country, without giving due consideration to the social, environmental, economic and security impacts.

The national policy "business as usual" must be changed by incorporating the following objectives of an adequate Climate Change policy:

- raising public awareness;
- developing climate change legislation;
- improving energy efficiency;
- developing carbon dioxide sinks;
- creating an administrative infrastructure for realising national commitments to UNFCCC;
- implementing adaptation and mitigation measures.

It is necessary that these measures were based on the achievements of climate science and take into account the particularity of the national economic conditions. The national climate change policy should be an essential part of the national welfare policy.

For example, in Ukraine, negative impacts due to climate change already occur in form of severe hydrological, agricultural and settlement damages, extraordinary floods in mountainous regions, and hurricanes with an unprecedented intensity in the western region.

Adverse climate change impacts like increases in the summer temperatures and increases in the rate of evaporation enhance all types of natural and anthropogenic soil erosion. A higher amount of precipitation will lead to some critical modifications in the hydrological system of the eastern countries, a general growth in rainfall intensity, which will cause the flash floods,

increase soil erosion and flow turbidity. The entire Ukrainian foothill belt may become an intensive mudslide zone. According to climate scenarios, for example in Uzbekistan, reduction in the snow cover and ice reserves in the mountains, an evaporation increase of 15-20% during the growth season, and subsequently flow reduction can be expected. This anticipated flow reduction during the vegetation period is especially unfavourable for irrigated farming and regional ecosystems (coastal and delta ecosystems, etc.). The increase in evaporation will, respectively, increase water losses in irrigated zones and increase irrigation intensity. Under current conditions of strong water shortages in Uzbekistan, even a small but stable reduction of these resources presents a drastic problem. During the course of the last third of the 20th century, intensive irrigation from the flows of the Central Asian rivers caused the regrettable Aral Sea crisis: the drying-up of the Aral Sea level, a reduction of the delta's lake system and drastic aggravation of the ecological situation in the Aral Sea Region. Global climate change is expected to cause additional adverse impacts to the region: increasing evaporation and salt migration, depleting ground water reserves; reduction of humid landscapes; salinity growth in the closed lakes; accelerated development of the water bodies' eutrophy. In addition, not a single climate scenario predicts increases in the flow of the Amudarya and Syrdarya Rivers, the two major river basins in the west of the Central Asian countries. This will worsen the Aral Sea crisis.

Here we stress that the United Nation Framework Convention on Climate Change emphasised the need to educate people about climate change. Today's children and future generation have to look to the world in a different way as it was done by most people during the 20th century.

The earth – the climate, the ecosphere and all living beings – is a closed system; what we do has consequences that eventually come back to affect us.

Tomorrow's children and today's adults will have to think about the effects of their actions on global climate. When they make decisions as members of governments and businesses, and/or as private persons, they will have to take climate into account. In other words, human behaviour will have to change - the sooner the better. But people need signals to act, and these signals are already visible but are still mainly seen by the most sensitive part of society - by scientists.

These signals have to be transformed into educational practice, into mass media information with the aim to create public awareness on climate issues. That can change human behaviour, can promote required environmental, economic and social measures and policies at the regional, national and international levels. We think, it is a priority task and that is why the Working Group was eager to develop the project: Raising Public Awareness on Climate Change Issues.

II. OBJECTIVES, TARGET GROUPS, METHODS AND TOOLS FOR RAISING PUBLIC AWARENESS

The general objective of the project is to rise public awareness through continuous information activities on climate change by both non-governmental and governmental organisations. The sub-objectives of the project are as follows:

- Evaluating the existing level of public awareness on climate change issues and involving of the general public in climate change activities,
- Searching for information;
- Developing good examples;
- Defining co-operation partners;

- Conducting workshops to train non-governmental organisations (NGOs);
- Promoting development of a national strategic action plan to raise public awareness, that should include NGOs activities.

The main message to the public should include: What is the scope of the global climate change? What are it's expected regional impacts? What kind of solutions, both for adaptation and mitigation strategies, are needed for a specific country?

The target group to be considered for a public awareness campaign is mainly the general public.

The main tools that are to be used for raising public awareness:

- Radio and TV;
- Newspapers;
- Booklets and posters;
- Public actions;
- Workshops;
- Training seminars;
- Facultative school lessons on global climate change and on national commitments;
- Youth and school summer excursions and expeditions, including e.g. action on afforestation.

In order to be accepted and not easily undermined by pressure groups, these tools must be developed and handled in accordance with up-to-date scientific information and knowledge on climate change issues, e.g. the reports of official UN bodies and formal national documents presented in correct but popular language.

III. ACTUAL SITUATION, GENERAL ANALYSIS OF PUBLIC AWARENESS ON CLIMATE CHANGE

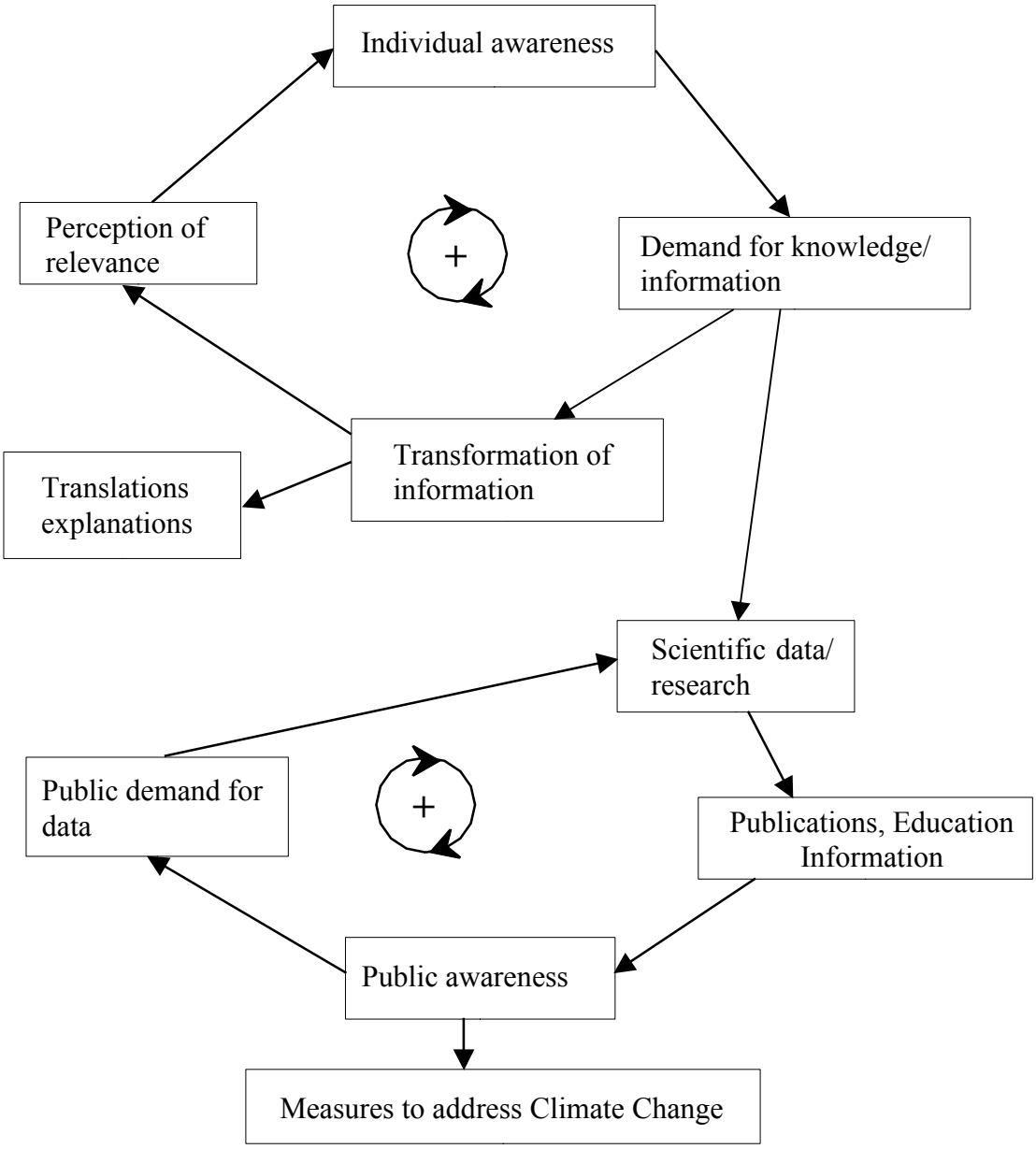
Public awareness is an open, abstract, complex social system and consists of individual awareness, awareness of different socio-cultural groups, different generations, all coming from diverse regions and belonging to various ethnics, religions or political parties. It is therefore essential to define as carefully as possible all controllable and uncontrollable factors, look at the interconnections of these variables, feedbacks and to design a strategy with the perspective of the general objective of the project - to raise public awareness on climate change issues through continuous activities both by the governmental and non-governmental organisations.

The most important controllable factors and activities are:

- availability of objective official data on air pollution and greenhouse gas emissions;
- education that includes knowledge of natural climate cycles, of global climate change and its impacts on sustainable economical and environmental development, as well as its impacts on human health;
- research programmes;
- mass-media flow of information;

- governmental and NGOs activities to create selected climate change information.

Figure 3-1: Self-reinforcing dynamics of awareness creation in the field of Climate Change



The passive uncontrollable factors in public awareness projects are;

- climate change is not a priority for the decision makers in the media (low value);
- economic situation;
- environmental situation;
- national mentality, traditional behaviour, religious rules and regulations;
- rumours;
- personal motivation in the public.

The central interest of the project concentrates on active factors that lead to quick-action in the public awareness system. These are information and education by mass-media based on results of carefully assessed scientific studies, official UN, international and national documents and data.

The main actors (active and passive) are:

- Governmental organisations - ministries (especially those responsible for Environment, Education and Energy), parliament, city councils, regional and local authorities;
- Private companies;
- Intergovernmental and parliamentarian organisations (for example, UNDP, UNESCO, GLOBE);
- National non-governmental public organisations;
- International NGOs (for example Climate Action Network).

Table 3-1: Goals and success factors in the perspective of the key-actors for raising awareness on Climate Change

Institutional context	**Goals**	**Success Factors**
Schools	• Achieve Education • Increase Knowledge	• Organisation structure • Local best practices projects on energy efficiency, renewable, etc, which can be exposed to the broad public • Vision • Access to information • Acquired funds
Universities	• Education of Teachers • Research	• Scientific research • Organisation structure • Best practices projects • Vision • Access to information • Acquired funds
Policy makers	• Improvement of policy & legislation	• Pragmatic policy and legislation • Vision • Financial capacity to launch an awareness campaign
Economy	• Cleaner technology • Profit • Good image	• Climate change adaptation measures • Motivation of entrepreneurs • Vision • Access to information
Political parties	• Responsibility • Closeness to citizens	• Best decisions • Vision
General public & NGO	• Healthy life • Happiness • Safety for present and future generations	• Access to information • Exchange of experience • Best practices • Vision

It must be stressed that Interministerial Climate Change Policy Commissions are now

organised in many European countries, but their main attention is devoted to the fulfilment of the national commitments according to UNFCCC and Kyoto Protocol and do not have the special task to raise public awareness on climate change issues.

Besides this, these commissions create themselves significant public awareness obstacles:

- Specific vocabulary and terms in the official UN and national documents and on the web-sites (for example - "hot air", "bubble", "emission credit", "umbrella group") that are non-understandable to the general public and even to the mass media and that need "translation".
- Absence of National Programmes on raising public awareness on climate change, with the participation of all the above mentioned actors and, if existing, the lack of funds for their implementation.

But even in the present situation, there are opportunities and conditions for success:

- Aarhus Convention on general public access to environmental data and to the decision-making process;
- The experience of many environmental NGOs to organise public actions, workshops and training seminars on other significant social and environmental problems such as the perspective of nuclear energy, export of the hazardous wastes, etc.;
- Existence of special parts in school curricula that could easily incorporate climate change issues;
- Win-win effects in the implementation of the main tools for the reduction of greenhouse gas emission, namely raising energy efficiency and saving energy;
- Interest of developed countries in Joint Implementation projects and in Emission Trading, that could create new funds and allocations of parts for public awareness activities.

IV. ANALYSIS OF SPECIFIC ACTIVITIES

4.1 WORKSHOPS AND TRAINING SEMINARS (with examples from Uzbekistan)

Education can play a key role as instrument to rise public awareness, for example, if you try to motivate people to use environmentally friendlier alternatives to pesticides on their lawns or to use public transport to go to work instead of using the own car.

Another example is the training of professionals in "Ecology and Natural Resources Use", which exists in the majority of Uzbekistan's universities. Specialists in hydro-meteorology are trained in the geography and physics faculties of Tashkent State University and in the Tashkent Hydro-Meteorological Technical College.

The latest information on impacts of anthropogenic climate change should be broadly spread to the public. This could be achieved primarily by well-organised information and education activities. At present, there are no specialised popular scientific or engineering magazines devoted to the topic while the small-scale publication issued by the Uzbek Ministry of Environment "Glavgidromet" and other agencies (including NGOs) are unable to provide adequate coverage. A more developed system of general and specialised education in Uzbekistan, as well as the further development of scientific research, are necessary prerequisites for broadening the knowledge about climate and climate change.

Training and workshops are one of the most important tools to develop human resources and facilitate the transition to a more sustainable world. Additionally, the improved technologies of energy efficiency and renewable energy has to be installed in some demonstration places in

order to offer real and practical objects for training "in the field". All training programmes and workshops that address the information needs of the population must have following objectives:

- Involve the public and institutional decision makers in programme planning and examination of policies and options;
- understanding the links between greenhouse gases and climate change;
- understanding the links between climate change and other environmental issues, such as air quality, water resources and forests;
- identifying potential impacts of future climate change on the physical and biological environment and how we can best adapt to them;
- developing new or diffuse existing technologies and practices to reduce greenhouse gas emission;
- train future scientists, engineers, and educators by promoting the understanding of the multidisciplinary nature of global climate change issues and policy options;
- to facilitate exchange of experience between NGOs and governmental organisations.

With the financial assistance of the secretariat of UNFCCC, the Interregional Conference on Aral Sea Region Problems taken place in Tashkent in 1997. Representatives of five countries of Central Asia (Kazakhstan, Kirgizstan, Tadjikistan, Turkmenistan, Uzbekistan), secretariat of UNFCCC, local scientific organisations, NGOs, mass media and international agencies discussed climate change problems, assessed probable consequences and mitigation measures, exchanged information and experience. Articles were published in newspapers and magazines, national TV and broadcast stations covered the event. The report of the conference was distributed to all organisations interested.

Under the umbrella of "Uzbekistan country study on climate change" project (under the financial assistance of the Global Environment Facility (GEF) and in cooperation with UNDP), a number of workshops were conducted in several cities of the country (Tashkent, Bukhara, Samarkand, Nukus, Fergana, Khiva, Urgench). These seminaries presented and allowed a first dialogue on results of the national climate change study, including the assessment of probable consequences and mitigation measures. One of these workshops was held in the Institute of Strategic and Interregional Research on "Problems of Realisation of the National Strategy to Reduce GHG Emission". Government officials, scientists, teachers, students of higher schools, NGO activists, mass media representatives and delegates of international agencies dealing with environmental problems attended these seminars. Popular publications, TV films and media articles were issued and distributed in Uzbek and Russian languages. Also three information bulletins on Uzbekistan's fulfilment of obligations under the UN Framework Convention on Climate Change were distributed.

Non-governmental international organisations can play a partnership role in educational programmes, as well as training programmes. Many Canadian environmental NGOs, industry associations, and governments organisations have developed programmes related to sustainable development education. The Learning for a Sustainable Future programme, for example, promotes sustainability education in the formal school system nation-wide. The Evergreen Foundation supports the "naturalisation" of school grounds, and the Harmony Foundation conducts summer workshops for educators on environmental values. The Canadian Forestry Association has conducted national workshops for teachers on sustainable forests and compiled an exhaustive catalogue of forest education materials.

The following lessons can be learned from the above non-exhaustive examples of public awareness related activities:

1. The existing programme of university courses in "Natural protection" should be amended and expanded with new information to incorporate the results of up-to-date scientific studies on climate change;
2. A special legislation should be adopted, as well as a concept and strategy of the country, in order to contribute to the improvement of the system of ecological education in the field of climate change;
3. Regular publications on climate change are needed, that can draw the attention of the public and politicians to climate change on regional and global scale;
4. The public awareness campaign experience of NGOs should be used, especially in workshops and seminars;
5. The organisation of workshops on the topic "Climate Change Day" can promote the main ideas and focus society's attention to the implementation of UNFCCC and its Kyoto Protocol. It will also explain the reasons for different political positions of various countries with regard to ecological problems and help to change them,
6. Creation of an integrated information exchange system between regions.

4.2 PROPERLY USE OF MASS MEDIA: THE EXAMPLE OF UKRAINE

Choice of an adequate indicator set

To analyse, how properly the mass media and related activities in a country with economy in transition like Ukraine are used, following elements and indicators for the level of public awareness on climate change were selected:

- frequency and regularity of presentation of climate change material in mass media (TV and radio broadcastings, newspapers, professional environmental newspapers and magazines);
- the scope and quality of this material;
- the availability of UN, international and national documents on climate change issues for the general public;
- involvement of the general public and NGOs in the decision-making process concerning climate policy issues on international, national and regional levels.

Indicators for the evaluation of activities on climate change in educational practice could be:

- availability of a set of special lessons (curriculum) on climate change within courses on physics, ecology or geography in high school programmes;
- availability of the corresponding teaching materials for school teachers and children.

In addition, it must be taken into account that the preferred information channels and tools listed above in chapter 1 depend on the economic condition of a certain population group in a given region, and on the predominant control of a specific communication medium.

If the general public as a voter can feel that climate change may have a direct impact on personal income, property, health or could endanger the well-being of their children and grandchildren, public awareness can lead to actions that stimulate their governments and parliaments to take part in the global endeavour to mitigate the global climate change.

Main results of the mass media analysis

The specific analysis of mass media in Ukraine (newspapers, magazines, TV and radio,

booklets etc.), with the help of the proposed indicators, shows that during the first half of the year 2000, climate change appeared in them only by chance (several times in fact) in the form of sensational information about floods, very strong winds, hail that caused human and material losses. All these events were described as extraordinary but natural phenomena without any indication that it may have been provoked or amplified by human activity - the emission of greenhouse gases. There were almost no newspaper articles or special films on the scientific background of climate change. Scientists' explanations, if they were asked, ended very frequently by the remark that the probability of that or other events are once in hundred (thousand) years, although there would have been other opinions from many well-known climatologists in the Research Institute of Hydrometeorology, in State University (Kyiv), in Institute of Geography of the National Academy of Sciences of Ukraine. Moreover, there is the State Programme on Climate Change and the Concept of Sustainable Development of Ukraine was approved by the Government. All these facts are evidence that up to now governmental and scientific circles in Ukraine do not regard global climate change, often reduced to global warming, as a menace to humans and to many living species in this country. Most of the time, the scientific, politic and press leaders manage it as if it were simply a question of more advanced technology and of the most profitable GHG emission trading policy. Though the involvement of the general public can create a new governmental vision on climate change, even more significance has the fact that the public awareness on climate change issues and corresponding public campaigns could stimulate the government to implement the most efficient (with regards to climate change mitigation) economic and environment policy, that can secure the well-being of contemporary and future generations.

Lessons to be learned from this specific study:

- The necessary enhanced level of public awareness cannot be achieved by climate experts and specialists in governmental and non-governmental organisations alone. Installation of a network in the mass-media community on the basis of a National Programme of Raising Public Awareness on Climate Change is needed to strengthen both relationship and co-operation among Government, NGOs and mass media from country level to local level;
- The existing opportunities and conditions for success, described in the chapter 2, have to become reality;
- Public awareness on climate change as a general idea can influence the public participation in decision-making only if there is an economic, social and environmental interest of the public;
- Raising public awareness on climate change provides a new look at our world. Past development and policy, objectives would need to be re-examined and re-interpreted in view of existing and forthcoming impacts of global warming.

Box 4-1: Project description
"Raising Public Awareness on Climate Change trough TV Broadcasting in Ukraine "

Taking into account that nearly all families in Ukraine have a TV set, but do not buy regularly newspapers, the most effective mass media tool for raising public awareness on any issue including climate change is TV broadcasting. The description of the main steps of this TV broadcasting project is given below:

Definition of the company producing the broadcasts and of collaboration partners.
For successful realisation of the project the production company needs:

- High quality appliances to produce TV films;
- Experience in producing environmental broadcastings;
- Connection to good environmental scenario authors;

- Ability to involve either as consultants or co-operation partners the high-rank officials from ministries, local authorities and well-known scientists.

Actors and partners: Eco-Ukraine Ltd, Committee on Ecological Policy of Verkhovna Rada of Ukraine, Ministry of Ecology and Natural Resources of Ukraine, Kyiev Office of Canadian "International Development Research Centre", local authorities, general public, scientists and school children.

Types of TV broadcast and the main methodology. Every year the following types of TV broadcast will be used: 1. Interview; 2. Round tables with participation of well-known scientists, high-rank officials and public leaders; 3. Broadcasting from the premises of large CO_2 emitters, from new technologies on renewable energy, energy efficiency and forestry or from the site of natural disaster (flood, drought, etc.); 4. Competition of school teams on climate change issues with reward ceremony.

Each "interview" will last 30 minutes and will be introduced by 6 subjects presented with different background landscapes and a final conclusion.

Each "round table" broadcasting lasts 30 minutes and consist of foreword, discussion of the moderator with the invited experts on climate change issues, questions from the TV audience and the experts' answers and final conclusion.

Parallel to this, new projects of emission reduction and sustainable development have to be implemented and shown in different regions of the country, in order to demonstrate economic profitability and technological practicability.

The competition of school teams will be organised at the end of each year of the project. The broadcast including reward show will last 40 minutes.

