Energy and City: integrated system for Sustainable Development

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NSF Sustainable Energy Workshop (Atlanta 00)

OLITICS AND STRATEGY TOWARDS TH ENVIRONMENT AND THE SUSTAINABLE DEVELOPMENT

Sustainable Development determines deep changes in public politics.

The local autonomies, the metropolitan areas administrators and the government must have well defined the actions that they can carry out and also understand what is the existing connection between investments in the sectors of respective authority and the development that today it is worthy to define as sustainable.

In the cities the diversity culture and identity are concentrated, so a fracture opens between the dominant culture and the "others" ones, those of the immigrant community and of the informal economy, too.

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The local negotiated planning that can become an important reference point and will bring also to the determination of space devoted to the location of energy and communication centers both in terms of generation and utilisation.

From this point of view, some Institutions as Schools, Educational Centers, Universities, Research Centers must operate with their advice action for supporting the Government Authorities decisions in a sharp and clear way.

In this scenery, the improvement of environmental sources, the recovery of the natural and cultural background, the safety of the people and the respect of the environment assume a priority role.

Sustainable development politics is strongly conditioned by the social and health-care services, by the transportation structures, by the energy systems that define not only the quality of the territory, but the highly interconnetted quality of life, too.

The sustainable development is determined by the culture of the people that live in the territory, their knowledge of the risk and their inclination to accept or avoid risks.

The definition of the benefit function pass through the interpretation of the complex interactions that exist between social phenomena, territory and energy. These latter are represented by indicators able to define politics that points to the optimum under some settled constraints.

It is important to assert that the politics of city plans is not only limited to town areas, buildings or social aspects, but must take into account also the energy problem.

Then these plans must define the areas of generation, transmission, distribution and utilisation of energy.

SECTORAL AND TERRITORIAL PLANNING

The definition of the objectives described above needs the right methodological approach that requires the individuation of the program plan and the attribution of the appropriate priorities.

The formulation of a sustainable model pass through a participation process that involves all the interested sectors, evaluates the possible strategic options, adopts action plans with measured objectives devoted to the sustainability, and sets up procedures of interaction and monitoring of the plan realization

The objectives that qualify a new method of city plan are the following:

1) **the identification of the general system for the definition of a sustainable development plan;**
2) **the identification of the problems connected to the realization of territorial politics and of renewable energy technologies;**
3) **the analysis of the impacts associated to the implementation of different alternatives;**
4) **the definition of a support to the decision process through successive steps of the problem of creating territorial strategies and renewable energy sources;**
5) **the correlation between the city and the relevant territory development with reference to the places of generation and transportation of the necessary resources and their discharge**

The problem areas to be considered for defining a politics of sustainable development consist of :

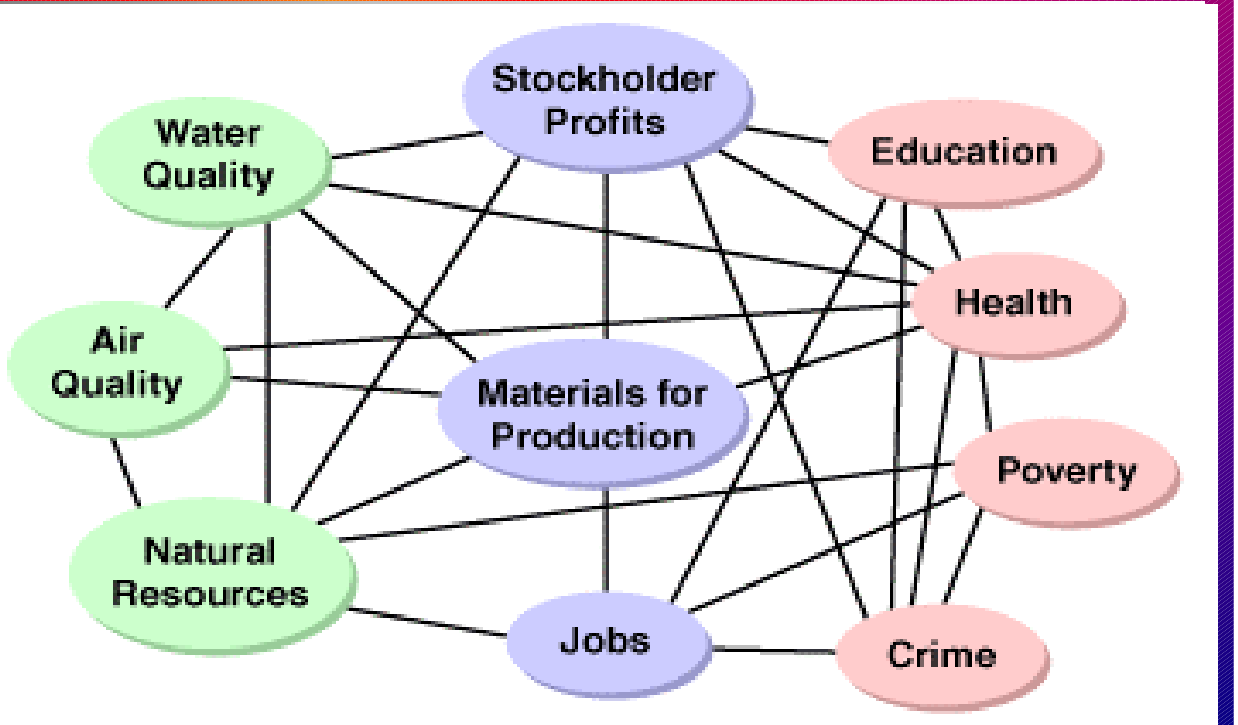
α) the formulations focussed on underlining the methodologies for management models and for continuous process of territory government (analysis, planning, management).

