

IV Biennial International Workshop Advances in Energy Studies  
**Ecology-Energy Issues in Latin-America**  
Universidade Estadual de Campinas (Unicamp)  
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## **Introductory words**

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### **Workshop's History and Scope**

Researchers from diverse scientific areas related to multidisciplinary analysis met for three workshops in Porto Venere, Italy, over the last 5 years., with the aim of evaluating the relationship between human activities and the environment, Issues were approached using methodologies which ranged from classic thermodynamics analysis, to different energy and energy-related environmental assessments and economy evaluations.

In the last meeting, researchers concluded that it is highly important to understand these issues for developing countries and for Latin America. This is why Brazil is hosting the fourth workshop called *IV Biennial International Workshop - Advances in Energy Studies: Ecology-Energy Issues in Latin America* at the University of Campinas, in Campinas, São Paulo State on July 15 – 19, 2004. The meeting will focus on the analysis of Latin America's position within the globalization process and in the international economy as well on scenarios for the region, in order to subsidize the decision-making process on the definition of general public policies.

In particular, the meeting aims at focusing on the following objectives:

1. Giving ample publicity to the created *scenarios* and proposing alternative development models.
2. Increasing society's and decision makers' awareness.
3. Outlining the support mechanisms to implement proposed solutions.
4. Encouraging the development and consolidation of an exchange network among research centers and groups that promote Sustainable Development through the creation of a permanent work team.

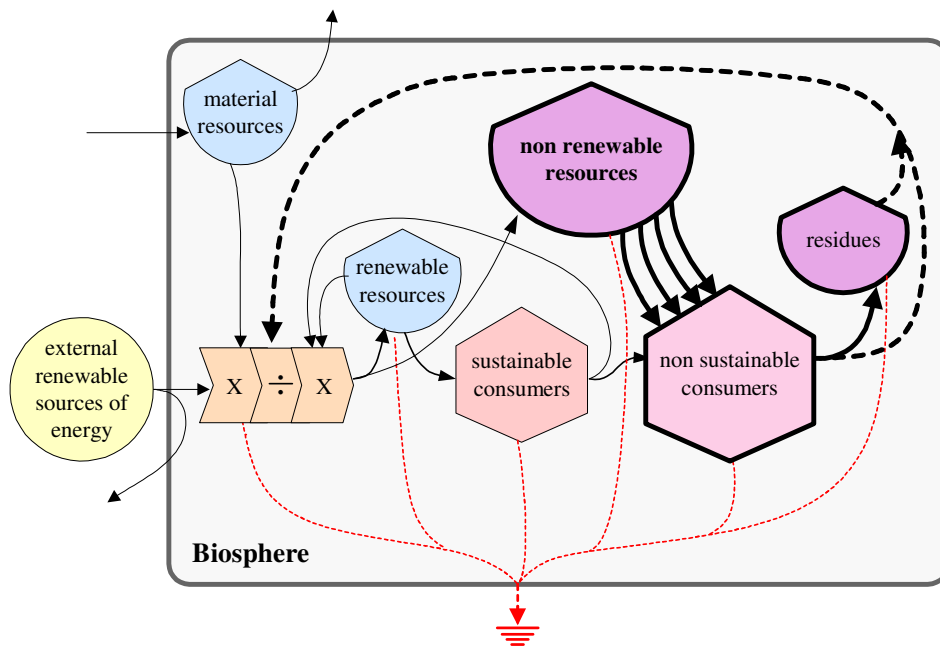
### **OBJECTIVES**

This Workshop intends to offer government, scientific academy and organized sectors of Latin America advances in Energy Analysis and in the appraisal of technological, social and political alternatives for human development. It is taking place at a time of great questionings on Globalization effects.

Energy Analysis is a powerful scientific tool that enables the discussion of "future scenarios". In order to be feasible, these scenarios need to incorporate the social and cultural dimension, through the parameter called "richness distribution", as well as the ecological dimension through the parameter known as "sustainability".

All over the world there is a demand for a new form of development that would really constitute an alternative to the present economic system. This search becomes evident in the discussions and conclusions of the “World Social Forum”.

