REGIONAL PLANNING IN A SEISMIC SITUATION
METHODOLOGICAL CRITERIA AND REFERENCES TO SOUTHERN ITALY

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SUMMARY

Regional planning in a seismic situation is a particularly important case of planning in terms of 'risk' or of 'uncertainty'. It means that space-time variables have to be singled out by identifying both the functions of time and of space and the relationships between long-range forecasting and regional survey.(1)

The study of earthquakes, which has to be defined in space-time terms, lends itself to system analysis, in the sense of scientific research applied to situations before and after possible events. Since it is subject to seisms, the South of Italy is one of those areas where the criteria indicated could well be applied.

INTRODUCTION

Earthquakes of varying intensity (as well as other catastrophic occurrences and slow bradyseisms), and the continual deteriotation of the environment due to anthropic processes, all constitute the field of physical phenomena that affect risk and uncertainty factors in regional planning. The second category refers mainly to the hydrogeological disruption caused by eradicating vegetation to make room for economic activities and hydraulic works; the burning of bush and forest, the draining of rivers and excavations in the soil (for quarries, mines and deposits), the production and distribution of energy, the construction of dams and acqueducts, of roads and railways, as well as the random spreading of urban areas, all have harmful effects. 'Certain changes in environmental features, such as soil erosion or slit agglomeration at the mouth of rivers, do in our time accumulate to a critical point and then provoke wholesale economic and social adjustments'. (2)

These phenomena, which can present the discontinuous characteristics of the dynamics dealt with in the 'theory of catastrophies', are considerably wide-spread in the South of Italy and all over the Mediterranean, affecting mountain, hilly and coastal areas. Their effects can be cumulative, and could multiply several times the severe damage caused by earthquakes; they converge and combine, harming and altering the systems of the environment and the social and economic organisms.

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(1) The present paper on the earthquake related planning develops and applies some general concepts presented in F. Fiorelli, Long-range Forecasting and Regional Planning, 'European Regional Planning Study Series', Council of Europe, Strasbourg, 1981.

(2) W. Isard, Location and Space-Economy, The Massachusetts Institute of Technology Press, Cambridge, Mass., 1956.

These phenomena are mentioned in order to set up comprehensive territorial planning criteria, both medium and long-range, so as to prepare for and cope with seismic occurrences, rather than examine individual problems of: vulnerability of building structures, use of anti-seismic building techniques and preservation of artistic and cultural heritage; advance planning for civil defense and emergency measures to assist inhabitants of earthquake areas. The problems pertaining to the re-settlement of the inhabitants and the rebuilding of dwellings and economic activity structures, destroyed or damaged in the disaster, are all considered to be part of the broader economic development and regional planning of the earthquake areas.

THEORETICAL CRITERIA

Basic Principles

'Long-range forecasting' means the systematic analysis of the probable trend of future occurrences and of the measures to be taken and their consequences, proceeding from the present situation to the possible outcome and considering factors and obstacles which could intervene. Conceiving of the future in terms of probability does not mean foregoing value judgements and planning; it means facing hard facts, so as to plan more realistically. The future has to be built, not only discovered and to shape the future, it must be first explored.

Above all, long-range forecasting responds to the essential aspects of regional planning: the sequential steps of defining intentions, and the irreversible consequences of actual implementation.

In this field, in fact, the sequence idea formulation-planning-implementation is usually a complicated and long process, and there is a marked time lag between the 'thinking phase' and 'acting phase'. The reasons are obvious, although frequently disregarded:

- the various government levels with jurisdiction on a specific area and the complexity of the forms of social participation (in that the 'local citizen' is always part of a larger community);
- the nature of the measures and the time required, particularly for the construction of infrastructures (which often need to be carried out rapidly and in a coordinated manner, if they are to ne economically productive and socially useful);
- the possibility that the demands and requirements change radically during the long time lag between the design and implementation phases and the awareness of their permanent consequences.

About this latter aspect, one of the features of regional planning (particularly where land use definition is involved) is its irreversibility, or at any rate its difficult and costly reversal, even in the event of changes in the structural economic conditions and social needs that motivated the decision in the first place. Monetary policies or import-export, tax and credit regulations, and merely social policies, do change continually, according to economic experience and market response. Decisions involving capital investments in general infrastructures, urban systems and industrial plants cannot usually be modified once implemented, and can in-

fluence permanently or almost the structure of an entire region, substracting vast tracts of land from alternative destinations.