The tentative budget. The cost of each broadcast is composed of the fees for the staff, of the producer, the scenario authors and consultants, travel expenses and broadcasting time rent. In present condition in Ukraine it will be equal to about 5,000 US$. 6 TV broadcasts per year would need a total budget until the 2003 about 75,000 US$.

Sponsors and options. Canadian government, as a partner of the agreement with Ukraine has begun to finance the Programme on Climate Change Policy. It has approved the application "Raising public awareness on CCI". It will give a 60,000 Can$ grant for the project. An additional sum could be received from the joint implementation projects that are in the negotiation stage between Ukraine and some other countries. Only a small amount of the governmental budget of Ukraine, a part of the finance resources of the environmental ministry, would be further required.

V. STRATEGIES TO RAISE PUBLIC AWARENESS ON CLIMATE CHANGE – GENERAL PROCESS DESIGN FOR COUNTRIES IN TRANSITION TO MARKET ECONOMY

Raising public awareness on climate change is a dynamic process that needs to be carefully managed during each step of implementation. The framework for this management must be the National Programme on Raising Public Awareness on Climate Change. The programme should create a common language and permanent platform for discussion and collaboration, for a partnership relation between government and general public. This framework should incorporate all actors on the national, regional and local levels. Furthermore it has to take into account the interest of different generations and social groups. Different tools and methods should be used in mass media practice, in publishing activities, in organising and conducting workshops and training seminars, in organising special courses for ecojournalists, for a staff of local authorities, activists and representatives of local communities.

Elements of the strategy

Finances: The funds needed for implementation of this programme can be composed of allocation from national, regional and local budgets, from international organisations, private donors and grants.

Organisation: Institutional and organisational strengthening is needed, especially in governmental and non-governmental environmental organisations that supply climate change information to the general public.

Involvement of the public: Activities on a voluntary basis should be encouraged especially on grass roots level.

One of the major challenges facing the world community as it seeks to replace unsustainable development patterns with environmentally sound and sustainable development is the need to establish a common goal of all sectors of society. Public awareness on change climate is one of the factors needed to create a genuine social partnership in achieving goals of sustainable development. For that reason, many further measures are needed in order to raise general public awareness:

- Strengthening of national institutional, informational, methodological and human resources capacity;
- Facilitation of access to climate change data for mass media;
- Improvement of communication ability for environmental NGOs and local authorities, especially in developing countries and countries in transition to market economy;
- Internet and international networks could offer interesting and innovative opportunities for a practical and efficient support of activities raising public awareness on climate change.

VI. CONCLUSION

Public awareness on climate change provides a new look at our world and create conditions for new joint activities of government and society. Past development, policies and objectives would need to be re-examined and re-interpreted in the view of existing and forthcoming impacts of global climate change.

Public awareness on climate change would give the following advantages

for governments:

- change of the general public from an opponent or passive actor into an active participant in international and national activities to mitigate climate change and to adapt on climate change;

for general public and NGOs:

- possibility for a partnership with the government and to better secure its social and environmental interests;
- implementation of an environmentally friendly behaviour in private and social life;

for the environment:

- protection of biodiversity and dynamic equilibrium of the existing ecosystems.

REFERENCES

Meadows, D. H. (2000): Places to Intervene in a System, Whole Earth Web Page www.wholeearthmag.com/ArticleBin/109.html, United States of America.

Schwaninger, M. (2000): Managing Complexity - the Path towards Intelligent Organisation. Systemic Practice and Action Research, vol. 13, No. 2, 207-241.

UN – United Nations (2001): United Nations Framework Convention on Climate Change. Bonn (http://www.unfccc.de/resource/conv/conv.html).

Republic Uzbekistan (1999): Initial Communication of the Republic of Uzbekistan under the United Nations Framework Convention on Climate Change, Tashkent .

Ukraine Government (1998): The First National Communication on Climate Change, Kyiev.

RAISING AWARENESS ON CLIMATE CHANGE THROUGH SCHOOL EDUCATION

WORKING GROUP REPORT

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I. INTRODUCTION

Today's children and future generations must learn to look at the world in a different way than it has been looked, and treat the world - man's habitat - in a way markedly different from the way their more recent predecessors did. During the 20th century, mankind, to better its well-being, made gigantic strides in many vital spheres through science and technology. Many (but not all) pre-industrial cultures lived in harmony with nature. At the dawn of the 21st century, pursuit of advanced scientific research brings forward the same scenario: *"Development is no longer a case of "bigger is better" or "more the merrier", but sustainability. The concept of development has acquired new dimensions. We must no longer think of human development as a matter of imposing ourselves on the natural environment. The earth, the climate and all living things, is a closed system; what we do has consequences that eventually come back to affect us and our own progeny."* Today's children, tomorrow's adults, will have to learn to think about the effects of their actions on the climate. When they make decisions as members of governments and businesses, and as individuals, they will have to take the climate change into account.

Climate change presents a significant challenge that mandates decision makers, industrialists and the general public may have to be educated about the phenomena of climate change and its potential impacts. The United Nations Framework Convention on Climate Change (UNFCCC) emphasises this need under

- Commitments:

  Article 4, (i) "Promote and co-operate in education, training and public awareness related to climate change and encourage the widest participation in this process, including that of non-governmental organizations";

- and under Education, training and public awareness:

  Article 6, (a) (i) "The development and implementation of educational and public awareness programs on climate and its effects."

Education and training are essential on two accounts:

- firstly to adopt early preventive/safeguard mechanisms,
- and secondly to respond adequately and efficiently to the climate change.

At both phases, climate change being a complex system, the issues and responses are also necessarily complex. Therefore, there is a compelling need to build broad understanding of climate issues among policy makers, government officials, scientists, business leaders, and the

general public to ensure that the decisions negotiated in international forum represent the interests of all participating parties and constituents. Moreover, only through a broad-based understanding of these issues we can make appropriate decisions regarding choices that will help us to reach the goals of UNFCCC.

Climate change is a subject of greater significance to the long run than to the present. Therefore, it is pertinent to take into account the popular proverb "Children of today are the leaders of tomorrow!" A clear vision inculcated in the minds of children remains firm and strong through out their lives. Similarly, it is far more easy to develop a concept in a naive child than an adult. Raising awareness on climate change through school education will be one of the best options to fulfil this inevitable need.

II. OBJECTIVES OF RAISING AWARENESS IN SCHOOLS

How to raise awareness on climate change through school education is the main question of this study.

2.1 Specific Objectives

1. Educate children on the concept and the mechanisms of climate change
2. Produce future generation knowledgeable of above climate change consequences
3. Make children a good example for the parents/public to emulate
4. Mitigate climate change through children participation on proactive preventive activities.

2.2 Complementary Objectives

Four other objectives are identified to complement the fulfilment of the main objective. These are:

- To reduce domestic energy consumption - reduce monthly household budget for energy conservation
- Create more greenery
- Paper recycling
- Waste (separation) management/minimization/recycling

These specific objectives in turn reduces the greenhouse gas emission and produce a better environment for us to live in.

III. PRESENT SCENARIO

3.1 QUEST FOR AWARENESS CREATION

Climate change caused by anthropogenic activities is a topic of heated scientific and public debate. It still remains a subject of discussion mainly at high ranking official levels in many countries. To keep the children informed of these global trends, it is imperative that awareness programmes are conducted globally, irrespective of whether a country is affected by direct Climate Change impacts or not. Child awareness and their involvement in climate change mitigation strategies will have profound impacts, firstly on adult population and then on sustainable development on the national level. It can significantly influence to initiate and/or strengthen the political will – today's children are tomorrow's politicians. Eventually,

children's participation may acquire global dimensions, operationally.

The problem of Climate Change may seem overwhelming! One might wonder what a child can do to make a difference. The answer is yes : small drops of water that make rivers and then oceans! It is symbolic of what we strive to achieve.

The children, too, can play an important role to mitigate climate change through a number of activities. Tree planting campaigns, efficient utilisation of energy, waste management etc. can be done of them. School children should be made aware of the fundamentals of climate change in simple along with a clear understanding of its pros and cons. Appropriate picturesque illustrations can be effective tools in this regard.

Although 'Climate Change' is a popular subject, of such critical significance, it remains very alien topic to the majority of school children around the world. Certain awareness programmes have been carried out at school level in certain countries; examples are:

- "Fifty-fifty" on energy saving in Hamburg, Germany
- Tree planting campaign in Canada
- Delhi Environment Action Network (DEAN) of school children, India
- Country Level Environmental Action Network (CLEAN), India.

3.2 DIFFERENT PERSPECTIVES OF KEY-ACTORS

To accomplish our endeavour of raising awareness it is imperative to develop pragmatic proposals. Enormous amount of project proposals are developed around the world today. But, implementation continues to be a crucial deficit in many projects. Most of the time, barriers remain unrealised because of implementation atrophy, as due to diagnostic errors or design fallacies (Schwaninger, 1997). For an effective awareness programme all actors involved has to be considered in the framework of analysis, diagnosis and designing. Goals and 'expected arguments' in the perspective of each and every stakeholder has to be critically analysed to produce pragmatic solutions as illustrated in Table 3-1.

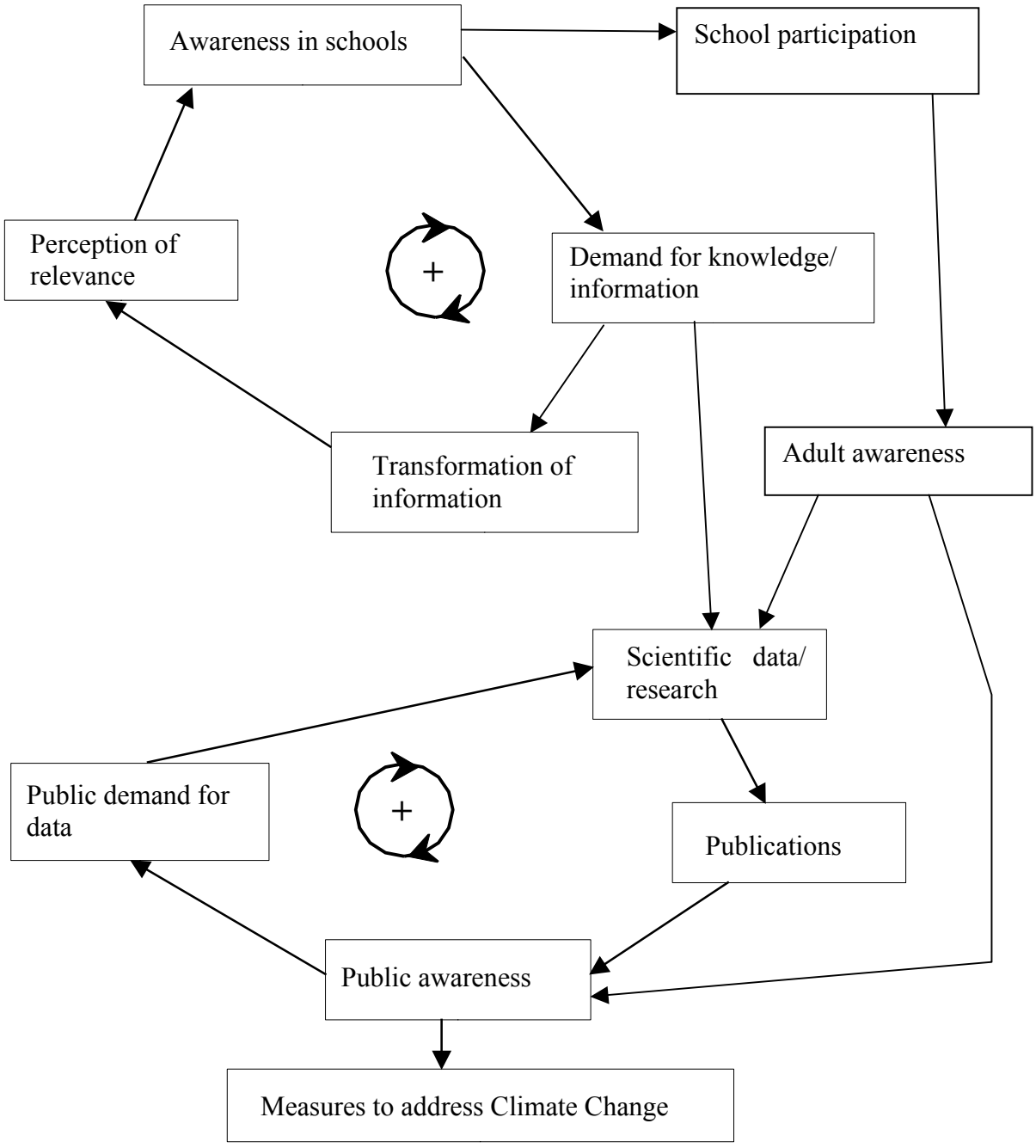
Table 3-1: Goals, expected arguments and key success factors in the perspective of stakeholders involved in schools activities on raising awareness on Climate Change

Stakeholders	*Goals*	*Expected argument*	*Success Factors*
Ministry of Environment	Improve the quality of environment Fulfil the international commitments	Lack of human resources Lack of co-operation between stakeholders	Motivation of people involved Good organisational structure Clear responsibilities
Ministry of Education	Increase the level of knowledge of teachers and children	Lack of human resources Difficult to fit in to school hours	Motivation of people involved Clear responsibilities
Teachers & school board	Educate the children	Additional work Lack of knowledge	Motivation (incentives) Training
School children	Education	Theoretical information is too boring	Attractive materials & presentation
Citizens & parents	Safety Happiness Healthy life	Lack of knowledge Lack of benefits	Access to information Motivation through: More jobs in recycling Saving money, saving energy Better environment (more green places)
Politicians	Responsibility Closeness to citizens	Lack of funds Impact insignificant	Develop a vision Mass publicity campaign
NGOs	Create awareness in the society and government	Lack of funds Lack of sound & programmes	Freedom to work Availability of funds

3.3 DYNAMICS OF AWARENESS CREATION ON CLIMATE CHANGE THROUGH SCHOOL EDUCATION

The self-reinforced dynamics of awareness creation on climate change through school education is impressive. Social systems are designed to fulfil child requirement, the treasures of the adult parents. The external lever to raise awareness in school children activates the entire system as illustrated in figure 3-1. The right initiative "right kick at the right place" automatically develops organisations and social systems to fulfil the aroused demand for knowledge and information. This cycle leads to a dynamic open-ended path towards collective awareness to address issues concerning climate change.

Figure 3-1: Self-reinforcing dynamics of awareness creation on climate change through school education



3.4 METHODS AND TOOLS FOR RAISING AWARENESS

The following methods and tools can be used for raising awareness through school education:

- School curriculum
- Mass media
- Training programs and workshops
- Books
- Brochures
- Posters
- Public action

- Documentaries
- Games
- Competitions

These methods can be combined in order to accomplish the specific objective. It is very important to adapt the above methods and tools to this specific target groups to suit their specific particularities (age, interests).

IV. CASE STUDY: RECYCLING PROJECT FOR SCHOOL CHILDREN IN SRI LANKA

As implementation issues of any project are complex and dynamic the requirement of studying "best practices" or successful case studies has become increasingly evident. Therefore, the following case study on waste recycling is critically analysed to learn successes, failures and necessary improvements.

4.1 DESCRIPTION AND RESULTS

Title:	Recycling Project for School Children (Shell Sri Lanka, 2000)
Target group:	School Children
Location:	Colombo Metropolitan Area, Sri Lanka
Time frame:	1999
Duration:	1 year

Problem overview:

The solid waste management system in Sri Lanka is in a unsatisfactory state and poses a great threat to society and future generations. Currently, waste is dumped openly, especially in the invaluable marsh lands. The municipal councils are facing problems of finding appropriate land within the municipal area or bearing the cost of transportation to far away rural places. Similarly sanitary land filling is costly. The Recycling Project was proposed in view of helping the community at large to keep the city clean by initiating recycling at school level.

Objectives:

- Improve environmental awareness among school children especially in the area of waste management including recycling.
- Encourage "source separation" at school and household level.
- Increase awareness of recyclable and reusable resources.
- Contribute in extending the life span of a landfill site by reducing the amount of waste.

Back ground:

The project was carried out by a Non Governmental Organisation (NGO), Environmental Resources Management Lanka Pvt. Ltd. funded by Shell Gas Pvt. Ltd. to achieve the following:

- Control ad-hoc dumping
- Implement a recycling system to reduce the quantity of waste to be disposed and thereby save landfill space.

The pilot project included five schools within the Colombo Municipal area. Activities

included educating school children on environment and recycling of waste. Children were taught how to separate recyclable material, solid waste and method of producing compost fertiliser. Each school was provided with separation bins, compost bins, posters and brochures.

To motivate the pupils to participate in this programme the following incentives are offered:

- Pupils were taken on environment day tours
- A trophy and prizes for the most successful school in developing waste management into a continuous process
- Inter-school debate competition on recycling waste
- Certificate for participation for students

Results and impacts

The overall project was a success. The children of the involved schools were made aware on waste management, recycling and there contribution.

4.2 CRITICAL ANALYSIS - SUCCESSES AND FAILURES

Successes	***Analysis***
1. Overall success of the project	Sri Lanka having a high adult literacy rate of 90.2 % can be one of the main reasons → magnifies awareness
2. Attentive student participation in practical activities	Motivation to win the final trophy is high
3. Increased environmental awareness	Debate intensifies the knowledge
4. General public awareness	Use of mass media: TV, newspapers drew the general public attention

Failures	***Analysis***	***How to improve ?***
1. Sustainability of the source separation	Lack of motivation/ encouragement after the competition	- Governmental involvement for a permanent institutional arrangement
2. Control ad-hoc dumping	Having little control over mass waste management system → May influence in the long run as adults	- Should be addressed at national & local level - Extend the project to national level
3. Reduce demand for landfills & extend the life span	Number of schools involved is small	- Extend the project to national level
4. Students resistance for theoretical presentations	Lack of attractive techniques	- Adaptation of attractive and innovative presentation methods

4.3 LESSONS LEARNED

Systemic analysis should pay sufficient attention to the socio-cultural and political aspects of organisation, not only to the action plan.

- Discussions with stakeholders from the conceptual stage to insure their participation.
- Project should be continuously monitored from the start and the achievement of the planed benchmarks has to be checked.
- Dispersion of created awareness or knowledge is most successful in countries of higher literacy rate.
- For attentive participation of children until the end of the project a very attractive final award should be presented.
- To obtain children's attention attractive and innovative presentation methods have to be adapted specially when presenting theoretical concepts.
- Other tools and methods such as mass media should be used to further spread good practices and also to get the co-operation of the general public.
- To obtain maximum results of a project, it is necessary to look into the sustainability even after the termination of the project.
- To make a firm vision in the minds of children, it is necessary to run the project for a long period, at least more than six months.
- A successful pilot project should be further extended to a larger area.

V. ACTION PLANS FOR IMPLEMENTATION OF SPECIFIC PROJECTS

Teaching children the concepts of climate change and their role in mitigation alone is insufficient. It has to further extend, make them apply and experience it the selves - to build a firm vision. School is the best place to accomplish the objective of creating awareness among children. Taking this into consideration - to make things happen - the group on Climate Change developed action plans for two school projects during the Summer Session:

- Mitigate climate change through efficient utilisation of energy (a case study for Sri Lanka)
- Paper recycling and tree planting for a better climate (a case study for Romania)

5.1 PROJECT 1: MITIGATE CLIMATE CHANGE THROUGH EFFICIENT UTILISATION OF ENERGY

Rationale

World energy demand and climate change are strongly inter-woven. Fossil fuel combustion alone emitted 6.0 ± 0.5 Gt. C of carbon dioxide in 1989 and 1990 (IPCC, 1996), the major contributor to global warming. Domestic energy consumption accounts for more than 10% of the total anthropogenic CO_2 added into the atmosphere each year. For example, in 1996 in U.S., 20% of CO_2 emissions from fuel was residential (Energy Information Administration, U.S. Department of Energy). Therefore, a reduction of household energy consumption will also reduce the total green house gas (GHG) emission.

For example: The U.S. releases about 40,000 pounds of carbon dioxide per person each year. If we can reduce energy use enough to lower greenhouse gas emission by about 2% a year, in

ten years we will "reduce" about 7,000 pounds of carbon dioxide emissions per person (Global Warming: Focus on the Future, 2000).

Saving or efficient use of energy will not only reduce the demand for coal, oil, and natural gas, GHG emitters, but also save money.

Efficient use of energy would also reduce the burden of countries straggling to meet the ever-increasing energy demand. For example countries like Sri Lanka have reached the optimum level of hydro power generation which is the major source of electricity (70%). Reduction of household consumption may reduce the amount of energy, which if not will have to be met by more environmentally unfriendly and cheap sources like coal.

Relevance of climate change policy to Non-Annex 1 countries

Non-Annex 1 countries are still not obliged to reduce their emission level. But they too have an obligation to submit national communications with issues such as national policies for limiting GHG emissions and national GHG inventories to the Conference Of Parties (COP) of the UNFCCC. Furthermore, the provision in the Kyoto Protocol for Clean Development Mechanism (CDM) and Emission Trading may become important means of developing countries participation in emission reduction activities.

Target group: Secondary and high school children

Objective: Raise awareness on the consequence of Climate Change among school children and how they could contribute to mitigate it through efficient energy utilisation.