The need of creating instruments for the definition of constraints and standards, taking into account not only the relation among different sectors and the strategic vision of the city and territory development, but also criteria of quality on the social, economical and environmental point of view.

INDICATORS TO ENVIRONMENTAL POLITICAL SUPPORT

Indicators of sustainability are different from traditional indicators of economic, social, and environmental progress.

Traditional indicators measure changes in one part of a community as if they were entirely independent of the other parts.



Sustainability indicators (SIs) are indicators which would be used to reveal and monitor the conditions and trends in the any sector. SIs monitoring :

- **sustainability,**
- **development policy**
- **management performance**

in relation to the components of the any parts of system

SIs characteristics are:

- ✓ **relevant: they show you something about the system that you need to know**
- ✓ **easy to understand even by people who are not experts.**
- ✓ **reliable: you can trust the information that the indicator is providing**
- ✓ **based on accessible data: the information is available or can be gathered while there is still time to act.**

Indicators can be useful as proxies or substitutes for measuring conditions that are so complex that there is no direct measurement.

Just as sustainability is about finding the balance point between a community's economy, environment, energy and society, deciding how many to keep can be difficult.

The development of sustainability indicators requires;

- **consensus among interested parties;**
- **reference to agreed sets of principles, rules and concepts:**
- **standard protocols for their calculation, based on accepted, peer-reviewed scientific methodologies and "the best scientific information available".**

Indicators should be accompanied by information:

(1) type (pressure, state or response indicator);
(2) purpose;
(3) relevance to policy;
(4) relevance to sustainable development;
(5) linkages with other indicators;
(6) targets;
(7) relations with international conventions and agreements;
(8) data requirements;
(9) appropriate methodology.

Care to the energetic problem, the indicators assume relief which:

- **meaningful environmental aspects**
- **environmental quality to the contour of the plant**
- **expenditure on air pollution**
- **use water resource and drainage in the water shape**
- **management waste**
- **contamination of the land**
- **noises, smell, visual impact**
- **place of job**
- **industrial accident research**

DECISION MATRIX AND ENVIRONMENTAL RISK ANALYSIS

The indicators, which consent to measure system sustainability, are often complex and affected by randomness: the analytical model, must take into account these properties. It is possible to approach the problem adopting the decision and risk theories.

Defined m state for the environment, called "environment state", the decision analysis identifies the sequence of actions, which, acting on the environment state, produce an effect on the system. Each action produces a different value which depends on the E_j "environment state" and is related to action/"environment state couple and it can be defined as a specific quantity of a "benefit function".

All these values can be reported in a matrix A,
called "decision matrix": each row of A is related to an action
and each column is related to an environment state,
which is characterised by a proper probability value.

Any component A_{ij} represents the benefit function of
the i^{th} action performed on the j^{th} environment state
and is computed through the indicators
which take into account correlations between components.

If new data on the state are know, it is easy to adjourn this value of probability adopting the Bayes'theorem:
it provides a mechanism for combining the initial ("a priori") probability concerning the occurrence of an event with related experimental data to obtain a revised ("a posteriori") probability, reducing the randomness of the analytical model.

Starting from the "a priori" probability function of each environment state, p(E), it is possible to compute the "a posteriori" probability function of the state by:

$$p(\theta_j / X) = p(X/\theta_j)\, p(\theta_j) / p(X)$$

where E_j is the j^{th} environment state and X is the random vector of new data.

The risk factors are defined as the product of the damage for the probability that the damage occurs.

The risk analyses are assessed on the basis of subjective data, observations and experiences, performed during the risk factors individuation.

The subjective risk assessment is of account, since it permits:

- To establish a risk index,
- To define the acts to adopt,
- To indicate the lacked adoption of a prevention act.

Using the risk factors, it is possible to make the operators able to operate choices to define, manage and act systems.

The optimal decision can be obtained selecting the result associated to best value

Assumed, in probabilistic manner, that the environment states E_i are mutually exclusive and $=\sum_j p(E_j)=1$defined A_{ij} the benefit function of i^{th} act/j^{th} environment state, it is possible to define the benefit function associated to the i^{th} act as:

$$L_i=\sum_j p(E_j)A_{ij}$$

which looks like the probabilistic mean value of the random variable A_{ij}.

The optimal choice is the one which presents the min value of benefit function L_i.

CONCLUSIONS

The city and the industrial system play a central role in the economic development of the territory from the moment that consume environmental energies and resources to one always increasing speed. The sustainable development is introduced as the only realistic solution closely correlated to chosen the environmental and energetic political and the relative ones are characterized from dynamic decisional contexts, uncertain and, to times, conflict . An important research project is also necessary, at international level, to codify the indicators and the related methodologies as a basis for eco-labelling or certification and in order to characterize of the plans energetic regulators.