Globalization has affected negatively ecosystems and native populations in the Southern Hemisphere; this situation can no longer be disregarded. On the other hand, for a long time, Northern Hemisphere populations have received the benefits of the economic model with no social costs. But today, people from the North are becoming aware of the environmental and social disasters in course. They even know that today the cost of oil does not take into consideration the political and military costs and are discovering that the Information Society is based on low-price Arabic oil.



Resumed energy flows diagram of Biosphere situation.

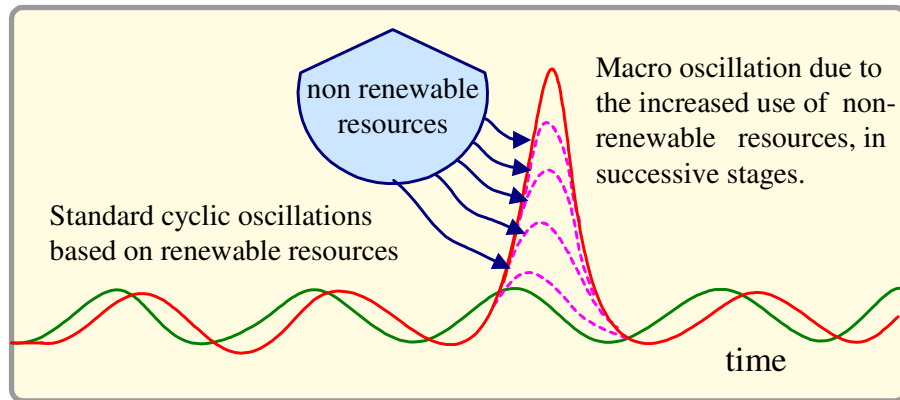
Figure1. Systems Diagram showing that World’s Consumption Society (non sustainable consumers) is based on fossil fuels, a Non Renewable Resource. It also shows that, the vital supply of Renewable Resources is declining because natural ecosystems are affected by undesirable feedback produced by modern intensive human activities. The remaining sustainable consumers are suffering an exclusion process by the expansion of very competitive systems of Northern Countries. Nowadays, some Southern countries, as China, Brazil, India, are entering into that Biosphere’s destruction pathway.

Everywhere, politicians are subject to intensive pressures that limit their choices to small adjustments in the dominant technological and financial frameworks, which do not allow them to think about long-term scenarios. The scientists that work with ecological, energy and economic systems should join efforts with society to discuss new alternatives.

**Producers' stocks (biomass and diversity)**

**Consumers' stocks (population, physical structures, information)**

**Non-renewable stocks (fossil fuels and aquifers, species)**



Plot of production-consumption cycles in nature showing a high intensity pulse when non renewable resources (fossil fuel, biodiversity) are used by humanity.

Figure 2. The media offers to the public a false idea that Human Economy is a Forever-Growing System. Only a very few scientific tools can help us to understand the real situation. Energy Analysis can show us that exponential growth of human activities is based on an increasing intake of energy and material resources from Nature. The growth is made possible by technological advances in the use of resources, but this intake deprives other species of vital energy and affects the Biosphere in a negative form.

We know that Nature always proceeds in cycles, which may be small or medium-sized (if based on renewable resources) or big (if based on non-renewable resources). We are witnessing the end of a long cycle of **economic expansion** that will likely be followed by a deep decaying process that is called **senescence period**. The social and scientific paradigms of growth are very different from those of the decay process. The first ones are based on competition, exclusion and growth, without any concern for social or environmental debts (passives). The senescence model should have as principles: cooperation, dialogue, social inclusion, sustainable patterns of production and consumption, ecological methods and high systemic efficiency. The growth stage of the cycle we are living in has led to an increase of human population. The scientific proposals for a transition to Sustainable Development should consider the re-integration of urban populations to rural spaces in the best possible manner, not only in the Southern Hemisphere but also in the North of the World. The ecological occupation of rural space should happen in both areas, at the same time, in order to have success and both movements should have interactions. The time is scarce if we are to avoid a "population over-shoot".

