

Comprehensive social assessment: An essential instrument for environmental policy-making

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Prologue

The use of Environmental Impact Assessment (EIA) has become increasingly widespread during the last few decades, because environmental conditions have been identified as critical factors in determining our wellbeing and quality of life. The objective of this chapter is to underline that EIA is reliable and useful only if developed within a comprehensive approach to planning and evaluation.

The conclusion of our analysis recommends the incorporation of EIA in a more general process of evaluation and decision, which guarantees that environmental policy decisions are evaluated within the complexity and comprehensiveness of development planning.

In the present chapter a number of general considerations on the importance of comprehensive planning procedures will be developed in order to underline the indispensability of these procedures in turning environmental policy from a "negative" strategy into a "positive" one.

Comprehensive Assessment and Environmental Impact Assessment

The EIAs which have been developed until now are usually linked to single projects. Their reliability is often questionable, which is mainly due to the paucity of national parameters.

(1) Analogy with cost-benefit analysis experience

The limited reliability of EIAs runs parallel to Cost-Benefit Analyses (CBA) of projects. Even though such analyses had a different scope (which in most cases excluded the environmental costs or the environmental effects, since they are difficult to quantify according to the units of measurement used in CBA), they had -and continue to have- the defect of not being "hooked up" to an adequate system of national parameters such as the relative weight of economic objectives related

to the national economy, the social discount rate, the shadow price of investment, the shadow wage and the shadow price of foreign exchange. In fact non-existence of central planning systems which might be able to provide these parameters (and make the evaluation of costs and benefits of single projects coherent and credible) was certainly a serious handicap to the development of suitable CBAs.¹

In fact, the need for these parameters presupposes the existence of a policy agency competent to formulate them and to use its appropriate decision-making power to bring them to a decision.² The lack of an adequate process of comprehensive planning - and of its capable management - thus implies the lack of adequate national parameters as well. The lack of national parameters, in turn, implies that any project analysis ought to construct and presuppose, case by case, its own reference parameters. Assessments which are done quickly exhibit various precarious conditions, and their limitation is often apparent in the whole exercise.³

¹ "The efficacy of social CBAs depends on how one determines and uses national parameters" (Dasgupta, Sen and Marglin, 1972, para 1.3). "The success of project formulators and evaluators obviously depends on the degree to which the first approximations of the parameters accurately reflect the national priorities. If these are "prices fixed by chance," to use one of Walras' terms, project formulation and evaluation quickly loses its significance... And it is at this point that ... one understands why the link between project formulation and evaluation and national planning is essential." (Dasgupta et al., *Ibid.*, par. 11.4).

It has been accepted for some time that the social profitability of projects must be ascertained on the basis of an identification and enumeration of costs and benefits from a social point of view rather than a private one, and that such profitability must be based on an evaluation according to shadow-prices which reflect assessments or social preferences rather than private preferences. But how important it is to distinguish between "Pareto social optimum" which reflects the point of view that one must take into account individual preferences and the "complete" function of social well-being based on the notion that society is "an organic chooser of ends," to use an expression of Amartya Sen (1970) is rather less accepted. Sen defines Pareto ranking as a "quasi ranking" and organic social ordering as "ranking". Papandreou (1970) defines the first as "partial ranking" and the second as "complete ranking."

The CBA which has predominated in politics for the past twenty or thirty years is one which developed without the choices or pre-ordered plans and which is related to the first notion (Pareto "incomplete") of social well-being. But the lack of a coupling to a "complete" idea of social well-being - that of which is related to the appropriate definition of national parameters - results in not only an incomplete assessment of projects and plans, but also in an assessment which is highly unreliable (cf., also Weisskopf and Marglin, 1969).

² The essential role of a central planning agency with regard to the CBA is largely described in the work cited by Dasgupta, Sen and Marglin (1972) which, as is a UNIDO manual, instead of the title "Guide to Project Evaluation" would merit rather the title "Guide to the Formulation of Criteria and Methods for National Planning Capable of Making Single Projects Evaluation Possible and Reasonable."