It is clear that fluctuations in economic and social patterns must be carefully assessed, and even more so in regional planning in seismic areas. Great care is needed where the 'risk' levels (proability of seismic occurrences) do not limit or completely prevent human activity, although human intervention can heighten the level of 'vulnerability' (probability of seismic damage). The methodological difference between the economic and environmental approach suggests careful analysis and great caution in making choices and decisions concerning regional planning, as well as special attention to the long-term implications arising from seismic considerations.

Economic trends and policies are more subject to change than natural phenomena and regional plans (if exception is made for catastrophic occurrences like seismic events); this does not justify, however, a drastic and irrational split between economic and environmental factors, because in this way the first would remain devoid of significance and regard for the actual environmental situation and the second would disregard economic considerations and be thus reduced to a merely morphological dimension. Nor does this justify a concept in which the long-term view is fairly vague, the medium-term view concerned with planning and the short-term one, with decision-making. On the contrary, long-range forecasting should be meant to provide background information, based on probability, for any type of planning or decision-making process. (1)

However, a single-focus outlook and a belief that economic and social dynamics are synchronized leads to the selection of a single timing reference, whereas a more comprehensive examination requires a more articulate timetable, linked to the different elements which define the situation. If a desired goal is to be reached in such a complex setting, the phases and the time lapses of the various intertwined trajectories must be assessed. A thirty year perspective seems best suited to examining and interpreting the most significant phenomena, in reference to:

- the possible structural changes in the social and economic system examined;
- the technical and economic time steps (short- and medium-term), related to the obsolescence of housing and economic activity structures;
- the most significant seismic forecasts which measure the length of the 're-occurrence periods' of seismic effects and assess the limits and the time margins with relative accuracy.

Probabilistic Aspects

In this phase of modern society's evolution, marked by phenomena of

(1) For a review of space-time models in economic development, particularly regarding the relationship between long waves and rapid disasters, see P. Nijkamp, Long Waves or Catastrophes in Regional Development, in "Socio-Economic Planning Science", Vol.16, No.7, Pergamon Press Ltd., 1982 (and relative bibliography).

uncertainty and pressure for change, the meaning of the word 'standard' seems to have lost the substance it had in the past. Present-day 'enthropy' reduces the value of 'standard' even in the field of regional planning, especially long-term, which is what seismic forecasting is really about.

So far, constraints and standards relating to land use have had a predominating impact on regional planning, at least in the countries of continental Europe; it now seems, however, that in many cases, they are no longer able to withstand the real pressures of urban, industrial and tourist phenomena. There is nevertheless a need for the authorities to check these phenomena in the future, with measures which can effectively counter probable trends. Against the wide-spread practice of unauthorized construction on the outskirts of big cities, the solution does not lie in more stringent regulations and constraints, but rather in the implementation of choices designed to respond to the actual and potential demand for housing, providing a sufficient supply in the right place, at the right time, of the right size and type, using the right construction techniques, including anti-seismic ones. In the face of the uncontrolled use and the extensive deterioration of the resources and values of the environment and the countryside, the answer is not so much to create nature reserves as it is to lay out agricultural land and regional and city parks, suitably equipped with facilities which correspond to social demands.

In order to ensure that regional plans are enacted and that the desired results are achieved, the methods that should be applied are those which are capable of assessing trends, the probable occurrences and consequences and the changes that are likely to take place when measures are implemented. This type of implementation requires that the location in space and the initial and final points in time no longer be fixed criteria, but that the course of the phenomena, the execution stages, the effects produced and their functional relations, as well as priority and alternative solutions, be evaluated and included as feed-back in the planning process. The methodological principles mentioned lead to the rejection of the automatic, rigidly defined, planning process according to the level of authority, which in fact functions badly, and to the adoption of methods which give more weight to procedures involving the interdependence and convergence of choices and responsibilities which are the province of regional bodies.

Finally then, regional planning backed up by probabilistic approaches and procedural criteria produces continuity in regional management and illustrates the need to devise plans based on flexible project guidelines, which foster public participation. This entails making use of suitable instruments, such as environmental impact evaluation used in the United States for important federal agency projects (and, in some States, also for private ones), regarding which the European Communities are presently preparing guidelines.