Our hope is that the Workshop can be a useful **forum** to discuss **Ecology-Energy Issues in Latin America** with the contribution of insights from scientists of Northern and Southern Hemispheres. And also that Agenda 21's directives may be correctly addressed and serve as a basis for a real transformation in society's production and consumption patterns.

## PRESENTATION OF SESSIONS AND MAIN ISSUES

### **FIRST SESSION: SCENARIOS ACCORDING TO ENERGY AND SOCIAL ALTERNATIVES.**

#### **Seeds for the future.**

A discussion on Future Scenarios for Latin America, taking into account the availability of renewable and non-renewable energy sources in the next decades and the auto-organization capacity and cooperative efforts between economic systems. Open debate on Energy Resources, Social Scenarios and Priorities.

Systems Ecology has made progress to forecast the future of the Biosphere, world ecosystems and local systems. It is evident that depending on the development policy that is adopted, the scenarios could be either good or terrible, in terms of quality of life for Latin American populations.

The analysis of scenarios shows that the prevalent competitive excluding model must be changed to a cooperative-inclusive one. To make it possible, the academic community has to develop a great concern with preservation of natural resources, clean production processes and respect for regional human cultures in their scientific and technical proposals.

Economic planning for future decades must consider the renewable capacity of ecosystems to support human activities and sustainable patterns of consumption.

The scientists involved in Economic Planning must evaluate sustainability according to energy, economic and social indices in order to compare options.

Net energy yield ratio will be a very important indicator, as well as renewability ratio, total energy investment ratio, fair exchange ecological price.

Project evaluation should include the costs of "externalities" and restoration of environmental services ("multi-functionality").

All these new indicators have to be considered in the formulation of Public Policy for Sustainable Development

The design of Eco-Units and Eco-Nets could be a starting point to re-model rural and urban systems for Sustainable Development. Therefore it could be a topic of great interest for Latin-America's Agenda 21, as agrarian reform and new kinds of rural systems become regional and national priorities.

**SECOND SESSION:  
MANAGING AGRICULTURE IN SPACESHIP EARTH.**

**How to deal properly with Agriculture, Energy, Natural Resources and Population.**

Discussion of agricultural case studies from both Hemispheres, using economic, social and energy analysis, building a platform for implementing Agenda 21 in Latin America.

**New paradigm: everybody needs to discuss and cooperate.**

Nowadays, the economic model of Northern Hemisphere countries, characterized by high consumption of non-renewable resources, can no longer be used as a model neither for them nor for the South. In the global arena there are political, military, market and ethical pressures for and against a new model of Social Development based on Sustainable patterns of production and consumption. The individual concerns with the health of the Biosphere must be transformed into new social conscience and then into new behavior of social movements, institutions, mores and laws. The progress in this sense may be, at the beginning, slow, but afterwards, it needs to be rapid and effective. The consequences of our efforts to deal with this change could be of great importance in social and biological terms.

**A period of transition to Sustainable development**

Several researches and social experiments are being carried out in many countries to deal with this phenomenon, but not always with the correct hypotheses and procedures. The basic question is to modify production and consumption systems to achieve sustainable patterns. The main challenge is not to preserve the present economic model but to design a new one with an ecological basis and with social justice and fairness in international relations. So, it is necessary to distinguish between cases of real transition and cases of minimal adjustments.

**The common use of common resources**

The concept of **Spaceship Earth** implies fairness in international relations, as all human activities produce, in the long run, developments that, in their synergic and cumulative effects, impact the environment beyond national boundaries, and consequently alter the quality of life for all. Agricultural production, energy and natural resource use, whether renewable or non-renewable, are intermingled activities and depend on consumer lifestyles and political choices based on cultural and other value systems. The rise of multinational corporations in the 70's, and the progressive increase in their economic power, together with the advance of telecommunications, precipitated the process of globalization, which is leading to the extinction of entire ecosystems and traditional cultural alliances. Society needs new models of agricultural and energy production, which must imply more sensitive use of natural resources, and a lifestyle more in synergy with natural cycles.

**Examples of organization for transition.**

In this respect, the choice of case studies about key issues, illustrating novel approaches and solutions is fundamental to delineate a different regional and global scenario. These case studies should be proposed by prospective workshop participants and agreed on through consensus. They should be analyzed according to a common scientific structure, also proposed and agreed on and evaluated by diverse methodologies to be able to obtain as broad as possible a picture of their achievements, limitations or drawbacks, in such a way as to point out real possibilities of applications in different situations, contingencies and scales.