The implications for project formulation and the assessment of situations in which a social, "complete ranking" is spelled out for alternative economic states (that is, in situations where all decisions are made in the absence of a society which is an "organic chooser of ends") is in an important (and little known) essay by Papandreou & Zohar (1971).

In this essay in particular there is an interesting development of the relationship between "national plan" and "programme" (defined as a set of projects whose impact on the economy is indecomposable, and single "projects" (defined as a "sequence of activities" which merits the appellation of projects if and only if it is "indecomposable" (that is to say, if and only if it cannot be expressed as the sum of two "subsequences").

³ "If the assessors are not required to apply fixed social parameters and values, their judgement can constitute an important factor towards a choice which could cause a state of chaos..."

And finally, such a method of doing a CBA without a reference situation in order to put it into context, runs the risk of being strongly manipulated due to the single-faceted and often partial view of the project planners and the associated analysts in each project.⁴

(2) The indispensability of national parameters for EIAs

Environmental Impact Assessment shows a similar picture. Here too, approaches are often on the level of a single project, whilst adequate national parameters are lacking. The question is: What are the parameters that are appropriate for an "environmental" cost and benefit analysis in which the value and the criteria are not quantifiable in traditional economic terms (i.e., market prices or shadow prices)?⁵

The national parameters in this case are those of "value", as attributed in any manner (either qualitatively or quantitatively) to the physical/natural environment (including the urban environment). The parameters that are related to valorization and de-valorization from the viewpoint of the national community are eventually articulated according to the viewpoints of its diverse groups and interests'.⁶

Obviously this assessment can only be a political one, eventually assisted by a technical predisposition.⁷

In order to be expressed in an adequate manner, and not in an occasional, casual or chaotic one, this political assessment ought to follow precise decisional procedures which will make it ordered and effective.

Land-use Planning and Indicators of Environmental Quality

In order to achieve the determination of indicator values assigned to the physical/natural or regional environment, there are only two possibilities:

"It is worth remembering that the CBA is not a technique, but an approach. It furnishes a rational context to the choice of projects by using national objectives and values. Projects are judged in terms of their precise effect on the national economy, and this effect is measured using parameters which reflect national and social objectives" (Dasgupta et al., 1972, par. 1.4).

⁴ "A project assessor can practically justify any project starting from adequate pre-suppositions such as: tax on interest, consumption habits, gains values which are obtained in foreign currency, etc." (Dasgupta et al., Ibid).

⁵ On the limits of the CBA as applied to environmental projects, see Baumol and Oates (1971) and Pearce (1976).

⁶ But ultimately considered as "an organic chooser of ends".

⁷ As appropriately affirmed in Dasgupta et al. (Op. cit. par. 11.3), referring to the CBA, but which also seems valid in cases of environmental projects when the qualitative judgement is by now more arbitrary than the quantitative one. "National parameters which represent the relative weight of diverse objectives, and shadow-prices, which are instruments that contribute to the achievement of these objectives, must reflect conscious political decisions about issues that are, after all, political issues. To allow to project formulators and assessors to determine national parameters is to leave political decisions to technicians and deprive politicians of the role they are expected to take in the decision-making process."

- (i) First, an identification of the entire area of interest to the reference community (whether regional, national or global) of the objectives of appropriate use for the area, taking into consideration its diverse geographic areas, taxonomically distinct one from the other. We shall call this identification the construction of a LandUse Planning Framework (LPF).⁸
- (ii) Afterwards, an identification of the relevant phenomena and/or factors of environmental quality in each of the "niches" that the LPF has identified for an appropriate use of the territory itself (fixing also the threshold values for these factors and using a unit of measurement appropriate for each one). We may call this identification an Environmental Quality Indicator System (EQUIS) related to the environments or areas of the LPF; and we shall call the thresholds or the pre-selected values norms or standards of those factors of environmental quality.⁹

An example of the logical sequence for the undertaking of the two aforementioned modalities of evaluation may serve as an illustration: the task of the LPF (for the territory in question) will be to identify, given the present land-use, what areas will be designated (because of their best quality for that use) as urban centres. For these centres the LPF will indicate the concrete delimitation in order to distinguish the typological areas for a policy of environmental conservation as well as to determine the characteristics of density, functionality and role. Having determined this, the tasks of EQUIS would be to fix the indicators which can express the environmental quality threshold for such areas.

