Serie Research Memoranda

05348 Regional Economic Growth and regional Policy: A European Perspective

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Abstract

Regional Economic Growth and Regional Policy: A European Perspective.

Regional Policy in most European countries is demonstrating an interesting life cycle, which is connected with both the structural changes in the European economies in the eighties and the profound shifts in views on the scope and range of policy intervention. Traditional forms of regional policy intervention have not proven very successful. Rather than a reduction in intensity of regional policy, most countries have shown a reorientation of regional policy. This reorientation found its roots in modern (mainly neo-Schumpeterian) views on economic growth, with a strong emphasis on both competitive behaviour (rather than government protection) and innovative behaviour of all regions and promising sectors. As a consequence, the foundations for economic growth, i.e. technology policy and infrastructure policy, have become the focus of regional policy, in the framework of an ecologically sustainable regional economic development. This change in policy orientation vis-à-vis the region has recently become even more pronounced as a result of Europe 1992, which has led to a drastic increase in size and scope of regional policy from a European perspective.
1. Regional Policy at a Crossroad

The confidence in traditional regional policy has - in the past decade - become rather low. For instance, Folmer and Nijkamp (1987) conclude in an analysis of Dutch regional policy that subsidies on investment expenditures in backward areas are expensive and hardly effective. Especially the significance of direct public policy interventions at the regional level is increasingly being questioned.

At the same time it may be surprising to learn that just very recently the European Commission has decided to double the size of its structural funds, including also the European Fund for Regional Development. Does this mean a revival of regional policy interest in general?

In retrospect, regional policy in many European countries seems to follow a tidal movement. Periods of intensive interest are followed by a neglect of regional policy. Such a dynamic pattern of policy intensities is consistent with the so-called policy-life phenomenon (see for an exposition Brouwer and Nijkamp, 1990). The policy life-cycle concept is based on the idea that the policy interest in new important issues passes through various stages, ranging from awareness and agenda formation to policy strategies, solutions and management. It is essentially analogous to the well advanced product development cycle in industrial management and organizational processes. The various phases of a policy life-cycle are pictured in Figure 1, where the emphasis is on the relation between research and policy.

![Figure 1. The contribution of research to the policy life-cycle](source: Zoeteman, 1987)

However, the shape and the slope of a policy-life curve is strongly influenced by external conditions, as can easily be demonstrated for the case of regional policy in Europe. Until the end of the seventies, regional policy was a recognized and respected part of economic policy, focusing its attention on both the enhancement of economic efficiency (by favouring direct productive activities) and the reduction of undesirable interregional discrepancies (e.g., by
subsidizing social overhead capital in lagging areas) (see also Hirschman, 1965). In the period of the economic stagnation in Europe - the first half of the eighties - the policy interest shifted much more to economic restructuring to be induced by favouring competitive behaviour (rather than by protecting weaker parts of the economy). Reagonomics and Thatcherianism were typical illustrations of the policy view that direct government intervention would in the long run be detrimental to the economy as a whole. Beside a dramatic reduction in funds spent directly as subsidies for weaker branches of the regional economy, the rapidly emerging budget deficits forced governments also to reduce their expenditures for new infrastructures, one of the traditional means of regional policy. An illustration of the dramatic decline in infrastructure expenditures in the Netherlands is given in Figure 2 (derived from Bruinsma et al., 1990a).

![Figure 2. Investments in physical infrastructure in the Netherlands in billions Dutch Guilders (price level 1980)](image)

Only in very recent years the bleak perspective of regional policies has improved somewhat in various European countries. The reasons for (these first signs of) the revival of regional policy are twofold. First, it has been realized that regions are the 'workfloor' of economic activity and that - in order to be competitive - regions should focus much more strongly on economic restructuring generated by technological innovation (which means essentially an integration of regional policy and technology policy). Secondly, from a European perspective, the completion of the internal market (Europe 1992) and the recent shift towards Eastern Europe may endanger a rapid economic progress, if at the same time the intra-European discrepancies at regional levels become too large. In order to avoid a situation that in the nineties the fruits of economic development cannot be reaped because of extremely large
interregional economic discrepancies, a more intensified regional policy effort became necessary (focusing in particular on infrastructure and technology).