**Agriculture and Forestry**

The choice of agriculture and forestry as a starting point is due to the fact that we might be able to standardize better certain evaluation procedures by working on input-output flows and units per hectare, but this is just an initial suggestion.

### **THIRD SESSION:**

#### **VISIT TO RURAL SYSTEM WITH NOVEL APPROACH.**

**Cultural program:** (a) Agro-ecological Farm; (b) Social Activities - Drums!!!

Rural production systems have undergone great changes during the last century. The use of chemicals, machinery and fuel caused, as unexpected byproducts, especially in poor countries, a massive rural exodus to urban areas without the opportunity of good employment, the destruction of biological assets and the loss of systemic efficiency. Some social movements have tested innovative proposals to reverse this cruel situation that led to a new kind of barbarism. It is important for researchers from the Northern Hemisphere to establish contact with this reality through guided visits.

### **FOURTH SESSION:**

#### **THE "STATE OF ART" IN ENERGY AND SUSTAINABILITY.**

**The challenge is to change the Development Model:** From a technical, thermodynamic point of view, **will available energy sources deliver enough net energy to keep the system running at the present intensity level?** Some leading energy researchers believe that we must prepare for a state of decreasing availability of fossil fuel energy sources and discuss scenarios of increasing prices and decreasing levels of production in an effort to recover biodiversity and sustainability.

Some energy alternatives sometimes put forward as new sources (e.g. hydrogen cells) are not primary sources but new ways of using conventional primary energies.

We should also consider that some energy alternatives (as nuclear energy) receive heavy subsidies through the use of under-priced fossil fuel oil.

**What is Sustainability?** All over the world, politicians and entrepreneurs are questioned about Sustainability. Usually, it takes time for them to ask about this new concept, initially they do it reluctantly, later more open-mindedly. However, it is difficult to assess Sustainability because this new concept has many dimensions (energy, politics, economics and social) and because the answer does not usually meet the expectations.

**Sustainable Development** involves a new kind of human organization oriented towards using renewable resources and lower quantities of fossil fuels, recycling, self-organization, concern for the distribution of benefits, inclusion of externalities in the prices of products, adjustment of populations to levels compatible with the carrying capacities of ecosystems. It is not "business as usual". Anyway, Sustainability, either as a single variable (degree of renewability of resources used) or as the best combination of multiple factors, will become a fundamental parameter to be considered seriously in economic and ecological planning, as non renewable resources become more scarce, and the destruction of the biosphere and human conditions reach critical levels.

**How to measure the Sustainability of Energy alternatives?** A new economic perspective is required, possibly based on a biophysical benchmark. Energy analysis of economic processes based on Thermodynamics of Open Systems offers the best possibility. The balance of material flows involved in a transformation process must thoroughly consider the energy costs of the inputs: the embodied energy of resources as well as their renewability or percentage of renewable energy used in the production process. Progress has been made over the last three decades in measuring sustainability and in energy analysis. There are promising methods, with their specificities of scope, field of application, restrictions and tendencies. These methods can be used in the evaluation and comparison of alternatives.

**Sustainability of Energy alternatives:** Results of evaluation of new energy alternatives were presented and discussed in the Workshop.

## **FIFTH SESSION:**

### **POPULATION AND NATURAL RESOURCES.**

The energy assessment of social questions in terms of thermodynamic indicators is much more complex than an energy balance of an ecosystem or a process.

A in-depth discussion is necessary of the indicators used in the energy analysis of economic systems to deal with social questions and positive and negative externalities. Well documented contributions of Energy, Exergy, Emergy methods and Ecological Economy approaches to the same issues are welcome.

Product certification, public policies implementation to deal with clean processes, fair trade prices and environmental services, as well as the possibility to establish taxes to penalize the destruction of jobs, natural areas, nutrient pollution, toxic contamination, carbon dioxide and methane emissions are all very important issues to deal with in this Workshop.