Let us suppose that among these indicators the EQUIS indicates the amount of parking space available for registered vehicles. The norm of the environmental quality will therefore be the increase of x m² considered as an indispensable minimum threshold needed to guarantee an acceptable (urban) environmental quality.

⁸ Past demonstrations of elaborations of the LPF at many levels of political signification and authority are considered in: "Proiezioni territoriali" of Project 80 (Italian Ministry of the Budget and Economic Planning, 1969-71); "Schema d'Amenagement de la France" of DATAR (DATAR, 1968 and thereafter); and "Raumordnung Programme" of the Government of the Federal Republic of Germany (FRG, Federal Ministry of Regional Planning, Building and Urban Development, Regional Planning Programme for the Spatial Development of the territory of the FRG, 1975).

The negative aspect of such scenarios (except the German one which seems to have significantly influenced the operation of federal investments) was that of being concluded with their publication and not to have had any permanent follow-up of application, revision, updating or improvement.

⁹ A system of physical quality indicators of the receptors of environmental pollution (water, air, ground) is more or less present in every country where ad hoc institutions for the monitoring and control of environmental quality and the relative official periodic reporting of these indicators exist. However, indicators of the value (quality) of alternative uses of regional resources are absent; such indicators are of the type which spring forth from a matrix of availability and use of land (which will be discussed in section 4) Furthermore, indicators are absent also, more or less "synthetic, about the quality of the urban environment as such, which has crucial importance for an environmental policy directed to a human and social settled well-being.

Plan Evaluation

Environmental quality - in public opinion - is highly influenced by appropriate land-use. For ages appropriate land use, whether urban or rural, has been the objective of land-use planning. Every "blueprint" plan after all aims to assign an appropriate use to each area. From this point of view, it can be stated that a good conservation and assessment policy is the same as a good land-use plan, and vice versa.¹⁰

But "blueprint" planning only recently has contemplated the possibility of introducing systematic methods, and not only intuitive ones, of assessing alternative land-use choices. Until now blueprint plans did not include alternatives, nor systematic assessments. These assessments were the result of the planner's intuition which, at best, used some method of calculation as a support.

More recently the idea that an area can have multiple uses has been introduced. In order to choose between the uses it is possible to adopt several rational and systematic methods, so that errors of assessment and arbitrariness can be avoided. This is known as "Plan Evaluation".¹¹

Plan Evaluation, precisely because it is less unilateral is a "noble relative" of EIA: it is "noble" because it includes a "comprehensive" assessment of all the possible choices at play.¹² EIA remains extremely important as a source of information of a technical nature (as "analysis" rather than "assessment"). Other sources of information on environmental, social, economic, functional and institutional impacts are equally important and should be present in a "comprehensive" integrated assessment.¹³

Plan Evaluation is assigned to comprehensively evaluate all the possible costs and all the possible benefits, quantifiable as well as non-quantifiable. It is a way

¹⁰ For a systematic treatment of the relationship between land-use and environmental quality, it is worth looking at the classic treatise of Chapin (1965), in particular in the 3rd Edition with Kaiser (1979) and especially Chapter 7 ("The Users of the Land: Their Activity Systems and Choice of Space Qualities," pp. 194-230); Chapter 8 ("The Use of Land: Development and Developing Areas," pp. 231-288); and Chapter 9 ("Natural Environmental Inventory and Analysis," pp. 289-326). Another systematic treatment by Archibugi (1982) should also be mentioned, especially Chapter 5 ("Analysis and Assessment of Land Resources"), Chapter 11 ("The Land-Use Policy"); Chapter 21 ("The Protection of the Natural Environment"); and Chapter 29 ("The Prospective Balance of Land-Use").