Involved ministries and other authorities: Ministry of Environment
Ministry of Education
Ministry of Power and Energy

In addition to the expected arguments of the stakeholders mentioned at Table 3-1, the Ministry of Energy of Sri Lanka will have to be taken into consideration for this specific project as follow:

Stakeholders	***Goals***	***Expected argument***	***Success Factors***
Ministry of Energy	Fulfilling energy requirements	Good image in front of the people	Involvement in the publicity campaign for results

Methods and tools:

- Excursions
- Films
- Posters
- Games/competition
- Discussions
- Brochure

Action Plan for Implementation

Step 1: Finding sources of funding

Step 2: Discuss with relevant ministries to obtain their co-operation

Step 3: Select five schools for the pilot project

Step 4: Discuss with principals and relevant teachers

Step 5: Give an introduction to the children

- What is Climate Change?
- Consequences of Climate Change
  - world
  - country
  - individual
- Possible adaptation and mitigation measures
- What you can do?
- Explain the great contribution they can make by reducing energy consumption in their own home. This should be put forward with specific data and picture illustration

Step 6: Game/competition "Reducing Energy Consumption to mitigate CC"

- Introduce the game to the children
- Identify student leaders
- Collect previous month electricity bills of each student
- Assist them in averaging up for each class
- Assist students build up a list of activities that could be done at home to reduce energy consumption
- How can they obtain the involvement of other members in the house?
- Collect monthly electricity bill of every month for six consecutive month and tabulate them in bar charts
- In the meantime, new energy saving methods could be introduced
- Select the class with the maximum percentage reduction in energy consumption

Step 7: Poster competition

Step 8: Debate competition

Step 9: Grand award ceremony

Duration: six months

Approximate budget: US $ 25,000.00

Potential Generalisation of the Specific Project 1

The project proposed for Sri Lanka could be applied to many other countries with little change. In countries where many energy sources are used in a single home, cumulative consumption of other sources will have to be considered. For example use of natural gas for heating and electricity for lighting. This project would be more successful in countries where the domestic energy consumption is very high. It will show a remarkable reduction.

5.2 PROJECT 2: PAPER RECYCLING AND TREE PLANTING FOR A BETTER CLIMATE FOR AWARENESS CREATION

Project objective

The objective of the project is raising awareness on climate change in schools through changed curriculum and practical activities.

Target group: children from elementary and secondary schools

Methods and tools

- theoretical aspects: children will receive information about:
- what is meant by climate change?
- which solutions exist?
- what is the importance of forests?
- what can children do?

- practical actions:
- recycling paper
- planting trees
- designing posters

In many countries (including Romania and Sri Lanka) there is no separate collection of waste and the percentage of materials which are recycled from household waste is very low. Recycling paper saves valuable resources, saves trees. Throwing away paper is a careless waste of a natural asset. Recycling paper minimises the total amount of waste and saves valuable landfill space and extends the lives of the landfills. Recycling paper conserves energy. Up to 64 percent less energy is required to produce paper from waste paper instead from virgin wood pulp. Recycling paper conserves water. The manufacturing of recycled paper uses only half of the water required in the manufacturing of virgin paper. Recycling fosters goodwill among employees and the community. Children can feel they are part of the solutions in their region and their paper helps create new jobs in the recycling industry.

In Romania there is one more reason to start recycling with children because during the past everybody was obliged, in the dictatorial era, to recycle almost everything. Adults feel that each attempt of start recycling reminded them of the past which they reject. With a good explanation of the paper recycling connected with resource saving and nature conservation children will accept the activity and will furthermore try to convince their families of the importance of such an activity.

Main actions

Step I: Pilot project

- discussions with the main actors involved
- choosing the schools which will be involved
- preparing of the materials for teachers
- purchasing the necessary materials
- poster design and spreading
- advertisement campaign through mass media
- lectures (concept + practical actions description)
- practical actions
- results evaluation & award for best results

Step II: Extending of the pilot project to the country (regional) level

- advertisement campaign through mass media
- discussions with the main actors involved
- purchasing the necessary materials
- lectures (concept + practical actions description)
- practical actions
- results evaluation & award for best results

Stakeholders involved

The main institutions which will be involved are:

- Ministry of Waters, Forests and Environmental Protection
- Ministry of Education, national and local level
- Ministry of Industry (National Commission for Materials Recycling)
- Municipal authorities
- Recycling agents

Goals and possible arguments in the perspective of each and every stakeholder has to be critically analysed to produce pragmatic solutions as illustrated in Table 3-1. In addition to the general aspects mentioned the following specific stakeholders have to be considered for this project:

Stakeholders	***Goals***	***Expected argument***	***Success Factors***
Ministry of Industry	Industrial development (recycling facilities)	Lack of human resources	Motivation of people involved Clear responsibilities
Recycling agents	Profit	Too small quantities of paper	Good organisational structure in paper collection
Municipalities	Good management of the town Good image in front of the people (extending life of the landfill, green city)	Lack of human resources Lack of approved local plan for urban development	Involvement in the publicity campaign for results

Strategy for implementation

Step I: Pilot project

1. First discussions with the main actors involved: Ministry of Waters, Forests and Environmental Protection, Ministry of Education and Ministry of Industry (National Commission for Materials Recycling)

   Main topics of the discussions:
   - presentation of the project proposal
   - analysis of the project proposal (feasibility)
   - possibilities to finance
   - establishing of the unit which will carry on the project and the staff of this unit
   - establishing of the inter-ministerial committee which will be involved in monitoring of the project
   - choosing the area and the schools which will be involved in the pilot project phase
2. Preparation of the theoretical information concerning climate change by the Ministry of Waters, Forests and Environmental Protection and the Ministry of Education
   - what is climate change?
   - which solutions exist?
   - what is the importance of forests?
   - what can children do?
3. Preparing the logistical framework for paper recycling and planting trees (all main actors are involved)

- purchase of recycling bins
- establishment of the recycling paper flow from schools to the recycling agents
- search for areas where children can plant trees
- search for the seedling source and flow, time schedule

4. First workshop with teachers involved in the pilot phase of the project (all main actors are involved)
   - presentation and distribution of the theoretical information concerning climate change
   - presentation in detail of the practical activities:
     - paper recycling
     - planting trees
     - design of posters
   - presentation of the logistical framework
5. Presentation of knowledge and information on practical activities to the school children
   - paper recycling
     - continuous activity (six months e.g. Dec.-May)
     - evaluation of the results monthly (quantity of paper)
     - the importance of this activity will be continuously underlined
     - excursions to recycling facilities for paper
   - planting trees and monitoring
     - one campaign (spring) for planting trees
     - continuous care about the health of the planting trees
   - designing of posters on the topic of climate change
     - competition between children
     - one activity (environmental day -5 June)
     - award for the best poster
6. Evaluation of the results and award ceremony for best results (environmental day -5 June)

Step II Extension of the pilot project to the regional or country level

1. Evaluation of the results of the pilot project within the inter-ministerial committee
2. Advertisement campaign through mass media of the good results of the project (including distribution of the best poster designed by children)

The same steps from the pilot project will continue except for preparation of the information concerning climate change, the same materials will be used.

Main obstacles for project success

- Lack of finance
- Lack of co-operation between the involved institutions
- Lack of motivation of teachers to participate in this activity

Potential Generalisation of the Specific Project 2

The objective of the project is raising awareness on climate change in schools through changed curriculum and practical activities.

This project presented as a case study for Romania can easily be implemented in other countries with similar conditions:

- high rate of child literacy

- waste management without separate collection of waste
- existence of recycling facilities for papers
- possibilities to mitigate climate change through forestation (tropical and temperate climate)

The following aspects have to be considered:

- involvement of the forests authorities and seedling institutions if they are not parts of the Environmental Ministry
- direct involvement of the school boards in the first discussion between stakeholders if there are private schools
- possibilities to have more campaigns for planting trees if the climate allowed it.

VI. CONCLUSION

Lack of institutional capacities and co-ordination at different governmental levels hinders the efforts to raise awareness in schools. The following measures are proposed for the national government:

Institutional capacity:

- support (financially and methodologically) the existing teams/institutions to strengthen them
- create new institutions
- improve national co-ordination
- improve co-operation at/between the national, regional, municipal and community level and environmental NGOs
- improve participation of the main stakeholders
- improve infrastructure for data collection, monitoring and dissemination of information

Human resource development:

- increase the availability of national experts and policy makers
- increase awareness of the teachers through workshops, seminars and information dissemination
- promote exchange programmes for teachers and children

Improvement of information network capacity:

- access to means of information
- establishment and/or development of national centres for information
- events and workshops for sharing information

Non-governmental organisations play also an important role in education and public outreach. Therefore, it is essential to continue engaging the non-governmental organisations in the process of raising awareness. The lessons learned at section 4.3 are a vital part of the conclusion and recommendations.

REFERENCES

Schwaninger, M. (1997): Integrative Systems Methodology: Heuristic for Requisite Variety; in: International Transactions 4: 109-123.

Houghton, J.T., Meira Filbo, L.G., Callander, B.A., Harris, N., Kattenberg, A, Maskell, K. (1996): Climate Change 1995, The Science of Climate Change, Cambridge: Cambridge University Press.

Royal Dutch Shell Sri Lanka (2000): The "Shell Recycling Project". http://www.shell-srilanka.com/recycle.htm, Colombo.

United Nations Environmental Programme (2000): Framework Convention on Climate Change; www.unfccc.com, Geneva.

ACHIEVING SUSTAINABLE DEVELOPMENT IN REGIONAL DEVELOPMENT BY REDUCING SOCIAL DISPARITIES AND ENVIRONMENTAL IMPACTS

REPORT OF THE WORKING GROUP ON SUSTAINABLE REGIONAL DEVELOPMENT

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I. INTRODUCTION AND PROBLEM ANALYSIS

We are confronted with a perpetuation of disparities between and within nations, a worsening of poverty, hunger, human health and illiteracy in many regions, and the continuing deterioration of the ecosystems on which we depend for our well-being. When addressing these problems for sustainable regional development we face two strands of complexity: Ecosystems themselves are complex and knowledge of them is limited. So are human social systems complex. By definition, environmental problems incorporate both of these systems, making them twofold complex. The regional development working group with varied backgrounds and experiences of regional development are illustrative of this complexity. This is evidenced in the projects presented in this report. The report, nevertheless, is founded on the principles of sustainable development.

The contemporary global awareness of environmental problems began with the United Nations Conference on the Human Environment (UNCHE) held in Stockholm in 1972. The preparatory work, the conference and the follow-up injected a new impetus to the consideration of the ecological dimension of regional development. Its main goal was to articulate an approach to the environment consonant with the pursuit of economic growth. The Founex Report, of June 1971, resulted. It stated that environmentalism should no longer be considered a barrier to development but as an integral part of the process. Founex created the immediate link between development and the environment and the concept of sustainable development cemented the alliance. The concept of sustainable development is not new, but attempts to promote it as the basis of ecologically sound development were in greater evidence from the mid-1970s (Dryzek, 1997).

The primary statement of sustainable development, which marked the term's political coming of age and established the content and structure of the present debate, is the 1987 World Commission on Environment and Development (WCED) report, known as the Brundtland Report after its chairperson. The World Commission on Environment and Development has defined sustainable development as "development that meets the needs of the present without compromising the ability of future generations to meet their own needs" (WCED, 1987:8). It requires meeting the fundamental needs of food, clothing, shelter and jobs and extending to

all the opportunity to satisfy their aspirations for a better life. Thus, the strategy of sustainable development promulgates harmony among humans and between humanity and nature. This discourse regards economic growth, environmental protection, distributive justice, and long-term sustainability as mutually reinforcing. The primary accomplishment of this discourse was to systematically combine a number of issues that have been treated in isolation or as competitors: development (especially of developing countries), global environmental issues, population, peace, and global equity.

However, included in the weaknesses of this discourse is a lack of practical steps to bring about this vision. The purview is global dealing with global ecosystems, but sustainability is an issue at regional and local levels, too, where practical solutions will need to be found. Furthermore, sustainable development was devised to overcome two major global problems: the insupportable pressure on environmental resources and the inequitable differences between the wealth of nations and their inhabitants. Unfortunately, with the proliferation of sustainable development projects these two primary goals have largely been lost. Thus, it is our intention to overcome these shortcomings by translating sustainable development into tangible and practical options for regional actors and offering possible methodology and instruments for sustainable regional development planning. We recognise the associated problems with increasing economic disparities on the global and regional levels, namely the increasing gap between the developed and developing; the rich and the poor; and the urban and the rural.

The objective of the regional development group is therefore to *develop an environmentally sound plan to reduce economic disparities necessary for developing a region*. The working group is aware that sustainable regional development is an on-going and long-term process, involving participation and debate, ideally leading to consensus and action. For the purposes of this paper we understand regions as areas within a country and regional development as the search for possibilities for common development.

II. ACTUAL SITUATION

Introduction

Disparities in economic and social development are prevalent throughout the world, their offspring providing major obstacles to the pursuit of sustainable regional development. As environmental concern is a relatively new concept, regional developers and planners have not always been mindful of sustainability and environmental impacts in their pursuit of development. Furthermore, many regions have been given scant attention from these developers resulting in economically disadvantaged zones and huge social inequalities. The regional development working group is aware of these factors and thus our intention to develop an environmentally-sound plan to overcome these shortcomings. This chapter highlights our common objectives and methodology, providing the basis for individual analysis presented in chapters III to VI.

Goals and Objectives

The working group was presented with the task of determining how to achieve sustainable regional development. From this broad topic originated the group objective: *the development of an environmentally sound plan to reduce economic disparities necessary for developing a region*. The group recognised that any form of sustainable regional development would have to include four key elements, namely:

1. Economic Development

2. Natural Resource Conservation
3. Social Development
4. Peace and Stability.

Definition

The term regional development has varied meanings, ranging from regional blocks (e.g. European Union) in the global arena to local regional administrations. For the purposes of this paper the term regional development applies to the search for possibilities for common development of specified areas within a country.

Problem Statement

It is clear that in many parts of the world regional development is not necessarily sustainable, thus we identified some of the hindrances to sustainable regional development requiring attention:

- Economic disparities between rich and poor; urban and rural; developed and developing (economic)
- Environmental destruction and degradation (ecological)
- Shortage of natural resources (pressure on the environment) (ecological)
- Unsustainable population dynamics, e.g. overpopulation, aids, immigration and emigration, population increases and decreases (social)
- Poor, low education levels resulting for example in a lack of environmental consciousness (social)
- Political instability, e.g. lack of civil order, crime (political)
- Undemocratic political systems which prevent the formation of institutions and institutional capacity (political).

Analysis of the System

Analysis of the topic - developing an environmentally sound plan for reducing economic disparities for sustainable regional development - required three preliminary steps, identification of:

- The key stakeholders/perspectives
- Their goals/interests; and
- Key success factors for achieving these goals. (Table 2-1)

Communities, international organizations and local, regional and central authorities were identified as the primary stakeholders in regional development for the purposes of this project. The experience of the working group highlighted the point that the words local, regional and central can take on different meanings around the world. Hence, it is suggested that the readers consult the table for examples of these meanings.

Bearing in mind, the general goals and the stakeholders, the goals were then divided as per the stakeholder. The same are presented in the table. It would be interesting to note that equal opportunities to various sectors is identified as a key goal besides natural resources management and general improvement in the quality of life. It was further agreed that emphasis needed to be given to peace and stability across the globe and transnational co-operation.

Having identified the goals of the projects in regional development, key success factors required to achieve these goals were determined. It is of general interest that education is identified as the major factor along with public participation. It is also felt that policy co-

ordination is one of the main factors required from central and international authorities, playing a significant role in regional development.

Table 2-1: Stakeholders, goals and key success factors for SRD

Perspectives / Stakeholders	Goals	Key Success Factors
Communities (Citizens)	Equal Opportunities - Education	Qualification Environmental Awareness Public Participation
	Equal Opportunities - Employment	Qualification Public Participation
	Improving Quality of Life	Environmental Awareness Public Participation
Local Authorities (Towns / Municipalities)	• Improving Quality of Life • Natural Resources Conservation • Improving Infrastructure • Improving Public Services	• Education and Training • Co-operation • Institutional Capacity • Investment & Financial Resources • Policy Co-ordination
	Reducing Population Shifts	Institutional Capacity Investment & Financial Resources
Regional Authorities (Counties, Districts, Provinces, States)	• Improving Quality of Life • Reducing Disparities between Urban and Rural Areas • Improving Economic Conditions for the Detrimental Zones • Natural Resources Conservation	• Co-operation • Institutional Capacity • Investment & Financial Resources • Policy Co-ordination • Vision
Central Authorities (Central Govt.)	Natural Resources Conservation	Same factors like above + • Natural Resources Management • Research & Development
	Balanced Development in the Regions	Institutional Capacity Policy Co-ordination Co-operation Investment & Financial Resources Vision
	Creating Conditions for Transnational Co-operation	Same factors like above + • Economic, Social and Political Stability
	Managing Population Trends	Research Co-operation Vision Investment & Financial Resources

Perspectives / Stakeholders	Goals	Key Success Factors
International Organisations (European Union; Southern African Development Community; WHO; WTO; etc.)	Creating Conditions for Transnational Cooperation	Institutional Capacity Investment & Financial Resources Policy Co-ordination Vision
	Improving Global Economy	Same factors like transnational co-operation + • Research & Development • Trade
	Peace and Stability	Co-operation Institutional Capacity Policy Co-ordination Vision

Complex Systems

After the identification of these parameters, a network was devised interlinking various factors that influence sustainable regional development (fig. 2-1). The network shows the complexity of such systems. The global economic and political conditions are indicated as the driving force behind regional development and has been attributed with major importance for the functioning of the network.

Complex System Analysis

Sustainable regional development incorporates two major strands of complexity: ecosystems and human social systems. The creation of a sustainable regional development plan incorporates both of these systems making it doubly complex. The existing situation in Southern Africa, Southern Asia and Europe were analysed through brain-storming sessions and the following features (controllables, uncontrollables, indicators and decisions) of the complex system of sustainable regional development were identified.

Controllables

This category means the areas/fields where the administrators, planners and other stakeholders have some control in execution. Following are the major areas identified under controllables:

- Education (including environmental awareness programmes)
- Employment
- Public Investment
- Infrastructure and public services.

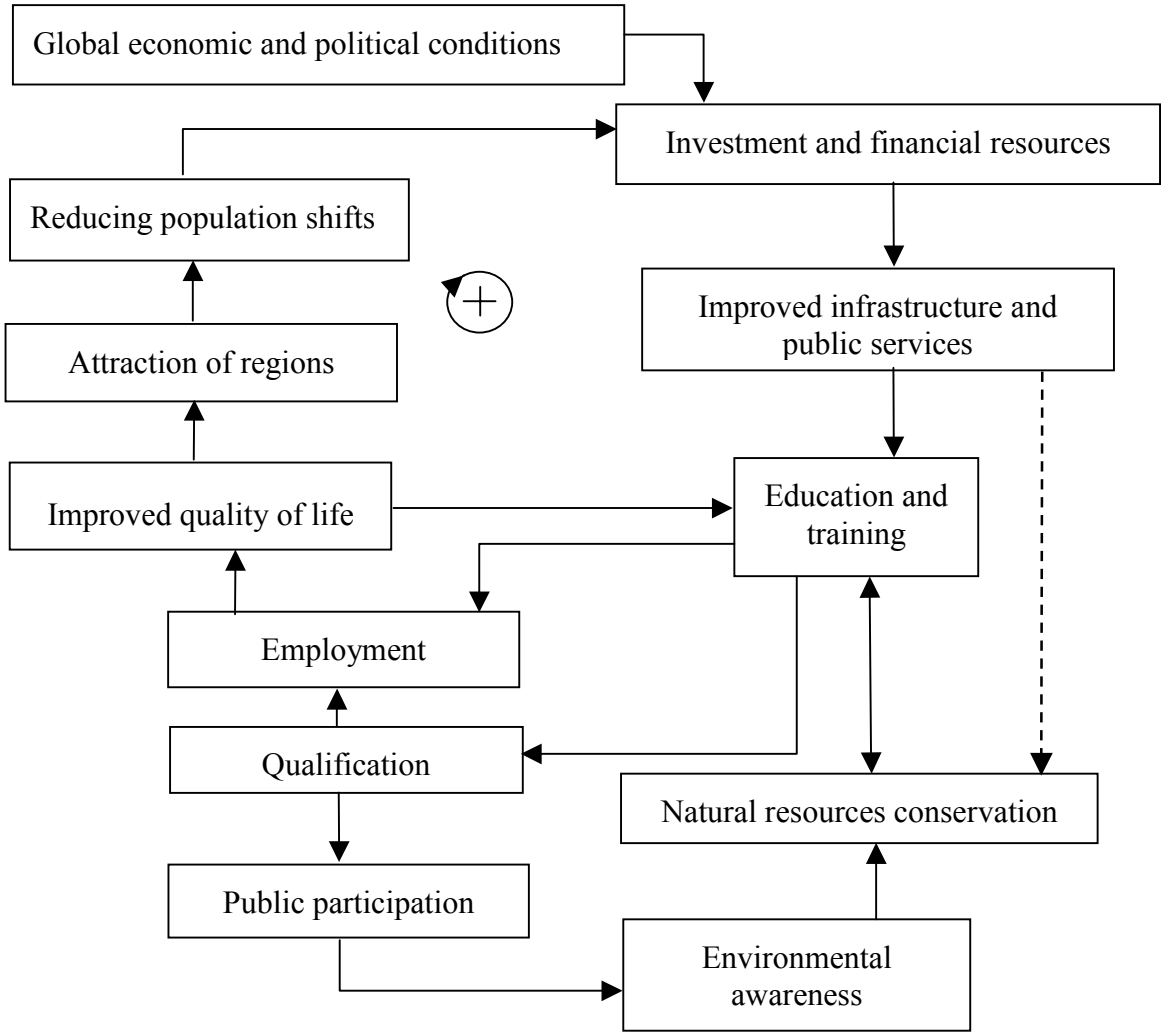
Uncontrollables

The following areas have been identified as the fields where the stakeholders have either no or little control during execution of projects pertaining to sustainable regional development. This does not mean that the areas could be left totally unattended. It only means that these areas should be strengthened from other aspects like enhancing educational opportunities, training, encouraging economic liberalisation (positive) and so forth.

- Macro-economic Environment
- Political Environment
- Global Political and Economic Conditions
- Natural Resource Base

- Public Participation
- Private Investment
- Social Consciousness.

Fig. 2-1: Network of success factors for implementing SD requirements in regional development



Indicators

Indicators are the parameters based on which the evaluation of any project on regional development can be assessed as sustainable. These have been identified. It is to be noted that the list is only indicative and not exhaustive. The detailed list is enormous and is beyond purview of the discussion. However, it is suggested that depending on the individual projects under concern, the indices could be selected and the evaluation process taken up. It is also suggested that the evaluation process might be taken (maybe in addition to the project personnel) by an independent body so that either technical or personal bias is eliminated to a major extent.

