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Infrastructure and Development in Society

In the current political, economic and social events, recourse is repeatedly taken to the term "infrastructure" to describe, analyse, and also influence the stage of development, market activity, and economic processes in general. This happens even though the concept has undergone changes since the sixties and there also seems to be no generally accepted definition even today. Since the practical relevance of the semantic content of this term is becoming more and more strongly apparent, a basic orientation seems needed regarding the areas in which the use of the term "infrastructure" is significant and the effects it has in determining the reality of society.

R. Joachimsen's definition is based on developmental theory: "Infrastructure is the total of the material, institutional, and human facilities and capacities available to an economy based on division of labour, which contribute (1) to reducing the differences in the remuneration of production factors, particularly labour (*degree of integration*) and (2) to raising the level of economic activity (*rate of growth*)". Thus, infrastructure amounts to the basic functions needed in an economy to enhance both integration and growth.

J. Stohler's definition is along the line of planning and policy. According to this view, "infrastructure expenditures are made on public projects and are as such investments, with the present cost bringing future benefits".

Both these approaches are combined in E. Tuchtfeldt's definition of

infrastructure as "the total of the investments made predominantly with public funds, which are the prerequisites for stimulating the integration and growth of an economy".

By taking its characteristics into account, infrastructure can be defined more precisely. The technological characteristics of infrastructure include: indivisibility (large project units), long life, the interdependence of its various parts (systemic effect), infrastructural performance as inputs for general use, low import possibility, etc. As regards economic characteristics, infrastructure is specified by: cost depression, external effects, dispersion of benefits (collective good), high portion of fixed costs, large scale, high investment risk, etc. Institutional characteristics of infrastructure are: operation at deficit, non-applicability of market prices, central planning, production, and operation, etc.

In applying these criteria, the infrastructure concept includes: transport and communication, energy and water supply, environmental protection, buildings and facilities for cultural activity, sports, recreation, education, research, and health services. Including public administration, legal institutions, and national defence in this concept is controversial, because in these the characteristic of investment is lacking; and, conversely, housing is not included in infrastructure, since here the factor of collective good character is not given.

Even in restricting the number of its elements, the heterogeneity of infrastructure is still great. For this reason, special subcategories are often formed, such as production (business) oriented and consumption (household) oriented infrastructure; social and technical infrastructure; effected and evolved infrastructure, etc.

Infrastructure can be determined quantitatively by differentiating between infrastructure expenditures, infrastructure costs, infrastructure capital, and infrastructure performance. According to estimates in various European countries, about one fourth to one-third of the total tangible and intangible capital available is infrastructure capital. It is estimated that infrastructure expenditures make up more than 10% of the gross national product (GNP) and between 35 and 40% of all government expenditures.

As to historical development, much is to be said for the hypothesis that in the pre-industrial phase, the portion of infrastructure expenditures in the GNP is fairly high; with the take off, this portion recedes, and the economy gradually fills in the capacities created. In the industrial phase, infrastructure expenditures are further reduced in relative significance by economic development in the private sphere.

Finally, in the phase of maturity of the economy the importance of social infrastructure increases.

The theory of infrastructure strives to give empirically substantive hypotheses for explaining the stage and the development of the economy. Hitherto, two main questions were prominent: 1. What influence does infrastructure have on the level of economic activity (*growth effects*)? 2. What *distributional effects* (human, regional, sectoral) are caused by the state and growth of infrastructure?

The discussion involving the reorientation of growth policies aimed at qualitative growth (*quality of life*) has resulted in a third question: 3. What effects does (material) infrastructure have on the conditions of the natural environment? This leads to the demand for an environmental impact assessment (EIA) for all (large-scale) infrastructure programmes and projects.

In saying that infrastructure is a public good, it is not generally concluded that providing and financing infrastructure are tasks to be left entirely to the government. Apart from solutions based solely on the government or on the private economy, there are also mixed forms; in practice, there are many different institutions supplying infrastructure.

State provision and financing predominates in infrastructure areas the services of which are clearly of a collective-good type, where their use is not for the private sector only (e.g. streets, basic research, telecommunications) or, on the other hand, where a minimal provision for all population strata is the main objective (e.g. education, health services).

In other infrastructure areas the state or quasi-state institutions function as providers, whereas financing is done through the market (fees, rates). This solution has been chosen in many countries with free market economies (e.g. water supply, rail and air transport, and part of health services).

In other infrastructure areas the state allots property rights, allowing private enterprise to offer certain services at given prices (e.g. patents in research). More or less total consignment to the private sphere can be found in a few infrastructure areas (e.g. in parts of health services, education, and transport).

The kind of institutions supplying infrastructure depends above all on two factors: the extent of the dispersion of benefits and the degree of applicability of the exclusion principle. If the dispersion of benefits is slight, and if those unwilling to pay can easily be excluded from benefiting from it (e.g. garbage collection), such infrastructure services are often left to private business, and their financing is achieved at market prices or by means of fees. If, on the other hand, the exclusion principle cannot be

applied and the number of those benefited is large (e.g. basic research), then the government is generally the supporting institution of the infrastructure service, and its financing is achieved via taxes.