¹¹ Already the passage from the assessments of "projects" to that of "plans" by itself constitutes an important step towards multi-faceted integration, treating the "plans" generally many projects and in such a way many objectives relative to a given territory taken as a whole. If the "multiple criteria" approach is already an important advancement for "assessors", which are usually applied to single projects, it is less so for planners, who are already used to having a "comprehensive" approach, i.e., an approach oriented towards many aspects and many projects, for a given territory. As the regional maps scale increases, the problems of environmental valorization and protection become more and more deeply ingrained in the project or planning process (and becomes therefore of less importance for the "environmental impact" to be taken into account, since environmental valorization and protection are already among the principal objectives of every plan).

¹² Therefore, in the first place among these is environmental valorization.

¹³ For a panorama of the many directions of "social" valuation it is worth considering an anthology edited by Pearce (1978).

of proceeding to an effective decision which at the same time is the most rational and realistic one.¹⁴

Single-faceted approaches (and the methods which support them, such as CBA and EIA) do not produce effective decisions by themselves. In the case of CBA, it does not because it emphasizes only quantifiable costs and benefits, and not unquantifiable ones; sometimes even only the "internal" costs and benefits and not all "external" ones (as any proper environmental philosophy rightly denounces). In the case of EIA, it tends to highlight only the environmental costs (or benefits) and not costs and benefits of any other type. Their single-facetedness is often, understandably, the very reason that a decision cannot be made; and assessment begins to be feared as an obstacle, rather than seen as a support to the decision-making process.

Single-faceted approaches are obviously less rational (often "sub-optimal") as they do not take into account all the factors which intervene in the action and/or in an assessment. They seem at first view more realistic because it is in single-faceted terms that the planned developments are studied and proposed. But this apparent realism is illusory because it is completely supplanted by a "stalemate" produced by conflicting interests. These cases need quite a bit more energy and time to settle things and get out of the impasse they created, than those that began

¹⁴ Plan evaluation began attempting to adapt CBA to environmental problems. Diverse methods were proposed:

- the "shadow-project approach" of Klassen (1973) and Klassen and Botterweg (1973 and 1976); the shadow-project is carried forward simultaneously with the basic project in order to compensate in real term the damage to the environment from the basic (socio-economic) project;
- "cost-effectiveness" analysis: see among others English (1968) and Seiler (1969), in which costs are directly correlated to levels of fixed objectives;
- "threshold analysis" (see Kozlowski, 1968), Malisz, 1970 and Rozlowski and Hughes, 1972), founded on the fixed supply to which are connected continuous curves of demand, among which evaluators identify the single "optimal" one (that is the threshold);
- plan evaluation was finally faced with (at the confines of the use of monetary and non-monetary instruments) the proposal of the "planning balance sheet method" of Litchfield and others (1968 and 1975); this method includes - where possible - effects expressed in monetary terms on a certain number of various "social" sectors; and if it is not possible in monetary terms, includes effects expressed by other units of measure or other indicators of an ordinal or nominal scale;
- another approach to evaluation is that of the "participation method" founded upon permanent discussions between or among interested parties, in which at the moment of selection are emphasized and brought up for discussion (see for example, Manheim et al., 1974 and 1975);
- the multi-attribute utility theory is not to be undervalued as it has offered methods to evaluate a number of possibilities of explicitly formulated choices (Fishburn, 1970 and Keeney and Raiffa, 1976);
- plan evaluation finally gave form to diverse methods of multi-criteria evaluations, which recently are multiplying and merit a systematic illustration in order to be correlated taxonomically to the diverse 'problematics' and the diverse decisional processes. Among the first approaches to multi-criteria planning must be mentioned the noted one of Hill (1973). A good survey of these methods is in Voogd (1983). A panorama of the "State-of-the-Art" is in the collection of writings in Fandel & Spronk (1985).

with a multifaceted, integrated approach. The latter incorporate diverse points of view within the decision-making process.¹⁵

A Method of Allocating Values Related to Land: The Land-Use/Resources Matrix

The comprehensive assessment of various alternative land uses (or Plan Evaluation) implies the capacity to assign a use value to land (which is commonly defined as a non-renewable public asset) without forgetting a certain shadow-value of exchange.