- Environmental quality indices
- Qualification
- Employment generated
- Investment and financial resources
- Demographic data
- Number of jobs generated in the environmental sector - e.g. "green" employment.

Decisions

As sustainable regional development depends largely on government policies and public participation, the following were identified as the factors necessary for ensuring effective implementation. It is believed that participation of people, particularly women and increased literacy among the public, alone could result in a lot of positive changes in regional development ensuring its sustainability, especially in developing countries. Recommended decisions are as follows:

- Enabling policy by state/government
- Policy for sustainable economic development of region
- Participatory process
- Participation of women

Summary

The above broad analysis of the system governing regional development, with special emphasis on the hindrances of economic disparities preventing the sustainability of this system, provides the necessary base for individual case studies and best practice analyses. Key stakeholders, goals and success factors common for each individual work have been identified. Chapter three delves deeper into the problem of economic disparities, providing case studies from Romania and South Africa, as well as tools for overcoming these and other hindrances to sustainable regional development. Recommendations for the development of an environmentally-sound plan are provided.

III. SRD THROUGH SUSTAINABLE TOURISM

3.1 INTRODUCTION

In the 1980s the concept of ecotourism was embraced by communities, tour operators and government. In the 1990s many became disillusioned as ecotourism became co-opted as a marketing tool and lost much of its original meaning of sustainable, environmentally-sound development. Is there such a thing as an industry that can remain small and sustainable without being caught up in the inevitable demand for growth - a growth that will undermine the very balance between natural resource conservation, communities and tourists that the ecotourism movement has sought to attain? The lack of discipline of government and regulation, and the demand for growth will undermine efforts to create sustainable ecotourism economies that are small but natural (Conservation International, 2000). Despite these developments, each year more community-based enterprises rooted in a deep understanding of the necessity to conserve the balance between the human and natural landscape are being initiated. Previously these enterprises were predominately launched by foreign intermediaries and often even the most well-intended efforts did not result in true community involvement. (Wood, 2000)

The concept of ecotourism has further problems in that it appears to give focus on "eco" and therefore the environment with not enough emphasis on the social aspects of this form of tourism. Nevertheless, out of ecotourism has sprung leaders of local guide associations and craft co-operatives expressing their own vision of an integrated future and discovering their own market directly and building a future on the foundations of the previous ecotourism economy. An example of this are the Makuleke people of South Africa who are in the process of setting up a business plan for tourism in the Pafuri Area of the Kruger National Park, an area for which they recently acquired communal land rights. This is all culminating in prosperity that is home grown and possibly the best expression of sustainable tourism in the

new millennium. Thus, it is proposed that we have moved beyond ecotourism to a new level of tourism namely sustainable tourism.

3.2 BACKGROUND: SUSTAINABLE TOURISM CONCEPT

The concept of sustainable tourism has three key elements which define it: the environment, development and peace. In terms of the environment the prerequisite for tourism is minimal impact, requiring a respect for the environment and understanding of its fragility. Development calls for maximum benefit for the local communities, respect for their interests and mechanisms for their participation. As the implementation of sustainable tourism necessitates multiple actors and co-operation between these actors, peace is an integral part of the concept. Furthermore, the tourism must contribute to mutual understanding and respect especially between indigenous communities and tourists.

The focus of this work concerns how to sustainably develop rural regions, specifically in developing countries and proposes the multiple use of a landscape through the mechanism of sustainable tourism. Many regional development and management plans (Schleicher-Tappeser, 2000; Vonkeman, 2000) have already been developed, but they largely focus on case studies in developed countries thus the need to adapt these models to developing country scenarios. Therefore, South Africa will be used as an example, although it is acknowledged that even South Africa has unique circumstances and thus in developing a regional management plan, it is necessary to develop a common framework, which gives some guidance, but at the same time remains flexible.

Main Objective

The objective of this case study is the development of an environmentally-sound plan to alleviate economic disparities in rural regions: Multiple use of a landscape through sustainable tourism.

Sub-objectives are:

1. Reduce economic disparities in rural regions
2. Show inter-relationship between the environment and the economy
3. Create a self-generating system.

3.3 IDENTIFICATION OF KEY PROBLEMS

The developing world context holds a number of obstacles to sustainable regional development, which include poverty, inequality, histories of racial and ethnic conflict, political instability, corruption, disease, illiteracy, lack of technology, lack of environmental consciousness and economies on the semi-periphery of the global economy. These problems endemic to most developing countries, result in increasing large-scale economic disparities. In developing countries there is often a large discrepancy between the rich and poor; and the urban and the rural; micro-examples of the global system and the disparity between the developed and the developing nations.

But the unsustainable development problem often goes deeper and finds its core in the distorted relationship between man and nature. Frequently the establishment of protected areas has worked against the direct economic interest of local communities. It meant that many communities no longer had access to resources they had traditionally used for years. South Africa serves as a case in point. Often, the gazzetting of land for its "preserved" areas led to the displacement or enforced relocation of rural communities with little real compensation for the loss in traditional livelihoods or resources. Any subsequent use of the

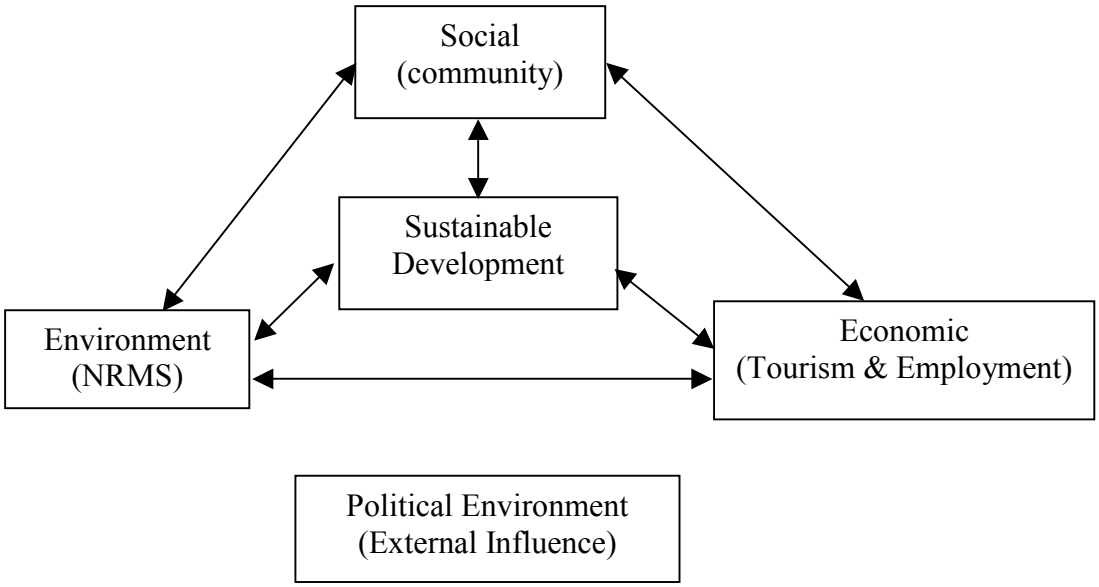
land and wild resources from these areas was deemed illegal, yet at the same time; many neighbouring communities had to bear the full brunt of crop and other economic damages from marauding wildlife or their frequent migration. This resulted in local communities losing their traditional management and use rights to local wild resources and seeing little incentive, and indeed a major cost, in conserving them (Swanson and Barbier, 1992; Thomson, 1986). The situation has deteriorated due to rising rural populations, scarcity of arable land and increased urbanisation. Direct land use conflicts over protected areas and their resources are now the norm in many parts of South Africa. With the poverty endemic in many of the rural areas, illegal encroachment, hunting and harvesting in protected areas is often the only available source of living. Local people may not be directly involved in these activities, but their complete alienation from or disinterest in wildlife conservation generally translates into little opposition to or concern for the depletion of local wild resources by others.

With the limited financial resources, trained manpower and equipment at their disposal, the national and local authorities responsible for protecting and maintaining these preserved areas are often powerless to control the problem. Low morale and wages sometimes leads government officials and park employees to participate in the lucrative, illegal exploitation of protected areas. It is clear that much of South Africa's wealth lies in its natural resources. It is this potential that needs to be tapped and wisely utilised. It is not in the interest of the region to see this unique commodity being plundered and destroyed. South Africa, as with other developing countries, has the difficult task of having to create a balance between conservation and development, especially where poverty is of primary concern.

3.4 METHODOLOGY AND SRD PROCESS

The sustainable development of rural areas through the multiple use of natural resources includes three core elements: the environment, economic development and the society, as illustrated in fig. 3-1.

Fig. 3-1: Multi-dimensional/Multi-disciplinary Approach to Overcome Economic Disparities through Sustainable Tourism



These interactions are further influenced by political factors, for example the political system. Depending on the interactions and the relationships between these three elements and the influence of politics the result will either be sustainable or unsustainable development. The

strategy of sustainable development regards economic growth, environmental protection, distributive justice, and long-term sustainability as mutually reinforcing. The primary accomplishment of this discourse is the combining of a number of issues that have been treated in isolation or as competitors: development (especially of developing countries), global environmental issues, population, peace, and global equity. Sustainable development therefore is not just a question of the environment, but an integration of interests. The challenge posed by this approach is how to integrate the various elements.

Before implementing a plan for sustainable regional development the answers to three basic questions must be identified (Schleicher-Tappeser, 2000).

1. What do we want to sustain?

It is necessary that the region be defined so that the stakeholders and the development dimensions can be identified. The three dimensions being: environmental, economic and socio-cultural. For example in a national park like the Kruger National Park in South Africa, identified as the region, the dimensions would be: the natural resources of the National Park, the tour operators and the tourist facilities within the National Park and the communities which have a vested interest in the Park, for example the Makuleke community.

2. Why do we want to sustain this region?

The stakeholders must now be identified and their interests determined. With a number of stakeholders there will surely be conflicts of interests and these need to be pre-empted as well as mechanisms established for consensus-building and conflict-resolution. Refer to table 3-1, which illustrates the stakeholders of a national park, like the Kruger National Park. The key stakeholders are as follows: the environment represented by national park authorities, the tourism industry, and the communities. This list is by no means exhaustive but merely serves as an example of the key actors, during the process it is expected that further stakeholders will be identified. It is then important to ascertain what the various interests of these stakeholders are and the potential conflict of interests.

3. How can we move towards sustainable development?

Basic approaches which will be of use must be identified. As funds is often a concern, especially in developing countries, it is advisable to make use of studies which have been done previously to prevent re-inventing the wheel. At this point success factors must be determined, for example, co-operation, public participation, capacity building, consensus-building and most importantly - a common vision.

Core issues identified

The development of a sustainable tourism project depends on building a local constituency that has a vested economic interest in protecting their natural resources. All projects need to integrate the conservation of neighbouring ecosystems with the creation of economic opportunities for local communities, (Conservation International, 2000). Sharing tasks, risks and victories with local residents gives people the sense of ownership and autonomy that is necessary for long-term success. It is therefore essential that communities take part in the process from the outset. However, a major problem in rural areas, further exacerbated in South Africa because of past disparities, is a lack of education and capacities. The success of any project will therefore depend on capacity-building and education, especially environmental awareness and understanding of the benefits of sustainable development. Due to the prevalence of mistrust of `outsiders', generally found in these rural regions and again especially in South Africa, leaders from the communities, who speak the language and know

the interests of the communities, trusted and respected by the community members must be identified.

Table 3-1: Stakeholders, goals, key success factors and expected conflicts in the multiple use of natural areas

Key Stakeholders/ Perspectives	***Goals***	***Key Success Factors***	***Expected Conflicts***
Communities (Social)	Improved quality of life Equal opportunities - education and employment	Sustainable income Qualification Environmental awareness Public participation Capacity-building	National Park Authorities: access to resources. Tour operators: Income leaving the areas and not accruing to the communities. Disruption of cultural practices.
Tourism Industry (Economic)	Access to protected areas Access to "cultural products" Profit More tourism	Environmental awareness Sustainable tourism - low impact Co-operation with communities and national park authorities	National Park Authorities: Restricted access to protected areas Communities: Mistrust of tour operators.
National Park Authorities (Environment)	Protection of natural resources Low level of use Increased biodiversity	Community-based natural resources management Co-operation Investment and financial resources	Communities: Damage and depletion of the natural resources. Lack of co-operation. Tourism industry: Disruption of ecosystems through noise etc. pollution. High impact.

Prerequisites for success

Bearing the above in mind there are two major prerequisites for the project to be deemed a success: firstly, it must be a self-generating system, and secondly, it must create an harmonious, interdependent relationship between man and nature.

Externalities

It must be remembered that no region is an island unto itself, and there are external factors, which will have major implications for any regional project. These factors are usually uncontrollable, examples of these externalities include: the political system; the macro-economic environment and the level of public and private support.

3.5 IMPLEMENTATION PROCESS

Implementing agency and pioneer stakeholder

The implementing agency must act as a neutral facilitator and co-ordinator. It is proposed that the best institution to take this role would be a non-governmental organisation, for example Conservation International, or a research institution. These organisations are also essential for

providing the initial funding to start the whole process.

The intention to initiate a sustainable development process will be announced by the 'pioneer stakeholder' (Vonkeman, 2000), who can be a non-governmental organisation, governmental institution, research institution or an organised community body. The 'pioneer stakeholder' and the implementing agent will not necessarily be the same and for objectivity it is preferable that they are different.

Implementation Process of Sustainable Tourism:

Phase 1: *Planning process*

There are two components to the planning process: a complete *market analysis* and the *identification of key stakeholders*.

Market analysis includes data collection and subsequent analysis of this data. Data should be collected on the three main dimensions: economic dimension, the natural resources and the socio-culture dimension. All prior studies on the region must be gathered to prevent overlap. Tools such as Geographic Information Systems could be used.

It is essential that the process is guided by continuous participation so the stakeholders should be identified. In the case of the Kruger National Park the three key areas from where the stakeholders should be sought are:

1. Economic sector: tourism industry and local businesses
2. Society: communities (leaders, entrepreneurs) and NGOs
3. Environmental sector: National park authorities and conservationists.

The interests and goals of each of these actors and the sector they represent should be identified as well as potential conflicts of interest.

Phase 2: Tools and training

As mentioned previously, past disparities may result in unequal starting positions for the different actors. It is therefore essential that each stakeholder is given the necessary tools for effective participation. The provision of tools and training is a long-term, but absolutely essential process. Examples of tools and training include:

Communities: Capacity-building through the implementation of a programme of education, specifically environmental education and technical training. The communities need to see the real benefits of conserving natural resources. In the case of South Africa, laws like the Land Restitution Act, which enables previously disposed communities rights to their land or compensation. Such laws are essential tools for leverage for these actors.

Tour operators: Develop and dissemination of tools that influence the broader tourism industry toward greater ecological sustainability. Creating the environmental awareness and consciousness of tourists.

National park authorities: Training in community-based natural resource management.

Phase 3: Partnership creation and plan formulation

Once common ground and understanding has been established through the tools and training process then the implementing agency should initiate dialogue and forums for discussion whilst creating the right environment for partnership building between stakeholders. The agency is to act as liaison between local communities, tourism industry and national park authorities. It is during this phase that a common vision and strategy will be developed taking

into account the interests of all actors. During this process the criteria for sustainable tourism should be used as a measuring stick for all proposals.

Phase 4: Monitoring and evaluation

Monitoring and evaluation must be continuous processes. The stakeholders themselves should list the potential negative effects of increased tourism on local communities and natural resources. The facilities of GIS can be used again to determine the impacts on the natural resources and any changes in human activities.

Tools for counteracting these effects:

- Monitoring body
- Legislation
- Set of regulations
- Registration of sustainable tourism operations
- Blacklisting of offenders.

3.6 CONCLUSIONS

Economic disparities, especially in developing countries, put a strain on the environment and the economies of these regions. The largest discrepancies are often found in rural regions, where there is competition between man and natural resources. Our proposal thus is grounded on the necessity to bridge this gap between man and nature and creating a relationship of mutual benefit and sustainability-sustainable tourism. Sustainable tourism is based on three criteria: low impact on the environment; maximum benefit to the local communities and it must contribute to mutual understanding and respect. One of the major benefits of sustainable tourism is that the process itself is sustainable, after an initial boost of funds has been given the system should become self-generating. Guidelines have been given in the form of four phases in the development of an environmentally-sound plan. Strong emphasis, however, is placed on capacity-building as being fundamental to the success of any such plan. Developing a regional management plan requires the development of a common framework, which gives some guidance, but at the same time remains flexible.

IV. YOUTH FOR SUSTAINABILITY YOUTH, THE EMERGING INFORMATION TECHNOLOGIES AND THE ROLE OF GLOBAL NETWORKS IN REGIONAL DEVELOPMENT

ABSTRACT

The specific objective of the “youth for sustainability” approach is to define strategic sectors, which should be taken into account in a sustainable regional development plan, regarding the participation by the youth and the creation of long-term conditions to turn economic and demographic declining regions into a "laboratory" of technological and ecological innovation. The advantage of the “global class-room” and the “youth for sustainability” approaches is to continuously provide the children and young people – specially in remote areas – with the best available quality of information on each topic, with emphasis on environmentally sound and low social impact activities, but also on successful economic practices, in order to give them a long term perspective in their regional context.

Keywords
Social change, public participation, training and education, innovation, computer-based solutions, trans-national networks , "glocalization", infostructures, local participation in global networks.

4.1 INTRODUCTION

Mainstream economic and social measures have not sufficiently addressed the needs and constraints of the rural poor and people from economically and demographically declining cities. The multiplication of mega-cities – most of them near the coastline – and the disruption of communities in small and middle sized towns are some of the critical problems for regional planning. Due to environmental problems and social shockwaves, large cities can no longer continue to grow in a sustainable way, so the potential is increasing for intermediate cities. This situation is particularly widespread in European countries. The question is, as pointed out by Voula Mega, that "Globalisation may trigger a process of change which cannot be influenced by peripheral local communities, but which can reshape them against their will. High-speed trains bring together many regions but exclude others and produce shrinkage of the European space" (Mega, 1999).

One of the major points about declining small-sized areas concerns the lack of strong local social dynamics in order to face the new challenges of the global order, often the result of a shortage of human resources able to ensure innovation. As human beings create innovative ideas, the regeneration of a city is directly linked with the number and commitment of its inhabitants. People, especially young people with their creative capabilities, feel the effects of the deficiency of education opportunities, employment and, sometimes the most important point, the lack of entertainment standards like those disseminated by the media. This results in leaving the peripheral cities, searching for better opportunities. Thus cities lose the most active and motivated partners for social change.

Population shifts and its implications for regional development, the disruption of communities in one declining city and its desirable renaissance, as well as the question of the emerging mega-cities, are typical concerns for the social sciences, and issues to add to the sustainability question. But, as pointed out in the UNESCO/ICSU 1999 report on science for the 21st century, "while the natural sciences traditionally are involved in environmental research to a very high degree, the support for the social sciences as well as the systematic enlisting of social scientific contribution to interdisciplinary research, training and related policy formulation have not yet been matched to the expectations of the post-Rio-process" (UNESCO, 2000).

4.2 DISPARITIES IN LAND OCCUPATION : A GLOBAL QUESTION?

The question of urban growth remains one of the most complex and sensitive issues for a wide range of expertise, both from natural and social sciences.

Towards the end of the 20th century, several reports and data-sheets have been produced in the offices of global and regional institutions, such as the United Nations and the European Union, concerning spatial balance in the distribution of population.

Many demographic forecasts point to the year 2030 as the vital moment when world population growth will start to stabilise. However, pressure on urban areas will remain as problem to be solved beyond this time. During the 1990s, 80 million people were added to the population of the world's major cities each year. This is equivalent to 10 cities of the size of Paris or Moscow, added to the world's urban population (Machado and Ahern, 1997).

The 1999 revision of the World Urbanisation Prospects, a working report prepared by the

United Nations Population Division, presents estimates and projections of the number of people living in the urban and rural areas of the world for the period 1950-2030. It also provides estimates and projections for the period 1950-2015 of the population living in urban agglomerations. The key findings in the 1999 revision are the following:

- In terms of population size, the 2.9 billion inhabitants in urban areas today are expected to grow to 4.9 billion.
- During that period the urban population is expected to increase by 2 billion, the same number that will be added to the whole population of the world.

As Thomas Malthus pointed out two centuries ago, in the polemic *Essay on the Principle of Population*, a balance is needed between geometric human growth and arithmetical increase in the worlds food supply. More recently, however, the Neomalthusian perspective changed the core point of population growth from food supplies to consumption patterns and environmental degradation.

It is perfectly clear, nowadays, that urban concentration and its ecological consequences are not sustainable. One can easily understand these concerns when looking at the negative - and sometimes irreversible - consequences of continuous urban concentration in coastal areas. Taking as example the city of Porto, the second largest in Portugal, the measurement results of north-west beach profiles shows that there is a possible close relationship between the intensity and type of land use and coastal geodynamic behaviour. The effects of changed land use near the coast during the last 15 years, created manifold negative environmental impacts that need to be clearly evaluated (Oliveira, 1997).

Population movements and geographic distribution of population are questions that matters not only for large cities, which observe their population growing more and more, but are also questions concerning the declining small-sized towns, in which social conditions are becoming each day more deplorable, with few economic incentives and decreasing human capital to reverse this process.

4.3 SUSTAINABLE REGIONAL DEVELOPMENT: THE ROLE FOR LOCAL AUTHORITIES?

From regional and local governments, important activities are expected concerning the quality of life of those who live far from political and economic centres, since it is through those official authorities that national and international directives are implemented. The United Nations Organisation underlined the importance of this in Agenda 21. As it is stated in the UN Action Plan for XXI Century, *the levels of governance that work close to the population, have a vital role on education, public awareness and participation, towards sustainable development*. About two thirds of the statements of the Agenda 21 and specially the paragraph 28 recommend to all local authorities to develop a local-level action plan that should be completed in the next few years. It is an empowerment process which enables communities and individuals to reach an improved quality of life .