With a great number of those benefited but a large degree of applicability of the exclusion principle, public or semi-state enterprises can be the supporting institutions, with the state contributing to the financing or giving a guarantee to make up for the deficits (e.g. railway, theatres, hospitals). If by contrast, the number of those benefited is small and the exclusion principle only partly applicable or not applicable at all, sponsors are created in the form of societies, clubs and associations financed by membership dues.

Assigning responsibility for infrastructure at the various levels of a federal state can be regulated differently using different criteria: protection of minorities and proximity to the individual and regional needs are arguments for the lowest possible degree of centralisation. In contrast, the postulate of equality for all regions in the provision of infrastructure is an argument favouring a high degree of centralisation. However, the founding of ad-hoc associations is also possible, as is assistance from regional governments or from the superior governmental body.

The definition of the concept of infrastructure already implies a strong need for planning. Its high investment risk, low divisibility, long life, and the interdependence of its various parts make infrastructure the area of the economy which is probably most in need of planning. However, rational planning is extremely difficult. It entails, first, determining needs and goals. Then the available funds must be allocated up amongst the various infrastructure areas (programme planning), after which the choice of project is to be made (project planning). All of these steps involve considerable uncertainties, thus often making infrastructure planning a controversial field of political discussion.

Determining infrastructure needs is usually done by projecting past values into the future or by predicting certain index numbers or standard values which are determined on the basis of time projections or cross-sectional comparisons (with foreign countries, the neighbouring regions, a social group, etc.).

The problem with the first method is that the figures of past needs conceal the reasons which led to their being decided upon and thus include the problem of false prediction. The second method (index numbers) involves the problem that infrastructure needs are not an unequivocal quantity in terms of time, social structure, and economics: price or fee increases can, for instance, save capacities or shift costs from the public to the private sector (e.g. waiting fine). However, if instead of

index numbers standard values (or quality standards) are used, predicting requirements then become an evaluative planning of goals. But this method, too, does not permit the optimisation of infrastructure planning if and as long as it avoids comparing advantages (benefits) with disadvantages (costs).

In most cases, the allocation of funds for the various infrastructure areas is still done largely intuitively or according to the political influence of the respective areas. For systematic planning, the "Planning-Programming-Budgeting System" (PPBS) has been worked out to define the importance and urgency of state programming in regard to substance and time priority. The PPS is an ideal approach for allocating funds to the various infrastructure areas. Its implementation has, however, been a failure for a variety of reasons involving method and day-to-day politics.

For choosing a project in the framework of infrastructure planning, the cost-benefit analysis (CBA) has been developed to weigh all the positive and negative consequences of implementing the project. The CBA differs from investment calculations of private industry by also including in the decision the effects of infrastructure projects on third parties, society, and future generations.

A method of planning which has recently become more significant is the environmental impact assessment (EIA) to determine the specific negative and positive environmental effects of (large-scale) investment projects. Various building blocks of CBA and EIA are subject to interpretation (e.g. the social discount rate to be used, with which future and present benefits are to be compared), thus opening the door, in the practice of infrastructure planning, to the possibility of political manipulation.

The infrastructure influences most economic and socio-political goals. Providing infrastructure is thus viewed not only as a social goal, but also and particularly as an instrument of economic policy: to promote or influence economic growth, to stabilize economic activity, and to improve the distribution of income and wealth.

The great significance of infrastructure in the total investments of an economy is readily apparent from statistical and historical studies. This has made economists in general and development planners in particular "infrastructure conscious". However, infrastructure investments are not only recommended because they have direct effects on the GNP of a country, on its temporal stability and on distribution, but because they enable and often even elicit the activity of private enterprise.

To what extent infrastructure investment guides or follows private activity or whether both must occur simultaneously, is a question of

interest for development policy, to which, however, there is no clear answer. The relationship of infrastructure to private investment can be balanced or unbalanced, with two sequences of events imaginable in the latter case: "development via relative infrastructure shortage" or "development via relative infrastructure abundance". The corresponding strategies find differing agreement in theory and practice of infrastructure policy, according to how highly state functions are valued in the economic system or the resilience and flexibility of private business – and to what extent infrastructure investment is conceived primarily as an instrument or as a goal in itself. As a rule, the income effects of infrastructure investments are quickly noticeable, whereas the capacity effects follow later. They are thus suitable for short-term stabilisation of economic imbalances only in a limited way.

As regards distributional effects, each infrastructure project and infrastructure programme has specific advantages and disadvantages for specific population groups, regions, and time periods. Infrastructure can thus improve or worsen distribution (regarding living conditions, opportunities, environment, income, wealth). Even infrastructure provided and financed by the state solely as a collective good is not distributionally neutral, because the group of those benefiting from it is not identical to the group of taxpayers. Thus, it must be assumed that in the practice of infrastructure planning, there are goal conflicts between economic growth, distribution or stability, and conservation or improvement of the natural environment.