For this we proposed above the construction and the utilization of a Land-Use/Resources Matrix (LURM), in order to assign a value to each portion of the land in use, or under consideration for use, in relation to the use demand and the supply of available land.¹⁶

The LURM consists of an "ideal type" Table in which:

- (i) in the rows (or columns) the available quantity of land for every fixed category of land use is indicated, the taxonomy of which is based on its quality (seen from the point of view of its possible uses)
- (ii) in the columns (or rows) the quantity of use demand based on present activities (production consumption activities) coming from a given population or the future activities as forecast by programs or projects or interventions elaborated upon in the plan is indicated.

Land, as a non-renewable public asset, can acquire different values for the community based upon the amount of land available, the amount of appropriate use demand, and on particular circumstances related to the level of satisfaction of diverse needs which determine the preference model of the community in question with respect to a comprehensive needs schedule.

When we say "appropriate", we are introducing a concept of the quality of the land-use in relation to the area's characteristics, a concept which can be linked to that of assigning values.

In the framework of land-use planning, it is taken for granted that the future land-use demand (which in the LURM is compared to the available supply of land) will be appropriate.

In the creation of a matrix of present land use and supply, the quantity of appropriate and inappropriate use can be seen in each cell of the matrix and thus a conventional value can be assigned to each of them. If the plan also has the

¹⁵ The multi-criteria approach to decision-making, which is rich in a larger variety of "schools" and relative methods and "techniques" originated within the field of "Operational Research". It certainly broadened its own area of interest with respect to the CBA, when the area of transactions (and related decisions) based on "non-quantifiable values" is enlarged; thus rendering more difficult evaluations through the attribution of figurative shadow-prices of an "availability to paying". The entire problematic is treated with an abundance of examples in Sinden and Worrel (1979).

¹⁶ On the LURM see Chapters 5 and 29 of the work cited: "Principles of Regional Planning" (Archibugi, 1978) as well as the recent contribution to a Seminar at the University of Rome (Archibugi, 1988).

objective of restoring part of a region which has been used improperly, to an appropriate use (as, for example, in some urban renewal and regional renewal projects), the difference between the values constitutes an estimate of the operation's net gains.

The quality of the land resource which should be recorded in the matrix can also come from other characteristics or properties which are capable of determining or altering the value, for example, rarity in itself (and not simply as it results from the relationships between supply and demand which the matrix shows), or the degree of non-renewability, and so on.

The values which are generated constitute the national parameters, on which calculations of gain and loss from alternative land use projections can be done, either in regional plans, programmes or single projects.

Towards Integrated Environmental Planning: Some General Considerations

At this point we will review the discussion on the opportunities and even the necessity of an integrated approach to assessment (and planning). We shall reinterpret the relationship between development assessment and environmental protection assessment.

(1) The economic-oriented approach

Once there was a science of economy (economics) directed to unveiling the secret mechanisms of development (such as the quantity of goods and services available); and to define and establish (for the government) prescriptions and norms capable of making development as elevated and as fast as possible.

When economic science began to be used to judge the opportunity - in order to obtain the most elevated and quick development possible - of operations, programs and projects (public or private) in themselves or as alternatives, economists began to look for ways of elaborating methods of analysis and evaluation of the contribution of each one to development. Development was considered as an increase in utility or productivity. The latter qualities, in turn, were considered to be the relationships between employed resources and the results obtained, or between tolerated prices and benefits gained. The greater the net difference produced between these two variables (and the faster they became evident), the greater the advantage seen in the adoption of an operation, a program of action or a project. CBA has thus become the rational premise for public operations, whether direct or indirect, for the formation of new products (material goods or services).¹⁷

As stated earlier, CBA for development projects is considered too single-faceted, and overly oriented towards the single criterion of economic

¹⁷ For an up-to-date excursus from the first Pigouvian schemes on the welfare economics (1920) to the most modern theories on the measurement of "social costs" see Nash's panoramic text (1978).

development, understood to be the balance between input and output in the productive process. CBA is not sufficiently flexible to consider other criteria, non-economic objectives or other values: for example, values which are difficult to quantify, such as environmental conservation. If the latter criteria, objectives and values are somehow taken into account, they would seriously modify the results of such analyses and assessments. CBA, in so far as it is a rather single-faceted analysis, has not developed the capacity to effectively orient the behavior of politicians or of the operators.