Implementing the local Agenda 21 means that working close to the communities is a complex process that calls for co-operation and communication concepts, often disregarded nowadays.

Until the early 80s, in some European countries, local activities concerning quality of life of citizens were mostly connected to housing, water supply and basic sanitary conditions. However, realisation is increasing that local authorities should be aware of broader issues like income, skills, consuming behaviour, landscape management, and others. This seems to represent good starting points concerning population movements analysis (in both the social and geographic meaning), availability of human resources and regional development.

However, despite the importance of official governance, local action for sustainable development also enhances the role of other agents, like NGOs, regional round tables, neighbourhood committees, teachers, religious authorities and youth leaders. These are the local-level stakeholders to be taken into account for developing programmes in the so-called era of "glocalisation", in which local and global problems are now more interdependent than ever.

4.4 YOUTH, THE EMERGING INFORMATION TECHNOLOGIES AND THE GLOBAL CIVIL SOCIETY

It is necessary to provide young people with environmental, economic and historical knowledge about their natural and cultural heritage, and about the linkages between local and global issues, so they can become *geocitizens* (in the same time their cities can become 'civitas' - places of civilisation[4]) and potential entrepreneurs.

During the last decades, authorities have been recognising the citizens' rights for access to information, and now ensure them opportunities for participating in developing programmes. Young people and their organised groups and associations should be active partners in any developing process. Innovative options and alternatives to mainstream regional development programmes should be found, if we consider the demands of:

- the free market and the attractive conditions that regions should offer to potential investors,
- citizens' increasing awareness about the ethical principles governing sustainability.

Solutions based on the emerging information technologies should be understood as strategies to promote motivation and commitment among young people, for regional development action-plans. In this way, interest groups supported by global networks could be promoted by local authorities, NGOs and youth associations, contributing to setting out the *Global Civil Society*, where information about the technical means to deal with ecological "miss-behaviour" of people and also about investment opportunities could easily flow. As Gordon stated, "regions and networks constitute interdependent poles within the new spatial mosaic of global innovation. The effectiveness of local resources and the ability to achieve genuine forms of co-operation with global networks must be developed from within the region itself"[5]

4.5 YOUTH AND THE NEED FOR AN ENVIRONMENTALLY SOUND PLAN FOR EDUCATION AND TRAINING

Several reports indicate the necessity of understanding education as a continuous process, calling to mind the importance of an holistic view that seeks consciousness, that aims to link communities to their natural and cultural environment, and that may help people to deal with present and future environmental problems. However, "as we can learn more about the extent of the ecological crisis, it becomes easier to recognise that the forms of knowledge privileged in our public schools and universities are not contributing to the enlightenment and general progress of humankind".[6]

Implementing an environmentally-sound plan for training and education is not, however, an

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[4] Tagliaventi & O'Connor, 1996 cit. in Mega, 1997

[5] in McGinnis, 1999, p.101

[6] Idem, p.191

* 'Global Civil Society' extends in a transnational dimension the concept of 'Civil Society' - political, cultural, and social organisations of modern societies that are autonomous of the State, but part of the mutually constitutive relationship between state and societies (Definition specified by Ronnie Lipschiutz, 1999).

easy task for policy makers, because they are not only concerned with the need to reach a higher quality of life for all citizens, but also have to respond to the demands of the economic sector, which is often seeing the environmental resources solely as an opportunity for increasing profits. In this way, innovative measures for education, like distance learning and distance professional consultancy could offer a good opportunity to respond to the demands of nearly all productive sectors.

A global environmental education programme with "global class-rooms" could be promoted by local authorities, with the use of the emerging information technologies but, nevertheless, it is also important to recognise that educational programmes and *curricula* cannot be defined only by global concerns and private interests, if the aim is to provide students and *geocitizens* with a better knowledge about the uniqueness of their own territory and with a complementary "bioregional identity"[7]. In this way, such educational concepts and methodologies should always be developed, maintained and supervised by local authorities, with assistance from international and national institutions.

The advantage of the "global class-room" and the "youth for sustainability" approach is to continuously provide the children and young people – especially in remote areas – with the best available information on each topic, with emphasis on environmentally sound and low social impact activities, but also on economic successful practices, in order to give them a long term perspective in their regional context.

4.6 BEST PRACTICES ANALYSIS

As a concrete example to analyse, we have chosen the project "providing computer-based solutions for geographic and environmental analysis" to Portuguese secondary-level teachers and students.

In Lisbon, Portugal, the Department of Geography and Regional Planning of The New University recently developed a project that aims to disseminate technical knowledge about GIS software to secondary-level teachers and students.

With technical and financial support from the Portuguese Ministry of Science and Technology, the conception and implementation of this project also relies upon professional associations, such as the Portuguese Geographers Association and the Geography Teachers Association.

Starting with the statement that environmental education and awareness is one of the key issues for tomorrow's citizens, and that the knowledge about the territory is the most important related topic, promoters have defined a three-steps programme called To Build a New Kind of Citizen: the Geocitizen.

The three steps of the programme were the following:

- Preparing secondary school teachers
- Spreading Geographic Information Systems in secondary schools
- Preparing demonstrative information.

The first step was aimed at preparing secondary school teachers in geographic information tools: The project included a 50 hours seminar that covered different theoretical issues, as well as the use of different types of technologies.

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[7] Bioregionalism has emerged as the new framework to study the complex relationships between human communities, government institutions and the natural world. For a theoretical and practical approach to bioregionalism see McGinnis, 1999.

In Portugal, nowadays, nearly 100 per cent of secondary schools are already provided with information technologies such as the Internet, but GIS is still not considered.

Providing internet access to nearly all secondary school students and teachers, was one of the most important political achievements of the Ministry for Science and Technology, during the recent years.

The second step of the project was to demonstrate to secondary students the potential of GIS, especially in the modern societies where innovation is the best condition for development. Each demonstration session (from a total of 9), was based on two major issues:

- Population and Natural Resources
- Accessibility.

For each of these issues, organisers had prepared examples that were developed in a real time demonstration using GIS software.

The third step was centred on the organisation and edition of information. The idea was to create a set of information from a single Portuguese region, able to cover all kinds of themes. The selected region, for its size and complexity was Lisbon and its surrounding area. The themes were:

- Environment and Physical Geography
- Land Use
- Population and Demography
- Housing and Construction
- Economical Activity
- Infrastructures
- Planning

4.7 LESSONS LEARNT / FUTURE PERSPECTIVES

The importance of national institutions to promote regional development is still very clear and important, but in the medium to long-term, global-local partnerships may change the way we look at the nation-state.

Spatial economic and demographic balance is needed, if we want to achieve regional sustainable development. New opportunities exist for the European cities, but also new problems and challenges. Innovation and a "multi-use" character are pre-requisites for development in the free-market economy.

The role of the local authorities concerning quality of life goes far beyond the provision of "basic facilities". Environmental education and training programmes should be implemented on a local-basis, with the technical support of local agents.

Local agents should also be aware of the necessity of contributing to global networks, as a key condition for the development of creative ideas. Sharing information with “The Global Civil Society” can alleviate, in the long-term, the detrimental conditions for citizens living in declining cities.

The implementation of the emerging information tools should be spread by formal education to all citizens, from highest to lowest educational levels, and should include the best available knowledge on each topic, measure or practice.

People living far from the political and economic centres can use these tools in order to implement innovative programmes for Social and Economic Sustainable Development.

Young people can be active partners in the implementation of an innovative development

plan, since they are more flexible to social change.

Environmental protection is an ethical/moral concept but also a market opportunity. Ecological innovation can be one way to ensure income for declining areas. So, parallel to infrastructure, local policy makers should be aware of the importance of "info-structures" for the social and economic prosperity of societies.

"Info-structures" adds human development to the technical one. It needs communication facilities, like satellites and wireless communication, as well as motivated and creative workers.

V. CASE STUDIES ON SUSTAINABLE REGIONAL DEVELOPMENT IN ROMANIA

REDUCING ECONOMIC DISPARITIES IN ROMANIA

5.1 INTRODUCTION

Economic and social disparities between different areas of Romania have existed throughout the modern era. In the inter-war period, industrial activity was concentrated in only few regions of the country, which benefited from rich and easily exploitable mineral and energy resources, while the economy of other areas remains predominantly agricultural.

After the second World War, the communist regime undertook a comprehensive process of economic development through centrally planned industrialisation. With the intention to obtain a balanced development across the entire territory of the country, investments in industry have been made in all the areas, regardless of their economic or environmental soundness. This resulted in the development of economic activities which were not supported by resources available within their area and in the foundation of new settlement zones heavily dependent on a single type of activity, normally industrial.

Despite the ambition of the communist rulers to establish attractive local centres for the labour force, the towns and areas which were already developed continued to be more attractive. Consequently, massive migration flows towards these areas took place from the newly industrialised counties, which were still presenting characteristics of under-development.

Up to now, the concentration of industrial investments in the main towns leads to an important transfer of population from the rural to the urban areas, as illustrated by a continuously increasing share of the urban population. This spatial redistribution of population was too fast and had a serious negative impact on both the rural and the urban areas. On one hand, since the majority of those who left the villages were in a working age, the rural area suffered a severe economic decline. On the other hand, the towns had to withstand large increases in population over short periods of time, putting high demographic and social pressures on their insufficient housing facilities, public utilities and infrastructure (Romanian National Agency for Regional Development, 2000).

Thus, the present state of affairs is a reflection of the development model which was followed in the past in all the Romanian counties, leading to a situation where all the areas of the country are facing specific problems. With regard to their spatial coverage, in some regions the development problems affect, to large extents, their entire territory, while in others the problems are present in smaller areas of the region concerned.

5.2 BALANCED INSTITUTIONS FOR REGIONAL DEVELOPMENT

Concept

Regional development is a new concept aiming at enhancing economic activities, stimulating private investment, reducing unemployment and improving general welfare in a decentralized way.

Development regions were established in Romania in order to implement the regional development policy. Each development region contains several counties. The development regions are not administrative-territorial units and do not have juridical status since they are a consequence of the free agreement between the county and the local councils.

Spatial Entities for Regional Development Authorities in Romania

1 North-East	5 West
2 South-East	6 North-West
3 South-Muntenia	7 Center
4 South-West Oltenia	8 Bucuresti-Ilfov

The **strategic priorities** of regional development in Romania are the same as those of the structural regional policies of the European Union:

- increasing the competitiveness of the regional economies;
- increasing employment and social cohesion;
- redefining urban and rural progress in an equally developed territory.

As a consequence of the creation of the regional institutions and structures, the local and regional authorities shall take steps to control poverty by:

- their quality of contractors;
- their involvement and competencies concerning the development of local and regional economy;
- their responsibilities concerning employment; and
- their deep knowledge on the local situation, especially regarding the promotion of social integration.

The regional development policy stands for a set of measures planned and promoted by the authorities of local and central public administration, together with various private, public or voluntary actors. It aims at ensuring a dynamic and sustainable economic and social growth by efficiently using the regional and local potential.

The main interest areas of regional policy are: enterprise development, employment, investment, know-how transfer, small and medium enterprise development, infrastructure, improvement, environment, rural development, health, education and culture.

Rural development has a distinct place among regional policies and refers to: eradicating/ reducing poverty in rural areas, equal economic opportunities and social conditions for both rural and urban environment, stimulating local initiatives, preserving the spiritual and cultural traditions.

The *development region* - a voluntary association of neighbouring counties - stands for the implementation and assessment framework of regional development policy. The development region is not a territorial-administrative unit and does not have juridical status (Romanian National Agency for Regional Development, 2000).

Objectives

The main objectives of regional development policy are as follows:

- to reduce the existing regional disparities by stimulating well-balanced development, accelerating the recovery of delays in the development of the disadvantaged areas, and also by preventing the emergence of new imbalances;
- to prepare the institutional framework in order to comply with the accession criteria into the EU structures and to ensure access to the Structural Funds and the Cohesion Fund of the EU;
- to correlate the governmental sector policies and activities at the level of regions by stimulating the initiatives and using the local and regional resources in order to achieve sustainable economic and social development as well as a cultural preservation of the regions;
- to stimulate inter-regional, internal and international, cross-border co-operation, including that within the Euro-regions, as well as to encourage the participation of the development regions to the European structures and organisations which promote their institutional and economic development, in order to accomplish projects of mutual interest, in accordance with the international agreements to which Romania is a party.

Principles

The underlying principles of regional development policies are as follows:

- Decentralisation of the decision-making process, top down from the central/governmental level to that of the regional communities.
- A partnership for all the actors involved in regional development.
- Planning allotting resources (by programmes and projects) in order to achieve the settled objectives.
- Co-financing - the financial contribution of various actors involved in accomplishing the regional development programmes and projects.

Instruments and institutions for implementation

To implement the concept of regional development in Romania, a new institutional design was developed, based on national and territorial structures.

The national structures are composed of:

- National Board for Regional Development
- National Agency for Regional Development

The territorial structures are composed of:

- Regional Development Board
- Regional Development Agency

The National Board for Regional Development is made up of the presidents and vice-presidents of the Regional Development Boards and, in equal number, representatives of the government appointed by governmental decision. The president of the National Board for Regional Development being the prime minister.

The National Board for Regional Development takes responsibility for approving National Strategy and the National Programme for regional development and also for the use of the structural funds allocated to Romania by the European Commission for the pre-accession

period, as well as of the structural funds after the foreseen accession to the EU.

The National Agency for Regional Development (NARD) is a governmental body that promotes and co-ordinates the regional development policy. It has finalised the legislative and institutional framework necessary for the regional development system in a rather short period of time, starting in 1999, in order to achieve the decrease of economic and social disparities between the development regions of Romania.

NARD co-ordinates the implementation of the national policies of regional development and has the legal competence to negotiate them and manage the funds allotted by the European Union, working directly with bodies of the European Commission.

The Regional Development Board is made up of the president of the county councils and, for each county, a representative of the municipal, town and village councils appointed for the term of their mandate.

The Regional Development Board has a president and a vice-president. These two positions shall be filled for one year terms by the representatives of the counties thus designated, each in its turn. The Regional Development Board has responsibilities concerning the approval of the regional development strategy and also approves the criteria, priorities, allotment and destination of the resources of the Regional Development Fund.

The Regional Development Agency is a non-governmental, non-profit, legal entity of public utility and it acts in the specific field of regional development. The financing of the organisational and operational expenditures of the Regional Development Agency is provided from the Regional Development Fund, the amount being approved by the Regional Development Board.

The Regional Development Board approves the organisational chart, so that each county should be equally represented

The Regional Development Agency has responsibilities concerning the designing and the submitting for approval to the Regional Development Board, the regional development strategy and programmes, and the planning of the management of the funds. It has also attributes in implementing the regional development programmes and identifying and promoting the disadvantaged areas within the development regions, together with the local or county councils, as the case may be. It submits the necessary documentation (previously approved by the Regional Development Board) for approval to the National Board for Regional Development (Romanian National Agency for Regional Development, 2000).

5.3 REVITALISE DISADVANTAGED ZONES IN ROMANIA

General presentation

One of the national policies for economic re-establishment of industrial zones in decline (affected by industrial restructuring and former mines), is policy dedicated to disadvantaged zones. The aim of the strategy consists of economical revitalisation by attracting investments into these areas. The principal support allowed to the investors in disadvantaged zones is substantial fiscal facilities (exoneration or reimbursement of taxes) for a period of maximum 10 years.

The legal basis for implementing policy of disadvantaged zones have been created in 1998-1999 period. At the end of 1998 and during 1999, the National Government declared 25 miner zones as disadvantaged zones.

Criteria for declaring disadvantaged zones

An area can be declared as disadvantaged zone if it fulfils one of the following criteria:

- having a mono-industrial production structure which includes more than 50% from labour force (employees).
- a mining area where more than 25% of the employees have been discharged (collective discharge).
- an area where after a liquidation, restructuring or privatisation of business institutions affected more than 25% of their employees.
- an area where the rate of unemployment is more than 30% over the average of national level of unemployment.
- an area where communication facilities and infrastructure is undeveloped.

The declaring of disadvantaged zones is done by National Government approval, after having been proposed by the National Board for Regional Development.

Fiscal facilities in disadvantaged zones

The law concerning the administration of disadvantaged zones is OUG.no24/1998.

The main incentives to encourage investors into disadvantaged zones are the following:

- exoneration on payment custom taxes and added value tax for equipment imported to investments in the area;
- reimbursement of custom taxes for raw materials, and components imported for production;
- exoneration of payment of profit tax during periods of disadvantaged zone status; and
- exoneration of payment of special taxes for property.

Conditions that must be fulfilled by investors

Fiscal facilities are only allowed in the following situations:

1. Companies with private capital and Romanian juridical status.
2. Companies which have social residence and activity in disadvantaged areas.
3. Investment must be newly-created.
4. The new investment must create new jobs for local residents.
5. The goods for which fiscal facilities (exoneration/reimbursement of taxes) are allocated must be used for investments/production in the disadvantaged zone.
6. The investment in disadvantaged zone must function for twice the period that it has fiscal facilities, otherwise the investor is obliged to repay funds allocated.

Special programmes for disadvantaged zones

At present there are three special programmes for disadvantaged zones which will be financed by the government from resources obtained by funds raised through the privatisation of state companies. Beneficiaries of these programmes will be the private companies in the disadvantaged area that wish to develop their activities. The objective of these programmes is to co-finance the purchase of production equipment and for the development of the business.

The current problems and the expected outcomes of the programmes implemented in disadvantaged zones are the following:

Problems to be Solved	***Expected Programme Results***
Increasing rate of unemployment	Job creation
Poverty	Increasing income
Migration of population to the more attractive areas	Motivation and stability of population
Degradation of buildings, the environment and high pollution	Conservation of the environment
Lack of diversity of skills	Increasing education level (new qualifications)
Social problems	Conflict-resolution management and confidence building

Indicators of success

- number of the new jobs created
- decreased rate of unemployment
- increased income per capita
- education level (number of new qualifications)
- reduction in number of emigrants
- reduction in the number of degraded buildings
- reduction in indicators of pollution.

If previously, these used to be high pollution areas, now is the opportunity for them to be transformed into sustainable ecological zones. For this to become a reality there must be strict governmental regulations concerning the types of activities to be permitted in these areas.

5.4 LESSONS LEARNED AND CONCLUSION OF CASE STUDY ON REGIONAL DEVELOPMENT IN ROMANIA

- Regional development is not only a problem of the local level, but central government is involved too, and must support the process;
- Important decisions for development should be transferred from the government to regional level, thus the decentralisation of decisions;
- Special instruments for implementing the programmes of regional development can be adopted by the national and regional levels;
- The new institutions created are working together with local and county authorities to overcome economic disparities; and
- The importance of co-financing of programmes by the contributions of various actors (local budget, county budget, regional agency budget, national budget, international funds).

For disadvantaged zones in Romania

- Industrial branches with old polluting technology are unsustainable and continue to create further decline of some of the areas;
- A crisis situation can become a point of departure to the new concept of sustainable development;

- Fiscal facilities and special programmes of allocated funds can enhance the local economy;
- Policy of regulating activities in disadvantaged zones can save the environment; and
- Opportunities are needed to improve the quality of life of the residents (new qualifications and new jobs).

VI. CASE STUDY ON SRD: THE DEVELOPMENT OF TARGU MURES AIRPORT

6.1 INTRODUCTION

SRD has to be implemented in many projects, which differ in size, targets and involved stakeholders and are situated in different locations. During the Summer Session, many interactions between aviation and environment have been presented and problem solving approaches have been discussed for airplane techniques, navigation efficiency, airline management and maintenance plants measures. In this case study of the SRD working group, we try to obtain a balanced analysis of an airport infrastructure development in a transition country example.

Targu Mures Airport is located in Eastern Europe, at an altitude of about 294 meters above sea level, at 46° 28' 02, 46" north latitude and 24° 25' 29,03" east longitude. This is one of Romania's seventeen airports. The airport area is in the heart of Romania, in Mures County about 14,5 km North-West from the city of Targu Mures. In 1969 the airport was inaugurated and has since then been a thriving centre of activity. Targu Mures Airport's traffic services cover an area of about 34,100 km², servicing more than 2.6 million inhabitants from the counties of Mures, Harghita, Covasna, Alba, Brasov and Sibiu.

In the last 6 years the airport activity decreased as a result of political, economic and social changes in Romania. The local public administration and the Chamber for Commerce, industry and agriculture of the Mures County have been meeting to find solutions for the arising social problems of the area. One of the proposed solutions was to encourage air traffic into the area through the establishment of a tax free zone near the airport. This has set into motion the development of the infrastructure of the airport, starting with the establishment of a new terminal, which will serve the international traffic for passengers and cargo.

Why Targu Mures Airport?

The initiative to develop Targu Mures Airport as a multinodal platform for this part of Eastern Europe is well-supported by the Romanian Government Board and the central region. It has been selected for development because of the following favourable conditions:

- Regional population of approximately 2.6 million inhabitants
- Qualified and affordable labour
- High quality of goods produced by the surrounding industries
- The area offers many tourist attractions:
  - Accessibility to the area's natural resources
  - Famous hunting area
  - Place for winter sports
  - Many natural water springs
  - Balneo-climacteric spa for medical treatment
  - Famous vineyards

- The origins of the Count Dracula myth

Box 1: Technical data and services, Targu Mures Airport

Targu Mures Airport has at present the following infrastructure and equipment, which permits them to offer services for middle capacity airplanes:

- Concrete runway: 2 000 x 30 meters
- Parking apron, with 4 parking positions for BAC 1.11
- Lighting system CALVERT II simplified
- Approach lights system at RWY 07
- ATS equipment's: PAR + SRE radar equipments, NDB equipment and instrumental landing system Cat. II (ILS-Cat II)
- Terminal capacity 120 pax .
- Transit terminal capacity 60 pax .
- Complete aerial services for domestic and international flights
- Conference room, official room (VIP)
- Reservation, trip accommodation
- Bar-restaurant
- Rent-a-car

What has already been done?