Probabilistic approaches concerning regional planning in a seismic situation, that is the analysis and evaluation of the possible impact of seismic occurrences, must not be considered exceptional, but rather a particular consideration and a determinant aspect of a method of regional

planning. (1)

Systemistic Aspects

The concept of aménagement du territoire has gradually come to mean the planning and management of our physical surroundings. This should be considered a rather narrow interpretation, confined to the fixed assets of business enterprises and hardly conveys the complexity of the regional planning. Economic space should instead be envisaged as a field of activity, the composition and the boundaries of which are conceptually and historically mobile, according to the type of activities performed within it and to their internal and external interrelationships. In the world of today, when the 'closed market' seems to be a leftover from the pre-capitalistic era, social and economic organization can be called an 'open system', in communication with the outside world, so much so as to require the analysis not only of internal but also external variables.

When regional planning approaches are defined and put into practice, (2) the concept of space tends to merge into the concept of movement of people, goods and services: a definable whole, in spite of individual changes in residential and production patterns and in the flows of traffic and goods. When aménagement du territoire goes beyond the mere planning and management of physical investments, the concept acquires a broader meaning, which includes the search for criteria and ways of integrating the numerous internal and external variables.

These methodological conditions make long-range land-use forecasting difficult, although this does not mean it can be dispensed with. These considerations make it more and more meaningful as the area concerned increases in extension and as the 'risk' (known probability of an event) or 'uncertainty' (unknown probability of an event) of external agents and of their occurrence decreases, since there is greater possibility of internal compensation for the phenomena which are being evaluated. Conversely, the same conditions can reduce the meaningfulness of long-range forecasting as the point of reference becomes further removed in time.

An earthquake represents a traumatic and irreversible upheaval in the land system (from a residential, productive and social point of view): that is in the economic and social organism. The planning of civil defense and the analysis of the effects and the damages caused by the seismic event must take into account the interactions, since any phenomena of action

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(1) For an analysis of location choices dealing with regional planning, in uncertain conditions, see M.J. Webber, Impact of Uncertainty on Location, The Massachusetts Institute of Technology Press, Cambridge, Mass., 1972.

(2) For the concept of regional planning in systemistic terms, see J.B. McLoughlin, Urban and Regional Planning. A Systems Approach. Raeger, New York, 1969.

which affects one element to any extent is bound to have repercussions on the whole system. (1) Moreover, the steps taken to 'recover' and to 'reconstruct' the residential and productive structures, the way these are carried out and the way the overall economic development and land use planning in disaster areas are oriented, must correspond to systemistic criteria, designed to ensure new equilibria after the seism.

PRACTICAL CRITERIA

Operating Orientations

An earthquake, or more generally a catastrophic event, can interrupt, harm or alter the working of a system according to a rather broad range of consequences, pertaining to: a combination of functions, which determine the vitality of the entire system, or of one or more sub-systems (for example, agricultural, industrial or urban system); a single function, whether primary (communications, transport, or energy network) or secondary.

From a systemistic viewpoint, the predictable dimensions of the damage caused by a catastrophic event depend not only on the degree of risk which can be detected in the geographical surroundings and in the degree of vulnerability of human surroundings, but actually in the combination of the more or less important roles that the functions play. The more numerous, important and interconnected the functions, as they are, for example, in metropolitan areas and densely populated urban zones, the more serious the damage. The damage can be just as serious, nevertheless, in agricultural, hilly or mountain areas, characterized by extensive farming, low demographic density and scattered settlement, few communications with the outside world and a lack of viable internal alternatives.