(2) The ecology-oriented approach

Later on, ecologic science tried to unveil the secret mechanisms of natural and environmental relations. It was thought that one would apply the physical rule that in nature "nothing can be created or destroyed", to economic relations. It was concluded that every added value was equalized, in some fashion, by a subtracted value and that the appreciation of the value added (the net production) could not be disassociated from the consideration and computation of the value subtracted, as with natural resources, which once used up, are non-renewable or, more generally, any negative revenue which cannot be recorded on the goods and services market.

Subsequently attempts were made to assess planning and projects according to the impacts they had on nature and on non-renewable resources, and to accept only those operations which did not have a negative environmental impact.

Later it was realized (perhaps too slowly) that even this type of assessment is excessively single-faceted, is too narrowly focused on the absolute defense of nature *telle-quelle*, has no reference to its social utility, to its use for human or social interests, and sacrifices other criteria, objectives and values.

Well-known economists (for example Clark, Mishan and others) have criticized the logic of judging any operation in terms of growth maximization, complaining about a "growth-mania";¹⁸ the day well-known ecologists do the same, and coin "ecology-mania" will be a step forward for the critical spirit, rationality and finally, for good sense.

(3) Overcoming partial approaches

Unfortunately the two above mentioned approaches have difficulty finding an adequate point of encounter and integration. They seem rather to accompany (whether as cause or as effect is difficult to say) a radicalization of the fronts; they seem to have developed as opposite approaches, conflicting rather than cooperative.

And yet for some time it has been recommended that an approach be used to integrate CBA and EIA into a "superior" specimen of comprehensive assessment.

¹⁸ See Clark (1961), Scitovsky (1964), Mishan (1967) and Dale (1973).

In this type of assessment all criteria, objectives and values would be accounted for, without necessarily favoring one to the detriment of another, but rather assuring correct trade-offs. Evidently, as for all great reforms of thought or action, we must wait patiently until the cultural level of technicians and politicians matures with time.¹⁹

(4) *The planologic approach*

This latter method, from a politico-economic point of view, is referred to as the planning process. Since it deals at the same time with all the substantial aspects of human social welfare, it is an integrated socioeconomic planning process (comprehensive, unified, global or systematic). More specifically if it is concerned with the relationship between economic and environmental well-being, then it is the comprehensive land-use planning itself.

The same method, from a technical standpoint, is called multiple criteria (or objective or value) assessment methods and techniques. These are the methods and techniques which support decisions and planning.²⁰ As with many cognitive instruments which have been widely proposed at the scientific level, they prove difficult to apply to the adequate political process of planning at the operational level.

The recognition and acceptance of both methods have proven difficult. As mentioned previously the largest impediment is the cultural level of the operators (politicians and technicians) who all tend to refute what they do not know, and that which does not rapidly reach a consensus. Perhaps another factor of resistance is the wish of some interested and privileged powers not to introduce rational methods of decision-making which, by their very nature, tend to clash with the arbitrary exercise of power. However, it is also true that in the most