In order to develop a region, or an airport (as in this case), it is necessary to take certain steps. The most important preliminary actions identified and implemented at the local and governmental levels were:

for the local level

- Pressure groups
- Pre-feasibility and feasibility studies
- Upgrading of the present facilities has started
- Special governmental and local decisions for implementation have been made
- Network has begun to determine potential project partners

at the governmental level:

- Pressure groups for support at the international and national levels
- Total support of the projects
- Special laws promoted for the next phases of development
- International statuts for Targu Mures Airport has been applied for
- Procedures to join the EU and NATO have been set in motion
- Special funds for the general development of Targu Mures Airport have been allocated.

What are the further conditions needed to support the development process?

- To find partners to develop common projects
- Know-how
- Financial resources
- Consultants
- Contacts for specialised equipment
- Business plan
- Obtaining benefits from the financial investments made.

Airport and sustainable development are not opposite terms, despite many critical issues

demonstrated in the Summer Session concerning the aviation influence on air quality, greenhouse effect, water cycle or noise. The question is, how to develop an airport in a sustainable manner, minimize the negative impact on environment and social life and ensure a long-term economic development through adequate political support, balanced decision making and efficient management strategies.

6.2 SUSTAINABLE DEVELOPMENT PLAN AND OBJECTIVES FOR THE IMPROVEMENT OF INFRASTRUCTURE AND PUBLIC SERVICES FOR THE TARGU MURES AIRPORT

Critical to the development of an airport, from the point of view of the decision makers, is a properly managed plan. Elements crucial to the success of such a plan include a pre-feasibility study, feasibility study and an environmental impact study. The primary aims of these studies is to find possible barriers to development and other potential problems for sustainability, for example in the policy area (adopting new laws at the regional level); and sources of funding for project implementation.

Using these guidelines to develop Targu Mures Airport's basic infrastructure, the first step will be to:

- Extend the infrastructure to the highest level possible for all types of air traffic
- Resize of the runway to 3,200 meters in length and 60 meters in width
- Consolidate the taxiway and apron
- Establish a new airfield lighting system
- Build a new terminal with all the facilities
- Install an Air Emergency Centre with helicopter and ambulance
- Enlarge the Cargo Centre to about 10 ha
- Create a Training Centre for pilots using the present infrastructure and location.

Develop the airport as a centre for European air destinations as an alternative to the present western European Airports.

The second step is to establish a Free Economic Zone (Tax Free Zone) near the airport. To reach this objective, certain conditions are necessary:

- to be in a good geographical and strategic position
- to have good access to other modes of transport like railway, road and river
- to have an emigration and custom check point in the area (at Targu Mures Airport).

In our case we intend to develop a TFZ as specified by the Romanian law no. 84/1992, beginning with an area of 100 ha, and finally increasing it to 250 ha.

It is estimated that the area will create approximately 12,000 jobs and basic public facilities (methane gas, water supply, electricity, telephones).

6.3 INTEGRATION OF THE AIRPORT DEVELOPMENT IN OTHER REGIONAL ACTIVITIES

Association with other airports

Co-operation with other airports has been and continues to be extremely important for exchanging experience and working together towards new strategies for overcoming common socio-economic problems.

Developing tourism

The development of tourism in a region requires proper planning and strategies, which take the environment into account. This plan must include the following elements:

- identification of the most important and appropriate tourist zones
- an environmental audit
- provisions for pre-feasibility, feasibility and environmental impact study
- improvement of transport infrastructure to make the region more easily accessible
- development of public services and rural tourism
- building partnerships with tourism agencies, including hunting clubs.

In the case of the Targu Mures region it is our intention to establish a recreation park "Dracula Land" of about 60 ha, to be located in the original area of Transylvania in Lapusna place, the original location of Brian Stoker's famous novel Dracula.

Development of improved public services and increasing the quality of life

Our objective of developing the public services and improving the quality of life of the region's inhabitants is aimed at maintaining the population in the region. The strategy for developing the public services and its consequent improved quality of life, includes encouraging small and middle private investments thereby increasing employment; better social and health protection through improving basic public services like the police, fire-departments and hospitals services.

6.4 BARRIERS ANALYSIS

Key problems and barriers are limiting the successful implementation and the integration of the development plan in the regional development of the Mures County.

Table 6-1: Barriers analysis for SD of infrastructure, tourism and quality of life

Barriers for Developing Infrastructure	***Barriers for Developing Tourism***	***Developing Public Services Improving the Quality of Life***
Technological innovations are implemented too slowly	Technological innovations are implemented too slowly	Technological innovations are implemented too slowly
Policies and laws not clear	Policies and laws not clear	Policies and laws not clear
Lack of funds	Lack of funds	Lack of funds
Impacts on the environment	Impacts on the environment	Impacts on the environment
High energy consumption	Geographical location	High energy consumption
	Distance and transport to and from the airport	Passivity of citizens
	Different languages	Different languages

Identification of the levers and measures needed to solve key problems and surmount barriers

Certain general conditions are required for the successful implementation of a regional plan.

Social and political conditions for success are:

- Peace, dialogue, transparency
- Policy stability
- Decreasing corruption
- The work motivation, knowledge and skills of the inhabitants.

To put the plan into practice it is necessary to find the levers in the key sectors of the economic, environmental, social and political arenas.

6.5 LEVERS AND SUCCESS FACTORS ANALYSIS

In the economy

- The ultimate key to success are the good employers-employees co-operation.
- It is important to understand and be the first to use the opportunities presented by technological innovations (for example, environmentally-friendly and energy efficient technology).
- Identifying the financial funds needed to increase the amount of investments in research and development.
- Attraction of international financial funds through mechanisms such as Tax Free Zones.
- Encouraging personal investments and entrepreneurship.
- Invest in technologies which have long-term benefits (for example waste incineration, improved water supply and recycling technology).

In the environment

- Reconsidering the relationship between the environment and the economy.
- Implementing an environmental audit.
- Finding the most important environmental measures to ensure sustainability (for example, recycling materials, waste separation, the use of recycled paper etc.).

In the social sector

- Participative techniques for the promotion of sustainable development .
- New partnerships created between the commerce sector and the society in order to develop a new vision for the region, which takes the environment into account.
- Education and motivation of the younger generation.
- Co-operating and networking with different institutions and organisations from other countries to develop a database of experience.
- Consulting with experts.

In the political sector

- Greater co-operation and co-ordination between the different governing bodies.
- Development of new laws, which are more effective, efficient and take environmental factors into account.
- Greater transparency and mechanisms for public participation.

6.6 LESSONS LEARNED FROM THE SRD PROJECT EXAMPLE

- There is a great interdependence between the economy, environment, political and social sectors. These interrelations have to be co-ordinated and "managed" at the project level, where SRD principles are getting implemented.
- Even if the concept of a Tax Free Zone is not quite at the EU standards, it is a useful economic tool for the Romanian Government, in its intention to encourage foreign investments which are necessary for the national economic rebirth.
- Improving the transport network requires new rules for traffic in the towns especially for busses and cyclists.
- Discussions at the local and regional levels are necessary for overcoming past conflicts.
- Implementation of an environmental development plan is needed at the regional level.
- Reduction of bureaucracy which hinders the implementation of new laws and regulations.
- Reconstructing the industrial sector, beginning with the small and middle private companies, with respect to the protection of the environment .
- Implementation and development of sustainable water supplies for the region, especially in the small towns and rural areas.
- Collaboration and discussions at the local level is needed in order to develop new laws for waste collection, separation and recycling.
- Environmental education needs to be included in the local schools' curricula.
- It is recognised that culture, religion, nationality and social differences should not be obstacles for developing a region.
- It is essential to identify the needs and interests of the community and strive to meet these needs. Public participation and interest in the local government is also vital.
- Environmental and feasibility studies as well as environmental auditing are necessary to identify the most favourable areas and conditions for development.

VII. GEOGRAPHIC INFORMATION SYSTEM AND ITS ROLE IN SUSTAINABLE REGIONAL DEVELOPMENT

Introduction

The term GIS may be referred to as

G - Geographic stands for spatial data. This data must be referenced in space i.e., geo-referenced and displayed in the form of a map.

I - Information it may be viewed as a data with added knowledge. It includes the data which has been transformed.

S - Systems refers to the integration of user and machine for providing information to support operations, management analysis and decision making.

A GIS can also be defined as a system for entering, storing, manipulating, analysing and displaying geographic or spatial data. These data (i.e., the characteristics of the features) are represented by points, lines and polygons along with their associated attributes. For example, a point may represent hazardous waste site locations and their associated attributes, may be

the specific chemical dumped at the site, the owner and the date the site was used etc. Similarly, a line may represent vegetation type or land use pattern etc., while polygon may represent urbanised area or a water body etc.

Recent technological development and refinement in GIS computer hardware and software and data acquisition techniques have revolutionised regional development planners and decision makers. Today, land managers, planners, resource managers, engineers and many others can use geographic data through GIS, more efficiently than ever before to analyse management and policy issues. GIS links computerised maps (location data) to computerised databases which describe the attributes of a particular location. This linkage makes it possible for decision makers to access location and attribute data simultaneously to simulate the effects of management and policy alternatives.

The collection of high quality field sampling data is an important goal of any project or programme. Field sampling is vital to analyses, yet is often the source of problems due to the expensive efforts in terms of personnel and costs. GIS and remote sensor technologies supply part of the information that is usually required to meet the goals and objectives. Field sampling is the important effort that assists in their evaluations of the data and it also may supply the data necessary for conducting an accuracy assessment of the products (Chagarolamudi and Plunkett, 1993).

Objectives of GIS

- Maximising the efficiency of planning and decision making.
- Providing efficiency means of data distribution and handling.
- Elimination of redundant database - minimise duplication.
- Integrating information from many sources.
- Complex analyses/query involving geographical reference data to generate new information.

For any application there are four generic questions a GIS can answer:

Location - What exists at a particular location?

Condition - Where do locations with certain conditions exist?

Trends - What has changed since?

Patterns - What spatial pattern exists?

The nature of GIS work flow

A GIS work flow process consists primarily of four steps:

1. Problem Definition

In the problem definition step in GIS, just as in any scientific study, one examines what must be done with regard to an understanding of the problem and the needs for information processing. One describes the nature of the problem, doing the best that can be done with the information at hand. The information that is needed to solve the problem at hand is the basis for the data required for processing.

2. Data Input/Output (with Subsequent Data Storage/Management)

This function supports all other processing steps. In the data entry step, data are either converted to digital form from hardcopy sources or they are acquired from digital sources and are reformatted appropriately for the use.

3. Data Manipulation / Analysis

Data management functions directly support all tasks. These functions focus on characterising the state of the data environment for each context. Although substantial similarity exists in the listing of those functions, there are differences due to the nature of the spatial thematic and temporal character of the phenomena. Functions to support GIS data analysis focus on developing and synthesising spatial relationships in geographic data to provide answers.

4. Data Output/Display

Output can be generated in either soft copy or hard copy form. Soft copy output to the computer monitor is useful for interactive problem solving. Hardcopy output is useful for presentation to a large group of people over an extended period of time. Using a GIS to present the outputs from a model is one of the most obvious functions. In this sense, GIS contributes to visual analysis also. The GIS community also assists in various application fields, urban and regional planning, land inventories and for general administrating purposes, the oil and gas industry and many others. It, also assists geographers, planners, resources managers, environmental modellers, geologists, epidemiologists, soil scientists and representatives of the disciplines of those who work with geographical data.

The nature of GIS use

There are many dimensions that can be considered in the use of GIS. The taxonomy of dimensions may include

Type of task	resource inventory, assessment, management and development, etc.
Application area	environmental, socio-economic, etc.
Level of decision	policy, management, operations, etc.
Extent of problem	small, medium or large study area size and
Type of organisation	public, private or voluntary.

All five dimensions are pertinent for any particular use of a GIS. One of the dimensions of use is the decision-making level. Different levels of decision making are supported by different GIS processing environments. At the current time the largest group of users are mainly specialists with a background in both GIS and their own discipline.

Best practices in geographic information system and its role in sustainable regional development

GIS in general by its nature of origin is most suited for spatial studies coupled with analysis of point information. Hence, to start with, GIS seems to have tremendous potential in Environmental Impact Assessment (including socio-economic impact, vegetation and wildlife impact, impact of urbanisation etc.). However, probing into a little more depth the following areas could be identified as plausible areas for the application of GIS (Karale, 1992):

1. Non-point source pollution
2. Wetland development
3. Wasteland amelioration
4. Village (micro) district/regional (macro) level analysis
5. Siting of industries
6. Planning of transportation systems
7. Siting of hazardous waste spills

8. Data acquisition and
9. Water resources including flood management, monitoring of reservoir sedimentation, etc.

Non-point source pollution

As it is difficult to pin point the exact origin of non-point source pollution by conventional methods, the relative contribution from watersheds and sub-watersheds can be assessed using GIS. Pollution susceptibility models for surface and sub-surface waters combine hydro-geological parameters, such as soil type, topology or slope, depth of water table, net recharge, aquifer characteristics and conductivity of the media, with pollutant characteristics and demographic information. GIS, combined with modelling capabilities, offers an efficient mean of identifying and ranking the non-point source pollution potential of areas for both surface water and ground water. Existing databases can be used when applying GIS to assess the potential non-point source pollution problems. Data such as specific field cropping practices, district level land-use patterns, state wide data compiled, demographic data, transportation network information, hydro-geology, topography and many other similar types of information from various sources and at different scales provide the foundation for GIS based resource analysis for evaluating its potential for non-point source pollution.

Wetland development

GIS and remote sensing is useful for wetland detection. The environment to be monitored consists of geographic and ecological wetlands resources affected directly or indirectly by anthropogenic activity. There are two primary types of remote sensing projects relative to wetlands. The first, resource mapping, involves acquisition of base line data on type, extent and health of wetland communities. The second, development of wetlands involves detection of change, either natural or anthropogenic, in those communities. When wetlands are to be inventoried several issues need to be addressed about the method in which the base line or change data should be acquired, categorised, verified, stored and distributed. Because wetland generally have poor accessibility due to uneven and unstable terrain and frequently tall vegetation, any field work undertaken to inventory them is usually expensive, time consuming and sometimes inaccurate in location. Reducing the amount of field work via remote sensing is a viable solution (Bruce et al., 1993). It should be added that with the advent of GIS, land cover/land use data layers derived from aircraft or satellite-mounted multi-spectral sensors or digitally encoded aerial photographs can be incorporated fairly easily since their formats are compatible for GIS. Furthermore, remotely sensed data collected for wetland change or monitoring activities may be utilised in future projects which may not be under consideration at the time of acquisition.

Wasteland amelioration

Increasing pressure of population has created an excessive demand for food, fodder, fuel and fibre. This had necessitated adoption of scientific measures for increasing land productivity and bringing more otherwise considered as barren areas under cultivation/forests/general purpose. At the same time, land degradation due to desertification, salinity, waterlogging, floods/droughts, excessive soil erosion due to deforestation, unscientific agricultural practices etc., has resulted in the creation of vast stretches of wasteland (Pereira, 1989). Knowledge of availability of water, its quality, characteristics of soil, geographic and climatic conditions forms a pre-requisite to plan and undertake remedial/reclamation measures. This voluminous data warrants a system to store, retrieve, manipulate, analyse and display these data. GIS is one such system which combines the geographical information with satellite data to result in the required complex and tedious analyses.

Village (micro) district/Regional (macro) level analysis

Integration of remote sensing, GIS and database management intends to aggregate both attribute and spatial data of the village/district/region and present them in a meaningful way. The resolution, updating and flow of different data elements generated by various village/district/state/central agencies would continuously be available. This requires continuous compilation and processing as well for drawing useful resolutions. As this data may be both spatial and point information GIS is the only alternative to cater to both the needs of the community and the feasibility of the authorities.

Siting of industries

Using GIS, the entire land use patterns of any area (for example a district) can be stored. Also can be stored the data regarding the availability of water, transportation facilities, communication facilities etc., using GIS. These two would help the planners to zonalise the area (district) for various industrial development activities. This would also suggest in siting of new industries along with possible locations for shifting the existing industries if found unsuitable (after the analysis by GIS) in the surrounding environment.

Planning of transportation systems

This is to simulate route choice through models with the aim to minimise the total generalised costs or weighted route resistance. This approach would allow for a prediction of probable construction and maintenance costs and then simulate the development of more roads and potential economic growth, even in areas where the terrain condition is critical.

Remote sensing images provide the source of data capture and improve the information available to the road system planners. When this information is digitised and stored in a GIS a database is created that can be acquired to produce appropriate roadway construction and maintenance cost model.

This analysis feature of transportation systems has also, besides the siting of road network as explained above, tremendous use in optimising studies for solid waste collection systems. Using GIS one can include the practical requirements like barriers (due to political strikes or religious occasions), turn impedances (travel time delays caused due to traffic and road conditions), number of trips required to collect all the dust bins or the garbage houses completely.

Siting of hazardous waste spills

GIS technology has recently gained widespread acceptance as a means to map and document hazardous waste spills. GIS is used to both document and map the response and also to assess the impact of the spill on the natural environment. This use represents reaction to the spill rather than use of GIS technology to help manage, co-ordinate and support the spill response effort. In order to use this technology for real-time management of a spill event it is necessary to prepare a GIS specifically for emergency response. The response maps include Environmental Sensitivity Index (ESI) of the shore line, bathing places and locations of other culturally and ecologically sensitive areas (Kill, 1993). A waste spill response makes extensive use of cartographic products to disseminate information about the spill to response managers, the media and the general public. The maps typically show data such as current location of the spill, estimates of spill fate and environmentally sensitive areas which should be protected.

Data acquisition

The collection of high quality field sampling data is an important goal of any project or programme. Field sampling is vital to analyses, yet is often the source of problems due to the expensive efforts in terms of personnel and costs. GIS and remote sensor technologies supply part of the information that is usually required to meet the goals and objectives. Field sampling is the important effort that assists in their evaluations of the data and it also may supply the data necessary for conducting an accuracy assessment of the products.

Other areas like monitoring of reservoir sedimentation, flood management, etc.

Monitoring Reservoir Sedimentation

Heavy silt inflows have lead to significant loss of useful storage in many major reservoirs. While the volume of actual silt deposit within the reservoir cannot be directly measured, active silting zones can be identified. Use of multi-date satellite imageries has resulted in estimation of silt deposit in various reservoirs very close to the value obtained from laborious hydrographic surveys (Shea et al., 1993). Identification of environmentally sensitive areas of flora and fauna such as bird nesting grounds, wildlife habitats, evergreen forest cover have benefited from remote sensing.

Flood Management

Since complete protection from floods is neither technically nor economically feasible, flood management essentially consists of minimising the damage caused by floods and protecting as large an area as economically justifiable. Multi-year satellite data has been used to study river migration and to predict potential areas of flood damage. Effective flood hazard zoning will require use of topographic information and discharge/flood records along with multi-year satellite data.

Constraints of GIS

There are also some limitations in the available GIS technology. While current GIS are most effective when dealing with static two-dimensional digital map data, many environmental data sets are inherently three-dimensional, as in solid geology, or even four-dimensional, as with marine and atmospheric circulation data sets. Similarly, GIS must not be misunderstood as 'mantra' capable of doing 'everything'. GIS must be treated as a tool only and it all depends on the user using this tool, rather than the tool itself to come to a good or otherwise decision (Good et al., 1993). A substantial proportion of GIS use in environmental science, hence revolves around fairly straightforward, though extremely effective, GIS operations such as efficient data input, storage and selective retrieval and display.

Conclusions

GIS is proving to be a very useful tool in mapping, analysing and combining the point data and the spatial data which is found to be very demanding for regional development in a sustainable manner. The major applications include the environmental impact assessment, siting of industries, planning large projects which have significant input requirements in terms of information. It's for academicians, environmental scientists and planning authorities to exploit the full potential of such a valuable tool in the field sustainable regional development.

Out of the map, query and model modes of working in GIS, the last mode is still under development and is expected to take over in the coming future for modelling the various activities in regional development. After having prepared the nature of the inputs to be retrieved for a model, the model is run and an answer is computed. More realistic data with a locational character to have an impact on the model results. In addition, geographical displays

interactively depicting the nature of the sensitivity of certain parameters can be very useful in support of model parameterisation. The model brings together the locational, temporal and thematic aspects of phenomena in a geographic process characterisation.

Databases

While other databases (for example for soils, land uses and land cover, etc.) are more or less standardised, the database for socio-economic analysis is still under development. Some of the aspects to be considered under this database, needed especially for the purposes of regional development, could include:

Social Status

- The population trend, its rate of growth, age structure, migration possibilities and other demographic factors that will affect the rate of use of resources in the specified region.
- The possible barriers towards innovative technology, poverty, lack of education, traditions, non-aggressiveness, lack of encouragement and incentives.
- Social factors that constrain the development and management of the region (e.g. farms, industrial area or national park) - land tenure, government rules, traditional farming systems, fear of risk or others.
- The existing social structures, systems or hierarchy which influence the individual or community development in the region.
- The regional developer's needs like more roads, domestic/irrigation water, housing, marketing arrangements, recreation facilities.
- Status of women in the society and their responsibilities.
- The conditions of youth including rates of unemployment, willingness to undertake field work and migration trends.
- Public awareness of the causes and problems facing local natural resources.

Economic Status

Collection of baseline economic data can, in many cases, be combined with the sociological survey. Because many social and economic data are interlocked and difficult to separate as is evident with the interlinking aspects of sustainable tourism. The main topics to be covered in a survey of the economic status of a region include:

- The present economic activities in the region, including production, income, development models, land use patterns, employment, labour demand and supply, rural enterprises, marketing, etc.;
- The potential for economic improvement or development, including human resources and capabilities, infrastructure needs, availability of credit or financial aid and agro-industrial development possibilities;
- The constraints or problems of development from the economics point of view, including land tenure, land rental, and fragmentation, capital, knowledge, labour prices, markets and transportation, etc.;
- Communities and other stakeholders' reactions to proposed economic improvement measures including credit and/or subsidies, extension services, taxation and rental reductions, marketing arrangements, etc.;
- Various costs of activities and their returns, the cost and benefit of natural resource conservation and other related economic figures.