Finally, in recent years we also observe a strong interest in effective environmental policies, which often require a focused regional basis (leading to the notion of regional sustainable development, cf. Kariukstis, 1989).

In conclusion, what we observe is a life cycle pattern of regional policy efforts, in which saturation patterns of outdated strategies and new stimuli caused by changing external conditions create a set of successive policy cycles. In the next sections, we will describe in more detail the main driving forces of modern regional development policy in Europe, viz. infrastructure, technology and the environment.

2. Infrastructure and Regional Development

The main aim of regional policy is to improve the regional production structure and the regional production environment ('milieu') so as to upgrade the regional performance (by making the region more competitive). The market position and the competitive position of a region are a result of the ratio of relative output prices vis-à-vis relative factor prices. By improving regional infrastructure this ratio may become more favourable, so that the relative strength of the region is increased and more activities are attracted towards the region. This means that infrastructure conditions have especially an impact via dynamic reallocation effects (see also the Williamson (1975) hypothesis).

In recent years a clear increase in the interest in infrastructure as an engine behind economic development can be observed. The reasons for the new focus on infrastructure are manifold, but at least four motives of paramount importance can be identified.

First, there is the recognition that the process of economic and technological restructuring will be hampered, if the design and implementation of new infrastructure will not keep pace with the needs of a growing economy. There is a growing fear that 'missing links' or even 'missing networks' will have a negative influence on the competitive position of Europe (cf. Round Table of European Industrialists, 1987).

In the second place, the emergence and implementation of new transport, communication and information infrastructure has to be mentioned. Especially telematics offers an enormous potential, but it is not yet fully utilized (mainly because of problems of compatibility and org ware).

Next, there is the growing awareness that Europe 1992 will increasingly move toward a network economy in which the nodes (i.e., metropolitan areas) will play a key role in a European spatial interaction system, where interactions (material and non-material) will take place along main corridors.

And finally, in many countries a new emphasis on infrastructure investments can be observed because of the presupposed causal link between these investments and their employment generating potential. In the latter framework infrastructure becomes an instrument for
socio-economic purposes. This renewed interest becomes once more manifest because of the significant reduction in public expenditures in infrastructure construction and maintenance (see also Figure 2).

Clearly, it has to be admitted that the interest in transport infrastructure also shows a cyclical pattern, and some authors argue even that transport infrastructure is exhibiting a megacycle. For instance, Andersson and Strömquist (1988) claim that historically major transitions in the European economic system were always accompanied (or even induced) by major changes in transport and communications infrastructures. These authors distinguish even four main transport and logistic revolutions in the history of Western Europe, each of them characterized by the emergence, adoption and implementation of a new basic type of infrastructure.

Insufficiently functioning infrastructure means missing economic development and as a result a loss of economic potential. On the other hand, reliable and modern transport and communication systems provide a stimulus for economic development. Bottlenecks in these systems in the form of either missing links or missing networks - be it unimodal or multimodal - cause economic inefficiencies. It is therefore no surprise that a very large share of the European Fund for Regional Development is spent on infrastructure; it is hoped that such investments would upgrade regional economics in backward areas.

The question is, however, whether new infrastructures lead to significant effects at the regional level. This is the subject matter of infrastructure impact analysis.

Infrastructure impact analysis is a specific form of spatial impact analysis (cf. Nijkamp and Van Pelt, 1989) and serves to assess the foreseeable effects (in the ex ante case) or the realized effects (in the ex post case) of investments in infrastructure. Various methods have been designed and used in the context of infrastructure impact analysis.

Input-output analysis is one of the conventional techniques used to estimate the direct and indirect employment effects of infrastructure investments. It turns out that especially the assessment of programme effects is usually problematic.

The estimation of the size of spillover effects of infrastructure investments has always been a focal point of attention in regional, development and transportation economics. Especially in regional economic development theories transport infrastructure has always played a prominent role, mainly because of the potential of such infrastructure for generating new growth impulses.

Beside input-output analysis and regional development theory, also locational theories have often focused attention on the role of infrastructure, by providing a micro-economic foundation for the behaviour of firms in view of accessibility conditions. These theories were normally based on the view that accessible locations brought about cost advantages to individual firms (mainly savings in transport costs), so that infrastructure is one of the decision parameters of the firm.