¹⁹ From the vast "planologic" literature we shall cite a few particularly significant and basic works. First of all several fundamental papers of Ragnar Frisch, written (but never as widely discussed as they ought to have been) and published posthumously (Frisch, 1973); among these, one, on "*Cooperation between Politicians and Econometricians on the Formalization of Political Preference*" (1970) and another on "*Implementation System for Optimal National Economic Planning without Detailed Quantity Fixation from a Central Authority*" (1964) presented in Rome during the First World Congress of the Econometric Society. Then a short piece by Wassily Leontief (1977) on what he means by "economic planning", and on the informative instruments and basic procedures upon which it can function at the national level in a pluralistic society with public power and private liberty. Lastly, the two volumes of Leif Johansen in which his "*Lectures on Macro-Economic Planning*" (Johansen, 1977-79) are collected, in which nearly all the basic methodologies for the construction of a planning system are presented. Other useful and systematic contributions are those of Caire (1972) and several papers of Archibugi; (collected in Archibugi, 1979). An important technical operative on the problems of general planning was anticipated in a well-known conference hosted by OECD in Bellagio (Lago di Como) in 1968, (for which, see the numerous contributions of Ozbekhan, Forrester, Jantsch, Rea, etc. in OECD, 1969). Further bibliographic references on the evolution of planology can be found in the bulletin of "*Sistema informativo sulla scienza della pianificazione*" put into operation by the Centro di studi e piani economici di Roma (Rome's "Planning Studies Center") with the support of the Consiglio Nazionale delle Ricerche (National Research Council) beginning in 1985.

²⁰ An important survey of these methods is in Nijkamp (1977, chs. 8 and following).

advanced and cultivated circles of this same power, the planning methods and decision-making techniques we are referring to already find great acceptance. Thus we maintain that the most convincing explanatory factor of this situation is still the cultural factor.

From the NO Strategy to the YES Strategy by the Process of Integrated Planning

In fact, we wish to combine the varied and manifold aspects which must confront, on the one hand, a political economy which wishes to be geared toward a defense and assessment of the environment, and, on the other hand, an environmental policy which does not wish to hinder the realization of the goals of economic and social well-being. In this context, it is necessary to introduce methods of integrated planning, viz., by adopting the planologic approach.

It is difficult to imagine that the environmental policy approach which until now has mainly been negative, can be overturned in other ways.²¹ To do so the world of politics must demonstrate a great organizational and re-formational capacity - which is the truly lacking technology of the present day. In fact, the awareness of our problem is not a shortcoming in the world of modern informatics. What we do not know well is merely how to manage them.

Technological potential comes from science and technological knowledge. But there is quite enough of that; some go as far as saying there is more than enough. What we are lacking, rather clearly, is a technology of political and social action, which could be made to govern science and technology with tranquility and safety. And also, where this technology of political action is already available - as in the case mentioned earlier -, it is difficult to find a way to apply it.

Our organizational and controlling capacity with respect to the entropy of development, both scientific/technological and political, remains mainly "negative".

In this vacuum of political decision the entropy of natural forces is at its greatest. The freedom of nature ungoverned by man is at its greatest. But, also at its greatest is the risk of catastrophe.

Mankind cannot leave the duty of resolving these problems and guaranteeing security merely to ecological, naturalistic, evolutionistic or biological "equilibrium", no matter how surprising and wonderful they may be to the scientist or the nature lover.

To do this, man would be negating himself. His progress has always been founded upon social and moral progress. His consciousness has always been founded on his liberty. To make his freedom of collective decision and of rational choices subject to naturalistic determinism, and scientific positivism, is exactly the positivist illusion which for the last two centuries accompanied both the most grandiose scientific and technical advances and the most uncontrollable political

²¹ To drive it towards what Giorgio Ruffolo several years ago called "creative ecology" (Ruffolo, 1985, pp. 165-167).

degradation, holocausts and social and environmental risks. Unlike in nature, there are no immanent laws for social life to subject society to a "managed" evolution.

At a more advanced level, we must recuperate the anxiety and the reform-oriented and constitutive willingness of political and social Enlightenment, which furnished the last substantial political scheme upon which modern society has founded its general historical progress - that of democracy, of participation and of social and economic liberty. And constitutive reform which today is spoken of everywhere, at the national level and above all at the global level, cannot be large enough. Minor issues which flaunt being pragmatic and realistic are a hindrance to the greater problem which political society must face in order to get in step with the great scientific, technical and economic progress of our century and of the social impact that resulted from them. To be useful these reforms must become finalized at a global level as well as at the national level in order to introduce new useful planning systems integrated into the decision-making process. Clearly, this is the most important challenge to which contemporary political structures must respond.

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