Some of the terms that could be included in the database might include, educational qualification, occupation, annual income, property, type of land, form power, type of housing (hut, temporary, permanent, etc.), family unit (separate, combined, size, etc.)

3D GIS

This is the GIS useful for terrain analysis and includes three-dimensional modelling in GIS. This is anticipated to obtain more presentable results for contours, drainage patterns, real time modelling, etc.

Internet GIS

This is another upcoming field in GIS. This deals with the concept of centralised GIS software with data bases at the user end. This is similar to client-server technology and is promised to be more economic, more effective in efficient utilisation of resources. This would be of tremendous use in regional development.

GIS and sustainable tourism

GIS provides an important tool in its application of determining the social and economic status of a region. This is especially required for data collection (phase one), and in the monitoring and evaluating process (phase four) of the implementation of sustainable tourism. This tool is particularly relevant for "before and after" analyses.

Lessons learned

1. GIS technology has tremendous potential in various fields of sustainable regional development.
2. GIS supports interactive manipulation of model data. Real time data manipulation is easy for the user to add or delete certain data and see how this addition or deletion affects the results.
3. Application of GIS emphasises its use to understand the regional geology, geomorphology, structure, soil and associated vegetation data in a more appropriate and effective manner.
4. GIS also helps in analysing the socio-economic data in connection with the corresponding places of their living and other point attributes to study some of the cases on urban sprawl, industrial growth, resources utilisation, etc.
5. Periodic updates to the data sets in GIS are required due to dynamic nature of land resources and entering new spatial data requires acquisition, registration and digitisation of the data.

VIII. CONCLUSIONS AND STRATEGIES FOR SRD

New strategies

Common to all the projects presented in this report is the fact that the sustainable development of a region is a long-term process, wherein constant learning plays an important role. The development of a sustainable regional plan is a dynamic process as are the concepts which govern it. This report for example has introduced two emerging concepts in the sustainable development debate, namely “sustainable tourism” and the “youth for sustainability”. Innovation is also a necessary part of the evolvement of regional development. One such

innovation, Geographical Information Systems and its future prospects for sustainable regional development has been evaluated. Furthermore, as regional development ultimately concerns the well-being of the inhabitants of a specified region, the goals and objectives for such development will vary as the interests of the stakeholders' differ, as illustrated in the two case studies. Thus, developing a regional management plan requires the development of a common framework, which gives some guidance, but at the same time remains flexible.

Table 8-1: Key Elements of SRD and Levers for Successful Implementation

Key Elements of SRD	***Levers for Successful Implementation***
Economic Development	• Creating the environment, which encourages and supports innovation • Investment in technology (environmentally-friendly) • Entrepreneurship • Encouraging foreign investment • Employment creation, for example through sustainable tourism
Natural Resource Conservation	• Re-conceptualisation of the relationship between the environment and the economy; bringing the environment back into the economy equation • Community based natural resource management; skills development • Regulations (laws/policies) insisting on environmental impact assessments and environmental audits • Promotion of environmental awareness amongst the public, especially the younger generation by including the environment into the curricula

Social Development	• Investing in local human resources by:
	  • Capacity-building through skills training
	  • Improving standards of education
	• Development of participative models, in other words participative decision-making, mediation and consensus-seeking mechanisms
	• Improvement of basic infrastructure and public services

Peace and Stability	• Creation of public-private partnerships • Co-operation and co-ordination across all levels and sectors • Communication: Mechanisms for public participation and identification of the interests of all stakeholders • Neutral facilitator

We, however, call for one shared goal in each regional development plan, namely, that the system will be sustainable. Regional development based purely on economic objectives is no longer feasible nor viable. Thus, the tools, the new concepts and the levers for regional

development which we present should serve as mechanisms for future regional development plans.

Levers for success

As noted in the second chapter sustainable regional development, with the specific aim of reducing economic disparities, requires a multi-disciplinary approach and any plan would have to include four key elements, namely economic development, natural resource conservation, social development and peace and stability. We, thus, present as taken from the different projects, possible levers for success in these key elements (Tab. 8-1).

Concluding remarks

Regional economic disparities have historical, geographical, cultural and economic roots. These disparities inherent in most countries can never be completely removed, but they can be reduced by creating an environment where opportunities are made equal and accessible. This report shows that the principle factor for successful regional development is communication. Regional development is complex as it involves a number of stakeholders and the differing interests of these stakeholders. Thus communication techniques like negotiation, mediation and consensus-building are important tools for regional development. But essential to the success of communication is providing the stakeholders with the necessary tools for effective participation, thus the need for capacity-building and motivation, especially in rural areas and economically disadvantaged regions. Training, education and skills development give stakeholders (for example local communities) a common starting position. The ideal conclusion of the communication process should be the development of a common vision for the region based on the principles of sustainability. Sustainable regional development is an on-going and long-term process, involving participation and debate, ideally leading to consensus and action, and then monitoring and evaluation.

The purview of this report has been regional and local, but it is recognised that economic disparities are by no means limited to these areas and are even more accentuated on the global level as evidenced in the differences between the developed and the developing nations. Thus, the lessons learned and the suggestions made in this report can be extrapolated to the global level, since the goal is common, namely the evolvement of a sustainable system.

IX. REFERENCES

Chagarolamudi, P. and Plunkett, G.W. (1993): Mapping Applications for Low - Cost Remote Sensing and Geographic Information System, International Journal of Remote Sensing, Vol.14, No. 17, 3181-3190.

Conservation International (2000): Golden Rules of Ecotourism. www.conservation.org, United States of America.

Dauskardt, R. (2000): Applied Financial Improvement Planning in Local Governments, (working paper) INH Rotterdam.

Dryzek, J.S. (1997): The Politics of the Earth: Environmental discourses. New York: Oxford University Press.

Ghimire, K. (o.J.): Population, Environment and Development, UNRISD, Geneva, s.d.

Good, M. F., Parks, B. O. and Steyaert, L. T. (1993): Environmental Modeling with GIS, Oxford University Press, New York.

Karale, R.L. (ed) (1992): Natural Resources Management - A New Perspective, I.S.R.O, Bangalore.

Kill, J. (1993): Geographic Information System: The Environmental View Geographic Information Handling, Research and Application, edited by P.M. Mather; John Wiley and Sons Ltd.

McGinnis, M. (ed.) (2000): Bioregionalism, Routledge, London.

Mega, V. (1999): The Civilization of Sustainability; in: Report of the 3rd biennal of towns and town planners in Europe, Herne.

Pereira, H.C. (1989): Policy and Practice in the Management of Tropical Watersheds, West View Press/Belhaven Press, U.S.A.

Reis Machado, J. and Ahern, J. (1997): Environmental Challenges in an Expanding Urban World and the Role of Emerging Information Technologies. National Centre for Geographical Information, Lisbon.

Romanian National Agency for Regional Development (2000): Romanian Regional Development Plan (www.andr.ro), Bucharest.

Schleicher-Tappeser, R. (2000): Integrated Methods for Sustainable Regional Development. Lecture presented at the Summer Session 2000: Beyond Kyoto: Achieving Sustainable Development. 17 July -25 August 2000.

SD Commission – Sustainable Development Commission (2000): UK Round Table on Sustainable Development, Delivering Sustainable Development in the English Regions, The Round Table, London.

Shea, C., Grayman, W., Darden, D., Males, R. M. and Sushinsky, P. (1993): Integrated GIS and Hydrologic Modeling for County wide Drainage Study, Journal of Water Resources Planning and Management, A.S.C.E., 119: 112-128.

Swanson, T. M. and Barbier, E. B. (1992): Economics for the Wilds: Wildlife, Wildlands, Diversity and Development. London: Earthscan Publications Limited.

Thomson, R. (1986): On Wildlife "Conservation". Cape Town: United Publishers International.

UNESCO / ICSU Report (2000): International Scientific Programmes on Environment and

Sustainable Development, UNESCO, Paris.

de Vantier, B. A. and Feldman, A. D. (1993): Review of GIS Applications in Hydrologic Modeling, Journal of Water Resources Planning and Management, A.S.C.E., 119: 246-261.

Vonkeman, G.H. (2000): Lecture presented at the Summer Session 2000: Beyond Kyoto: Achieving Sustainable Development. 17 July -25 August 2000.

WCED - The World Commission on Environment and Development (1987): Our Common Future. Oxford, Oxford University Press.

Wood, M.E. (2000): Ecotourism Beyond 2000; The International Ecotourism Society. Burlington. www.ecotourism.org

THE WADDEN SEA NATIONAL PARK – PROFIT VS. PROTECTION A CASE STUDY ON SUSTAINABLE REGIONAL DEVELOPMENT

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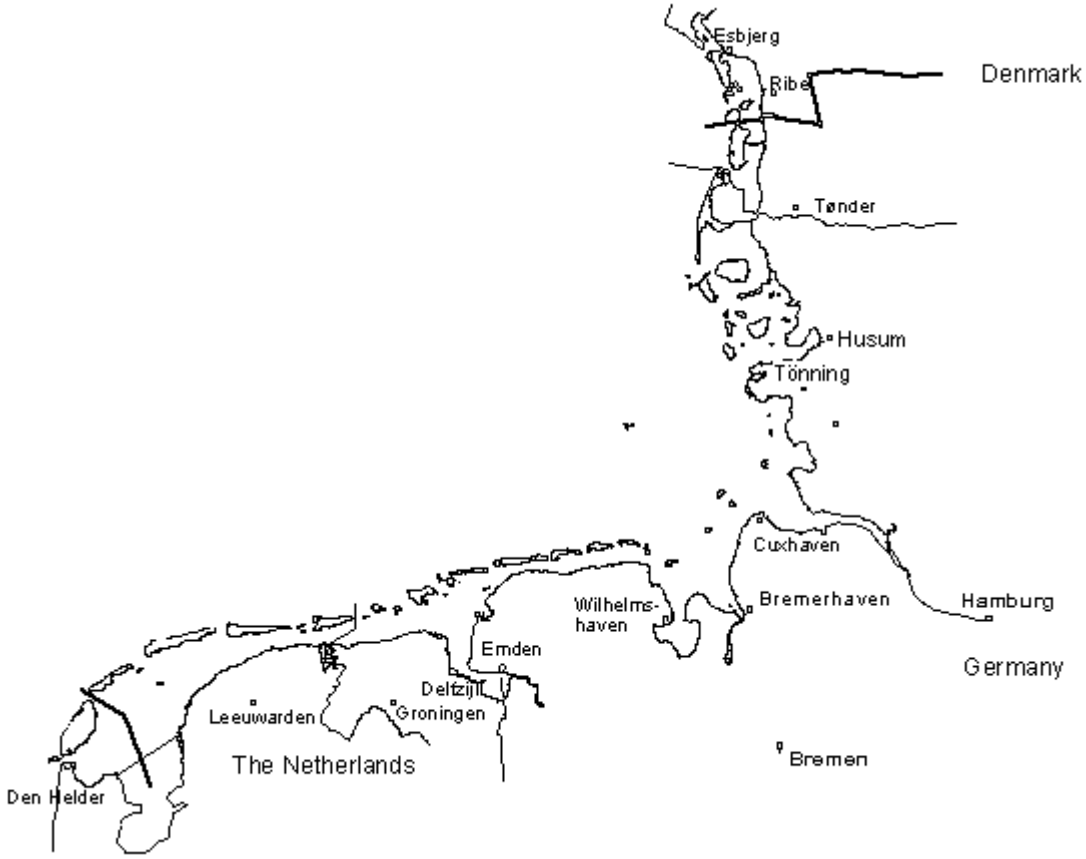

"… Sustainable use: The use of components of biological diversity in a way, and at a rate, that does not lead to the long-term decline of biological diversity, thereby maintaining its potential to meet the needs and aspirations of present and future generations. …"
(Statement on the Convention on Biological Diversity, 1992)

I. THE HISTORY OF NATIONAL PARKS WORLD-WIDE - AN IDEA CAPTIVATES THE WORLD[8]

The first national park -"Yellowstone"- was established in the United States in 1872. Many more were soon to follow. Today there are world-wide more than 1,600 national parks. In earlier times national parks were established simply to protect an endangered species or a certain type of landscape.

Since then, things have changed substantially. Nature is seen in its entirety and should also be preserved as an entity. Animals, plants and biotopes should be allowed to develop undisturbed

[8] See also: www.wattenmeer-nationalpark.de

and without human interference.

In Germany there are now 13 national parks, among them wooded and alpine regions, river meadows, sea cliffs and tidal flats. All of them have reached the highest protection status.

One of them is the National Park Wadden Sea, founded by German law in 1985 (Schleswig-Holstein), 1986 (Niedersachsen) and in 1990 (Hamburg) as an administrative decision at the end of 10 to 20 years of debate in this region. From the very beginning of the idea there were strong opposing groups, until today.

II. TOPIC AND CENTRAL QUESTION

The Wadden Sea is an area that different stakeholders want to influence and to use for their own purposes. A total absence of human interference is therefore an impossible protection and ecological goal in this area. The major difficulties are between developing a sustainable use of the area whilst keeping as much natural areas as possible undisturbed.

This report lists up the difficulties in bringing the different sides together, to mediate and to negotiate between them and, as the overall aim, to combine the activities with the demands of a National Park to conserve this unique natural area for following generations.

The understanding of the Wadden Sea as a whole and complex ecological and social system demands some general information as well which were mainly adapted from the official information agencies and their material[9].

The different ongoing processes and the possible influence on them will be treated by using some of the methods proposed by the different lecturers during the MPI and IGEI Summer Session 2000 in Hamburg, Germany.

III. THE WADDEN SEA, AN AREA TO PROTECT

The Wadden Sea covers the western coasts of the Netherlands, Germany and Denmark. It is the largest wetland area of Europe which developed its unique character under the regime of the tides of the North Sea.

The human settlement in this area has more than thousand years tradition and the economic activities started with hunting and fishing.

The technological developments allowed a growing human influence on the environment, especially from the beginning of the 20th century on. The natural physiognomy of the landscape was more and more changed into an agricultural picture.

The growing land use was in all times closely related to the improving possibilities of coastal protection and the embankment of new areas to be transformed for agricultural purposes.

Pioneers, organised in NGO´s, started the first initiatives for the protection of environmental structures in the beginning of the 20th century, but it took almost 70 years until the official authorities began to cope with the problem of protecting this area of outstanding natural value.

Nowadays the trilateral co-operation between the Netherlands, Germany and Denmark regarding the conservation of the area can be seen as an example for good regional partnership.

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[9] for example: Common Wadden Sea Secretariat (Hrsg.): Erklärung von Stade – Trilateraler Wattenmeerplan, Wilhelmshaven, 1998

From the south of Denmark to the north of the Netherlands[10]

The Wadden Sea extends from Esbjerg on the west coast of Denmark to Den Helder in the Netherlands. It covers a total area of 8,000 km². The Danish and Dutch Wadden Sea are nature reserves. National Parks were established in Lower Saxony, Hamburg and Schleswig-Holstein.

The Wadden Seas natural environment is a harsh one. Mud flats fall dry at low tide, exposing the organisms living there to wind, weather and predators. The plants and animals of the Wadden Sea are, however, adapted to these extreme conditions. Mussels, marine snails, shrimps and worms all have their own strategy to deal with the problems they are faced with the tidal flats. At low tide mussels close their shells to prevent desiccation, worms bury themselves in the mud to escape the beaks of hungry waders and shrimps move into the deeper channels.

The Wadden Sea is a rich feeding ground for numerous species of birds. For migratory species it is an ideal and necessary stop over site on the way from their wintering grounds to their breeding areas, where energy reserves can be stocked up for the long journey.

The Wadden Sea is also home to many seals. Approximately 15,200 of these sea mammals were counted on the sandbanks in 1999, 5,800[11] of them in Schleswig-Holstein.

What is so unique to the Wadden Sea – why build up a National Park?

The Wadden Sea extending along the coastline of Denmark, Schleswig-Holstein, Lower Saxony and the Netherlands is unlike any other natural landscape in the world. Nowhere else does one find a stretch of tidal mud flats of this dimension nor with a similar combination of wadden areas, salt marshes, dunes, sands, estuary rivers (estuaries) and islands.

The different habitats in the Wadden Sea[12]

The wadden area is the very special part that is regularly flooded and dried by the changing tides. Mud flats and small channels run through the area, they lead the water masses into and out of the North Sea.

There is an uncountable amount of life forms above and below the surface of the wadden areas. From the water and the ground particles they take nutrients but also harmful substances that come in with the flood. These small life forms themselves are food for the higher consumers such as fish and birds.

The second very important habitat are the salt marshes, they arise through sedimentation in front of the dikes. They are lifted out of the tidal regime and are just irregularly flooded.

Under these special circumstances (changing salinity, floodings, good fertility of the soils…) a very highly specialised community of life developed.

One good example for this specialisation are the insects in the salt marshes, around 400 species are specialised on 25 species of plants.

The dunes in the Wadden Sea are, as anywhere else, built up by the wind activity.

The accumulated sands are fixed by plants with deep roots, so that wind cannot deflate the sediment material. The dunes do not only offer habitat for a lot of fauna and flora they are as well to be seen as natural coastal protection.

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10 see also: www.mu.niedersachsen.de/Nationalpark/oekologie.htm

11 see also: www.nationalpark-wattenmeer.de

12 see also: Common Wadden Sea Secretariat (Hrsg.): Erklärung von Stade – Trilateraler Wattenmeerplan, Wilhelmshaven, 1998

Sands are in permanent movement as long as they are not fixed by plants and flooded permanently.

Wherever Rhine, Ems, Weser, Elbe or smaller rivers flow into the Wadden Sea, salt-water and fresh water are mixed to brackish water that offers special living conditions, the rivers themselves are heavily used for transportation (Bundeswasserstrassen) and sewage water so that it was not possible to integrate them into the protected area of the national park completely.

The Schleswig-Holstein Wadden Sea possesses an additional exceptional feature: the "Halligen". These small islands without dikes are flooded during springtides or during storms, only the embankments, the "Warften", on which the houses are built, rise above the waterline.

Tourism in the National Park

Tourism is the most important economic factor for about two thirds of the communities bordering on the National Park. Two million vacationers and eleven million day trippers spend their leisure time on the west coast of Schleswig-Holstein every year.

Every fifth Euro of income in this region is earned in tourism and related jobs.

Spending time outdoors is the favourite activity of vacationers in the Wadden Sea, ranking before cultural or sports activities.

Most visitors are willing to accept restrictions if they help to protect the environment. Most people support the National Park and tourism organisations try to benefit from the natural activity.

One example happens every year in mid summer in the Wadden Sea near the island of Trischen which is the setting of a remarkable spectacle. Almost the entire European population of the Shelduck (Tadorna tadorna) meet just a few kilometres off the coast to moult. An astounding 160,000 birds take part in this mass moult.

Another could be guided seal – watching tours by boat or guided walking tours through National Park areas.

The Working Group Tourism and Conservation works out strategies to present interesting activities for tourists and to direct the flow of visitors in the National Park.

People who visit the National Park expect information about the importance of the region. The information centres with their exhibitions, lectures, slide shows and souvenir sales are meant to satisfy this need at various sites on the west coast.

In addition rangers of the National Park Service and non-governmental organisations make every effort to inform visitors about the Wadden Sea. They answer questions and offer guided walking tours of the area.

As a support to their activities a system of information booths, information boards and maps, interpretative trails and up-to-date bulletins can be found at many entrances to the National Park.

The Visitors' Information System is being developed in co-operation with the neighbouring municipality.

IV. ACTUAL SITUATION OF THE CONFLICT

4.1 Analysis of systemic interrelations[13] between measures to mitigate the environmental pressure of activities in the economic sectors: agriculture, fishery, tourism, industry, settlement, transport and energy (Fig. 4-1).

The biggest conflict potential in the Wadden Sea area is between the conservation of the natural environment and the touristic usage of the area, but there are some other diverting interests as well.

We can distinguish between measures and effects in the agriculture, fishery and industry (pointed lines), measures in the field of technology and coastal protection (dashed lines) and measures in the energy sector (thin lines).

4.2 Overview on stakeholders positions and conflict potential

The interests of the main economic actors in the region are very different and have to be harmonised for the implementation of the nature conservation objective. This task remains difficult and complex (Table 4-1). An analysis of actors, following Schwaninger and Grassl, shows the existing possibilities (Schwaninger, 2000; Grassl, 2000).