At the same time, advance planning for civil defense in disaster areas must take into careful account the systemistic conditions. This means that administrative offices and operational units, storage premises and centres for the collection and distribution of food stuffs and medical units, all have to be decentralized and set up locally, and that the location of shelters and temporary settlements for inhabitants of earthquake zones has to be decided upon not only on the basis of the lower degree of risk and vulnerability of the sites, but also on the basis of their accessibility, which is determined by transport and communication lines

Solutions of this kind will have to be found by using appropriate gravitational and simulation models on different scales: that is, establish-

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(1) It is interesting to note that, even in these situations, an 'emergency social system' tends to resume, a system which is able to absorb even the so-called 'ephemeral organizations', the duration of which is connected with the re-establishment of new equilibra. Cfr. the important contribution of A. Barton, 'Emergency in Social Systems', in G.W. Baker and D.W. Chapman (eds.), Man and Society in Disaster, Basic Books, New York, 1962.

ing which scale is best suited to the activities required in emergency situation (given the locations of the epicenters of past earthquakes), by testing the routes and the vehicles and their respective travelling time in the network.

This applies also to organisms with institutional responsibilities pertaining, for example, to continual monitoring of seismic movements, warning signals and emergecny assistance, management of supplies, and preparation of living quarters and mobile service units, utilization of hospitals and medical centres, as well as to those called upon to provide special services, such as army authorities and school boards which make schools available as shelters; it applies to primary functions (like motorway, railway and air networks), as well as to secondary ones (as, for example, secondary and country roads).

Examples from Italian Experiences

These needs are particularly felt in vast areas of the Mediterranean such as the South of Italy. Seismic phenomena are fairly wide-spread in fact, although they only reach the intermediate range of the Richter scale, unlike the phenomena in California and in Japan. They affect the mountainous and hilly areas, the strip along the Tyrrhenian and, to a certain extent, along the Adriatic coasts (both of which are rather extensive, but not very deep). Moreover, the orographic and seismic conditions are accentuated by anthropic factors, already mentioned, which cause a high degree of vulnerability, especially on account of: the gradual process of hydrogeological disruption and abandonment and the deterioration of old settlements and farm lands in hill areas; and also the relatively recent phenomenon characterized by the over-crowding and the decrepitude of residential buildings in large urban centres and the disorderly construction of housing, industrial plants and tourist facilities, along the narrow coastal strips.

It is worth noting that, in many cases, these new buildings have been erected without regard for antiseismic technology and were just as subject to earthquake damage as the dilapidated houses in the internal zones, as can be seen by the consequences of the extensive earhtquake, which, in 1980, did serious damage in Campania and Basilicata (especially in the urban area of Naples and in the less accessible and less populated hill zone of Irpinia).

For the reasons mentioned, the problems arising in earthquake zones reflect and accentuate the problems already existing all over Southern Italy where more than 35% of the entire population lives and where the demographic density and the pro-capita income are considerably lower than in Central and Northern Italy. For these reasons, therefore, it is indispensable to enact the following measures:

a) the re-establishment of the hydrogeological equilibrium, according to guidelines set out at the beginning of the discussion on the 'Southern problem', by means of the intensive reforestation, the setting up of extensive agriculture, the consolidation of housing in hill areas (to prevent them from being totally abandoned), as well as by measures to

protect the coast from natural erosion and unplanned constructions;

b) the reversal of the trend to settle along the coast, through the improvement of coast-to-coast communications (from the Tyrrhenian to the Adriatic) and the promotion of guidelines for industrial development in the main inland valleys (which have the necessary water, agricultural and urban requirements and which do not present a high degree of earthquake risk);

c) the urban reorganization, the decentralization of housing and the building renewal in the main urban areas (Naples, Bari and Palermo);

d) the establishment of a civil defense network, according to systemistic criteria and the barycentric solutions mentioned, together with the improvement of access to inland areas.

These strategies constitute the essential premises of policies recently enacted to improve intensive irrigated agriculture and the expansion of the manufacturing industries (in sectors characterized by small-scale enterprises with high employment coefficients, specially suited for promoting local development, such as the food processing, mechanical and electronics industries). They form the basis of the economic recovery of the earthquake areas, a recovery which cannot be separated from the reconstruction of housing structures.

The 1980 earthquake, which dealt a very extensive and heavy blow to the already fragile residential and productive apparatus of Campania and Basilicata has illustrated the importance of unified action and a functional coordination between the special development policies aimed at the South of Italy and those directly concerned with the recovery of earthquake areas. To this effect, the disaster highlights the difficulty, but also the necessity of establishing a close link between the action of reactivation and restoration of housing structures and that of ensuring economic development and proper land use, so as to enable the resettlement of the emigrant population, within a medium-term time lapse.