A very important topic of discussion is the unfair "economic debts" of impoverished nations as a limiting factor to international cooperation and peace. Finally, proposals on how to cancel the debt by means of the recognition of ecological and social passives and a re-evaluation of the payments previously made are urgently needed.

## **SIXTH SESSION:**

### **SCIENCE AND SOCIETY.**

#### **Scientific concern with the future.**

At the end of the meeting a debate on the relation between thermodynamics of open systems and Strategic Planning for Sustainable Development as recommended in the Agenda 21 Global Action Plan could be very productive. Results would be very important for developing countries that are still structuring their economies and need to establish public policies for Sustainable Development, which could enable them to foresee and avoid major distortions in natural resource use, planning and management, prompted by the harshly-learned lessons of industrialized countries.

Energy scientist can provide here basic principles and discuss practices applying research results so far obtained within the Agenda 21 Action Plan reference framework. The application of this knowledge occurs at a time of great concern about a sustainable future, where new concepts about the economy and suggestions for public policies could be well used by governments facing new kinds of problems that will not be typical of a stage of growth but of adjustments to limited resource use and growth based mainly on renewable resources. Another important topic for discussion is the moral obligation of scientists in industrialized economies to work towards a smooth and progressive technological transfer to the developing world, since the present power structure is intensely based on exploiting the natural resources of the South hemisphere and the populations that thrive on them.

What type of mechanisms could be built within our academic and institutional frameworks that would incentive, promote, facilitate, creatively administer and monitor such a steady flow of technological transfer? The conception and progressive establishment of a network of associated Centers for Technological and Cultural Exchange for a Sustainable Society worldwide could be a starting point. There is, in return, the feedback that developing countries can offer in this two-way transfer system, where the North would amply benefit from the South. The role of traditional populations to provide time-proven solutions to production systems adapted to ecosystems has long been recognized in disciplines such as ethnobiology, ethnobotany and ethnoecology.

We are in the right time to apply biophysical economy methodologies to the investigation of examples of successful relationships of man and his culture to environment. Such research has already been developed with Emergy Evaluations in traditional cultures in several countries. More work in this area could provide important comparisons to

contribute to our understanding and to the application of these solutions on a wider range of issues in different situations.

#### **SEVENTH SESSION:**

#### **WORKING PROPOSALS FOR SUSTAINABLE DEVELOPMENT AND MEDIA.**

##### **Working proposals for Sustainable Development.**

In view of the implementation of the directives of Agenda 21, there is an urgent need for mechanisms within academic and institutional frameworks to promote interchange, scientific development and technological applications to the problems at hand. Presentation of the conclusions of the meeting's sessions, debates and final proposals would greatly help.

##### **Agenda 21**

It is always a benefit to discuss Agenda 21 in as many forums as possible. It allows participants to clear issues and offers a coherent and practical framework for its implementation. As global action plan for the XXI century, Agenda 21 should be structured to express the concern of the Earth's population with its environment and better standards of living. It is a challenge for democratization in Latin America and other regions of the world. The global system is interconnected; the transfer of energy and rich raw materials in international trade always showed a positive balance in the developed countries and their human communities and losses in the countries of the Southern Hemisphere.

##### **Feedback to Society**

The society is willing to hear relevant questions expressed in clear form and with objectivity. It is very important for this International Workshop to make public, through the press, the important conclusions already obtained in previous meetings, especially the energy-ecology questions that could become matter for discussion in the local media, universities, governments, enterprises and social movements.

##### **Centers of Cultural Exchange for a Sustainable Society**

A final event is dedicated to presenting, through the media, the more important Latin-American research efforts towards Sustainable Development. We are informing the global audience about projects under implementation, research studies and new networks of concerted efforts of scientist of Northern and Southern Hemispheres. This session is therefore extremely important because the main objective of the Workshop is to improve scientific collaboration with governments, enterprises and social movements in order to accelerate actions for better relationship among individuals, human collectivities and nature.

##### **Finally, another future is possible!**

Several efforts are being carried all over Latin America to implement alternatives to the present system. Some of those, after critical analysis, will be presented to the media with more detail, in order to increase public support to these technological and social projects with better ecological indices.