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[13] following: Prof. Schwaninger's method on complex system analysis, as presented in the Summer Session 2000, Max-Planck-Institute for Meteorology, Hamburg, Germany

Fig. 4-1: Analysis of Interrelations for the Regional Development of the Wadden Sea Area

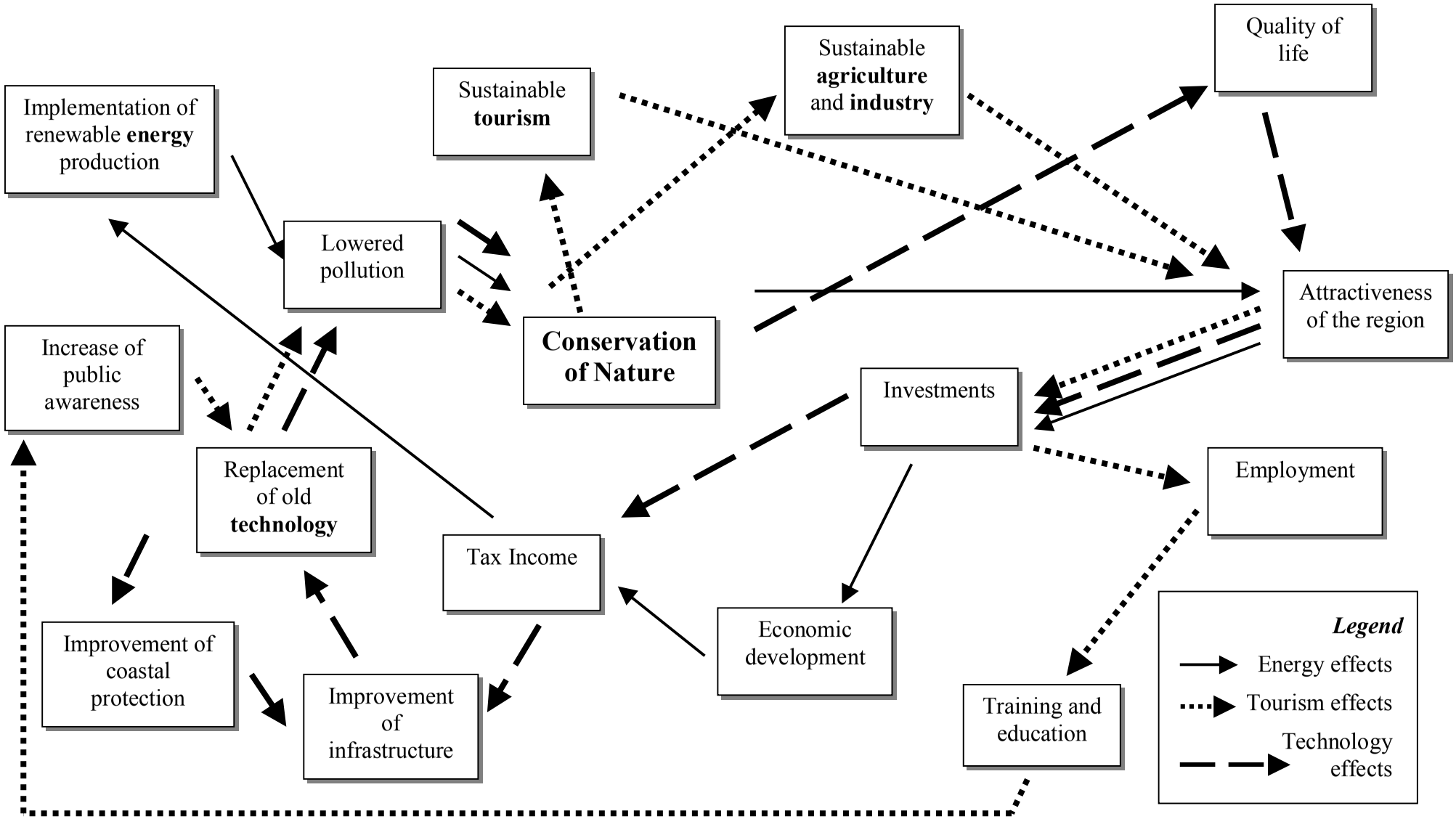


Table 4-1: National Park stakeholders, positions and interests [*]

Stakeholders	*Position*	*Interest*
National Park authorities	Unique landscape and the related fauna and flora must be protected	• Large area for National Park • Good public image • Raise public awareness
Coastal protection authorities	Coastal Protection is the 1st aim	• Low cost for CP • Strong influence
Administration Authorities on the **local** level (for example: city of Tönning)	Local development Raise local attractiveness Conflict between ecological and economic development	• Local economic growth • Re-election • Keeping up local "character"
Administrative authorities on the **regional** level (for example: Schleswig-Holstein)	Regional development Weaken the disparities between smaller areas Conflict between ecological and economic development	• Regional economic growth / structural change • Re-election • Low financial part for coastal protection • Stable tax income
Administration Authorities on the **national** level (for example: Germany)	National development Weaken the disparities between countries Conflict between ecological and economic development	• National economic growth • Conservation of existing agricultural structures (incl. fishery) by subsidies • Re-election • Low financial part for coastal protection
Administration Authorities on the **international** level (for example: European Union)	International development Bringing international administrative authorities together	• Low financial part for coastal protection • Improve international co-operation • Increasing decisive influence
Farmers and **fishermen** Organisations	Tradition in the area legitimates the continuous usage	• High profit • Traditional lifestyle • Subsidies • Guaranteed income
Citizens	Good quality of life and sustainable or (better) increasing income	• Housing • Employment • Safety • Recreation
Tourism organisations and private sector	Environment is part of the "product" => less protection	• High profit

[*] following: Grassl, H. (2000): Overview on stakeholders (presentation on Summer Session 2000) Hamburg (unpublished)

Stakeholders	*Position*	*Interest*
Tourists (including health- tourism)	Good quality holidays in nice environment; Medical facilities in close distance	• Recreation • Water sports • Health infrastructure • Activities (sports, adventure) • Good touristic infrastructure
Renewable energy companies	Installation of renewable energy plants cannot harm the environment	• High profit • Good image
Military authorities	National Protection comes first	• Areas for practicing

V. CASE STUDY ON A SUSTAINABLE PROJECT IN THE WADDEN SEA - THE MULTIMAR WATTFORUM IN TÖNNING, GERMANY

5.1 GEOGRAPHICAL AND ARCHITECTURAL DATA FOR THE MULTIMAR WATTFORUM

Fig. 5-1: Location of the Multimar in Tönning, Northern Germany[14]

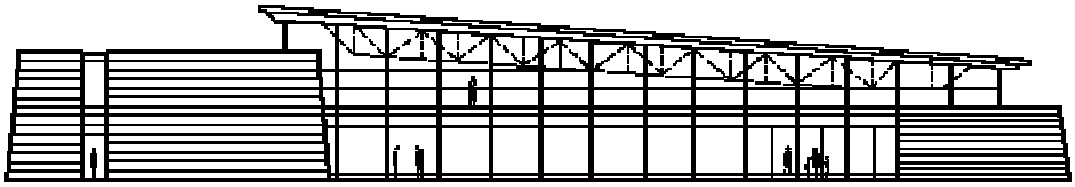
This map shows a large part of northern Germany, on the left side of the map lies the German part of the National Park Wadden Sea but as already mentioned it continues over the administrative boarders to Denmark in the north and in the western direction into The Netherlands. The Wattforum can be reached from the two biggest cities in Schleswig-Holstein, Kiel and Flensburg, within 75 to 90 minutes by car and from the city of Hamburg the distance can be travelled in approximately 2 hours by car.

The building in which the Multimar forum is situated lies in the marshland of the Eider River, near the city of Tönning.

The house is designed in a very sophisticated way it shows a triangular construction, this form of its ground plan was chosen to symbolise the inseparable unity of humans, marshes and the Wadden Sea itself (Fig. 5-2).

[14] Fig. 5-1 and 5-2 are taken from the homepage of the Nationalpark Wattenmeer (www.wattenmeer-nationalpark.de)

Fig. 5-2: Side view on the Multimar building in Tönning, Germany



The visitors have to enter the building "… over the historic Eider dike, and from there across a bridge. The location of the building in the forelands of the Eider and the surrounding area of 10 hectares make it possible to grasp distance as one of the characteristic features of the marsh[15]. … ".

5.2 WHAT IS THE MULTIMAR WATTFORUM?

The opinion of the inventors of the idea to build up a "Wattforum" in Tönning is, that scientific research institutions have the obligation to "present the results…, and to inform the public in a comprehensible manner" as they point out in their own information material in 1997.

Through the media, as television, newspaper, etc., the public awareness can easily be directed to problem fields in the environment, but it is very difficult to justify that only through permanent research the solution of problems is possible.

Regarding the inventors opinion the basic "..mission.." of the Wattforum is to be "a centre for Wadden Sea monitoring and information, … to explain scientific research and its results. Its objective is to achieve a better understanding of the ecological interrelationships in the Wadden Sea, in order to explain to the public the need for continuous environmental monitoring in the North Sea coastal region. The institution focuses on information and education in a popular form, as well as meetings and exchanges, fun and recreation, environmental protection and research, and management of conflicts arising from different user demands".

5.3 FUNCTIONS OF THE MULTIMAR WADDEN SEA FORUM

The inventors and the scientists that are part of the Wattforum have pointed out that the Multimar Wadden Sea Forum in Tönning has four main functions as there are:

- to be an institution of environmental education
- to be a stage for presentation of scientific data
- to be an information centre of the National Park
- to function as a place for active recreation.

The environmental education of the facility is organised in a very modern way compared to many other German museums. The exposition area offers a broad range of different ways to present the sciences that deal with the Wadden Sea area.

The different parts of the habitat Wadden Sea are presented by huge aquaria, tidal and experimental tanks, multimedia presentations, interactive games and sculptured natural space.

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[15] Meurs, G. and Bockwoldt, E. (2000): Multimar Wattforum Tönning, Information Folder, Tönning

The design of "touch pools" and a "research laboratory" was especially made for younger visitors so one can say that the exhibition as a whole covers the full range of age of its visitors.

In its function as a stage for the presentation of scientific data and research, the Multimar puts the conflict management between any usage of the area vs. the protection of the natural environment in the focus. The exhibition tries to put the visitor into the position of the different stakeholders of the area (not all of them) gives the scientific background and by this enlarges the understanding for the user conflicts and makes him think of solutions as well.

The third point offers the possibility for the institution to give place to people who want to discuss various issues concerning nature conservation activities.

A sometimes underestimated potential of the Multimar Wadden Sea Forum is its wealth as an attraction for the tourism in the area on the one side and as a site for excursions for the residents of the region on the other side.

5.4 THE MULTIMAR WADDEN SEA FORUM AS A SUSTAINABLE PROJECT AND ITS POSSIBILITIES TO BE HELPFUL FOR INSTALLING MORE SUSTAINABILITY IN THE REGION

Is the Multimar Wadden Sea Forum a sustainable project and can it help to bring more sustainability into the region?

One of the Multimar Wadden Sea Forum targets is to bring the fishery and the agriculture in the region on a sustainable level by taking care of the environmental impacts that these activities bring up to the nature. Therefore, it uses as one of its basic functions information.

A sustainable agricultural use leads the development in a more sustainable direction.

The same process has to be undergone by the tourism, here the Multimar Wadden Sea Forum can also help by informing the tourists and by this lead the further development into the right direction.

These two big blocks (tourism, agriculture, incl. fishery), if they are guided in their development, lead the region of the Wadden Sea as a whole to more attractiveness. What does attractiveness mean in this context?

First of all a higher attractiveness of a special region means, or influences the satisfaction of their living conditions, or in other words, the quality of life.

In the economic point of view a happy population is good, because a good motivation is always closely connected with this phenomena. The economic stakeholders like to invest into regions like these and by investing they carry new capital into the area and thereby increase the degree of employment, what as one looks closer to it, increases the happiness and quality of life again by itself so one could speak of a "motor for development" (Fig. 4-1).

A higher amount of employment and free new capital into a region are to some degree used for training and education, to some degree they are reinvested, which leads to economic progress. Last but not least a good and constant cash flow brings more money into administrative budget by taxes.

Training and education, this is where the Multimar Wadden Sea Forum again can influence the development in a positive way, good financial support for the institute guarantees modern exhibitions, the implementation of actual topics and a well trained and equipped staff to present the results of the research. In addition to that a secure financial situation could make it possible to increase the marketing for the facility and by this increase the amount of interested

visitors for the institution.

If we take all these things together, it becomes clear that by these means the public view on the environmental issues can be stimulated, a public awareness for the delicate situation in which the Wadden Sea is, can be created, an atmosphere where a high sensitivity for pollution and destruction of the area exists.

The administrative authorities also gain more possibilities of acting in the process, for example if one looks at the higher amount of taxes that will be collected.

The political stakeholders can improve the infrastructure of the region to lower the bad environment impacts of economic use, settlement and other forms of usage of the area.

A good example of this might be the solution of the traffic problems that regularly appear to the area during high touristic season. The enlarged sensitivity for the environmental issues of and inside the region might and should lead the responsible persons to the view that not only the construction of new streets will solve the problem, but the modernisation and increasement of public transport could be a good alternative.

Another improvable point of global importance is the implementation of alternative and renewable energy production plants, in the Wadden Sea nowadays mainly wind energy plants, that can only be financed with support of the administrations.

A very sensitive field is the coastal protection of the area in which a great potential for a clash of interests can be found because it is mostly situated in dangerous areas.

To put it in a general statement, the increased cash-flow offers to the administrative authorities the possibility to modernise and replace old technology, increase the environmental performance of existing structures and by this lower the bad impacts of human presence in a very sensible area like the Wadden Sea.

In this described process the Multimar Wadden Sea Forum can play a very important role by functioning as a location where different stakeholders can meet to mediate and negotiate under the assistance of well educated and equipped scientists who got the scientific overview on the demands of the region. The Multimar Wadden Sea Forum should be one of the neutral advisors to the administrative authorities by integrating the different points of views of NGO´s, residents, tourists, national park authorities and so on.

5.5 POLICY AND ADMINISTRATIVE MANAGEMENT IN THE WADDEN SEA REGION SHOULD FOLLOW 8 GOOD BASIC PRINCIPLES[16]:

1. Principle of Careful Decision Making
   to take decisions on the basis of the best available information
2. Principle of Avoidance
   activities which are potentially damaging to the Wadden Sea should be avoided
3. Precautionary Principle
   to take action to avoid activities which are assumed to have significant damaging impact on the environment, even where there is no sufficient scientific evidence to prove a causal link between activities and their impact
4. Principle of Translocation
   to translocate activities which are harmful to the Wadden Sea environment to areas where they will cause less environmental impact

[16] see also: cwss.www.de/

5. Principle of Compensation
   the harmful effect of activities which cannot be avoided, must be balanced by compensatory measures
6. Principle of Restoration
   where possible, parts of the Wadden Sea should be restored if it can be demonstrated by reference studies that the actual situation is not optimal, and that the original state is likely to be re-established
7. Principle of Best Available Techniques
   to apply the latest stage of processes, facilities or methods with the aim of limiting emissions, reducing by catch etc.
8. Principle of Best Environmental Practice
   to apply the most appropriate combination of measures with the aim of limiting environmental impacts.

These good principles are in practice sometimes not easy to implement, especially for an institution as the Multimar Wadden Sea Forum whose financial support is mainly given by authorities that are quiet near to the governmental level. In this point of view the position towards the military facilities in the Wadden Sea area could shine in another light.

Criticism also came up regarding the architecture of the Multimar Wadden Sea Forum building, there were many residents and visitors as well who were not satisfied with the outer appearance of the institution and who saw it in a clear contradiction to what it should represent.

VI. CONCLUSIONS AND FUTURE TARGETS FOR THE SUSTAINABLE DEVELOPMENT OF THE WADDEN SEA AREA (FOLLOWING THE WADDEN SEA PLAN 1996)

- A healthy environment which maintains the diversity of habitats and species, its ecological integrity and resilience as a global responsibility
- Sustainable use of the area
- Maintenance and enhancement of values of ecological, economic, historic-cultural, social and coastal protection character, providing aspirations and enjoyment for the inhabitants and users
- Integrated management of human activities which takes into account the socio- economic and ecological relationship between the Wadden Sea area and the adjacent areas
- An informed, involved and committed community.

VII. REFERENCES INTERNET

Selection of links to additional scientific information for further research on the Wadden Sea

Common Wadden Sea Secretariat (2000): cwss.www.de/, Wilhelmshaven, Germany.

Deutsche Bundesstiftung Umwelt (2000): www.umweltstiftung.de/, Osnabrück, Germany.

Deutscher Naturschutzring, Dachverband der deutschen Natur- und Umweltschutzverbände (DNR) e.V. (2000): www.dnr.de/, Bonn, Germany.

Forschungs- und Technologiezentrum Westküste (2000): www.uni-kiel.de/ftzwest/ftzhome.htm, Büsum, Germany.

Greenpeace Deutschland (2000): www.greenpeace.de/, Hamburg, Germany.

Landesamt für den Nationalpark Schleswig-Holsteinisches Wattenmeer (2000): www.wattenmeer-nationalpark.de, Tönning, Germany.

Multimar Wattforum (2001): http://www.multimar-wattforum.de/ Tönning, Germany

NABU – Schleswig-Holstein (2000): www.nabu-sh.de/, Neumünster, Germany.

Niedersächsisches Umweltministerium (2000): www.mu.niedersachsen.de/Nationalparke/oekologie.htm, Hannover, Germany.

Projektzentrum Ökosystemforschung Kiel (2000): www.pz-oekosys.uni-kiel.de/, Kiel, Germany.

Naturschutzgesellschaft Schutzstation Wattenmeer e.V. (2000): www.schutzstation-wattenmeer.de/, Rendsburg, Germany.

Seehundaufzucht- und Forschungsstation Friedrichskoog (2000): www.friedrichskoog.com/locations/seehund.htm, Friedrichskoog, Germany.

Umwelt.de Medienservice AG (2000): www.umwelt.de/index.asp, Ostfildern, Germany.

WWF – World Wildlife Fund Deutschland (2000): www.wwf.de/, Frankfurt, Germany.

VIII. REFERENCES

Brown, P.G. (2000): Ethics, economics and international relations/ Transparent Sovereignty in the Commonwealth of Life, Edinburgh Studies in World Ethics, MPG Bodmin, UK.

Common Wadden Sea Secretariat (Ed.) (1998): Erklärung von Stade – Trilateraler Wattenmeerplan, Wilhelmshaven.

Graßl, H. (2000): Overview on stakeholders (presentation on Summer Session 2000) Hamburg.

Stock, M. et al (1996): Ökosystemforschung Wattenmeer – Synthesebericht: Grundlagen für einen Nationalparkplan.- Schriftenreihe des Nationalparks Schleswig- Holsteinisches Wattenmeer, Heft 8.

Schwaninger, M. (1997): Integrative Systems Methodology: Heuristic for Requisite Variety; in: International Transactions in Operational Research, Vol. 4, No. 2, 109-123.

CONCLUSION – BOTH MORE SCIENTIFIC RESULTS ABOUT ACHIEVING SUSTAINABLE DEVELOPMENT AND MORE ACTIONS ARE NEEDED

Harmut GRASSL

Jacques LEONARDI

The needs for capacity building, educational and scientific activities on "how to achieve sustainable development?" remain very high. Not only because the answer to this question is too often inconceivable, unclear or because most of the well known measures fail to reach the expected targets, but also because of a delay of so many years after Rio, we really obtain a time pressure.

It is very clear for us, after six weeks of intensive debates with excellent experts, exchanges of ideas and presentation of new concepts, approaches and science results from many countries and four continents, with the perspectives of the south, the north and the transition countries, that we have first to address the most pressing non-sustainable trends like climate change, to develop innovative concepts to tackle tem, and parallel to this, try to surmount the actual existing barriers and obstacles. In our perception, the challenge of SD seems to be, after the Summer Session, higher than before.

Even if we have to act on so many different fields, it will be increasingly required to work together with the same "sustainable development" perspective, in a co-ordinate manner. For this reason, it is not difficult to find the common topic of all the working group results: The debate on the best possible institutions is always connected with the debate on the best possible management and organizational solutions. Despite the high diversity of the examples: we found these common principles of SD, common languages and common goals in science and practice, similar methods in enterprises and administrations, comparable activities in small households and large states. To further examine these principle similarities, like systemic interrelations, communication structures, stakeholder interests or lever adequacy could be useful for a further development of a sustainability science.

In all the fields studied, the availability of technologies was never the crucial point. Crucial was to implement the techniques in an efficient and economically profitable manner and to convince the stakeholder and the policy maker to take the right decisions.

But we are far from cohesion in the concepts and are very often confronted by the principal problem of heterogeneity in the activity. For instance, the integration of projects from diverse economic sectors into a coherent climate protection strategy is extremely difficult, and the scientific evaluations in this context are very uncertain. We are still in the beginning phase of the implementation of foreseen strategies, policies and measures. Most of the projects on sustainable development are not beyond the stage of a pilot phase, especially in the aviation sector and all the Kyoto related mechanisms for financing energy supply projects. Unfortunately, many of them are only existing on the paper. But new ideas, even if they are not implemented, are not always necessarily wrong.

The Summer Session "Beyond Kyoto - Achieving Sustainable Development" was a successful event from both the scientific and the practical point of view. All our objectives were reached and the outcomes exceeded by far our expectations.

The main results of the Summer Session were:

- most of the sustainable development projects are already successful and manageable
- the experience on management practices acquired by the participants during the Summer Session increases their skills
- the co-operation atmosphere within the lecturers was excellent
- the presentations of participant experiences inverse the lecturer-participant role and introduce a real global perspective in the dialogue on achieving SD
- a network on implementation difficulties for sustainable development projects have been established in almost each working group
- the experience of the organisers and the participants in capacity building and educational activities for climate change measures and policies increased.

Our message for the scientific community

As a conclusion, our message is to pursue in a common vision of SD and concentrate our efforts in the future on the following complementary matters:

- Global change research
- Research on "how to better achieve Sustainable Development" or "Sustainability Science"
- Training of decision makers and stakeholders on SD relevant management methods
- Maintain a global network of communication on Sustainable Development.

Participants and lecturers proposed in the Summer Session 2000 and in this report some promising, innovative, feasible concepts, measures and instruments. With this publication, we hope to contribute to the beginning debate on the best available sustainable development (SD) methodologies, including description and modelling, quantitative and qualitative analysis, perception and communication matters, conceptualisation, project planning, objective setting, instrument use and ex-post-evaluation.

The way of in deep scientific review and evaluation of all these methodologies and the search for the problem-adequate combination, which bring the solution for efficient, rapid achievements in energy efficiency, renewables, SRD, sustainable tourism, agriculture or inner city redevelopment, seems to be an absolutely necessity. Some Working Group Reports and some lectures show this possible combination or measures and adequate methods for a quick decreasing CO_2-emissions in a well defined rural area, in aviation or in the building sector of a large city. Some participants and lecturers show how the awareness can be focussed on the climate change issue and how this influence the behaviour of the next generation.

But sometimes, this way to an effective implementation of SD principles also seemed to have an unreachable, far end. During the Summer Session, we went some steps in this direction.

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ISSN 0937 - 1060