Some of these micro-based considerations have also been translated into a macro-based framework, for instance, by Tinbergen (1957) who tried to investigate the programme
effects of infrastructural investments. In the model developed by Tinbergen a major role is played by the improvement of infrastructure as a key factor for the improvement of market positions of firms. This model can briefly be described as follows. The demand for goods is dependent on the income generated by its production. It is evident that improvements in infrastructure lead to a reduction in transport costs of the commodities produced by the firms concerned. As a result, a shift in the relative prices of these commodities will take place generating a multiplier effect, because the shift in demand towards cheaper goods leads to a rise in discretionary income. This extra spending capacity will then lead to a rise in demand for new goods, which generates in turn additional employment, etc.

According to Tinbergen, the multiplier effects of such programmes are higher than the direct and indirect employment effects of infrastructure. Clearly, some remarks concerning this model are in order. For instance, the model neglects the fact that consumers might save their extra discretionary income (rather than spending it), while also the possibility that firms (especially in a non-competitive market) might take a higher profit margin (rather than reducing the commodity prices) is assumed away. Furthermore, the favourable results may be reduced by the phenomenon of leakage effects in international (or interregional) trade. Nevertheless, this approach is interesting and valuable, as it calls attention for higher-order effects that may emerge in other sectors than the transport sector and its directly related sectors.

Although infrastructure investments are of critical importance for regional development, they are by no means sufficient conditions for generating regional development effects. In this context various caveats (see Ewers-Koelman et al., 1988) have to be mentioned.

1. The effects of new elements of infrastructures on regional development differ more as these elements are more unique.
2. The effects are higher as a clear regional potential is more present; otherwise, even negative effects may result.
3. The effects are co-determined by the size of the infrastructure project concerned.
4. The effects are higher as the design of new infrastructure is oriented towards the generation of synergetic effects with existing infrastructure (an 'infrastructure complex').
5. The effects are higher as a given region is improving its infrastructure significantly more than other regions.
6. The effects are also dependent on the overall economic situation.
7. The effects are more favourable as infrastructure policy and technology policy are coordinated.
8. The effects of new infrastructure are also dependent on the development phase of a region.
9. The effects of most large-scale infrastructure investments are usually irreversible, so that such decisions are to be based on a risk strategy.
10. Finally, significant positive effects of new infrastructure can never be guaranteed, as
infrastructure is only a necessary - and not a sufficient - condition for regional economic development.

The previous remarks illustrate that a simple measurement scheme for assessing the impacts of infrastructure policy on regional development is far from easy. However, a policy based on synergetic effects via an 'infrastructure complex' strategy is likely to generate the highest benefits.

In an empirical study for the Netherlands, Bruinsma et al. (1990b) were able to estimate the regional effects of infrastructure, both in terms of (direct and indirect) construction effects and programme effects. Both the construction and the programme effects (based on industrial surveys) turned out to be clearly significant. This supports the idea that tailor-made infrastructure investments may be highly beneficial for the region. The latter observation also clarifies the current interest of the European Community in infrastructure development.

The previous concept of a (regional) infrastructure complex bears a close resemblance to a concept recently launched by the Round Table of European Industrialists (1989), viz. missing networks. The idea is that after the completion of the European market Europe is moving toward a network economy. However, the integration effects will only be fully exploited, if also the European infrastructure reveals a network character. Missing networks (i.e., malfunctioning of substantial parts of unimodal networks or absence of strategic connections between multimodal networks) may hamper a rapid development of Europe. Therefore, the policy focus should not only be on missing links (with mainly a local character) but also on missing networks of a European dimension. Examples of necessary policy efforts are integration of national European railways, standardization of software of transnational communication and telematics infrastructure, stimulation and expansion of the role of inland waterways in European freight transport, etc. Thus improvement of such missing networks is a critical key force for generating new dynamic reallocation effects.

3. Technology and Regional Development

In the past years technological innovation has often been interpreted in the context of Schumpeter's view on technological revolution as the driving force behind the Kondratieff cycles (see also Kleinknecht, 1988). Clustered innovations in particular have in the past exerted a profound impact on western societies (railways, electricity, cars, etc.). The introduction of new technologies requires a 'basic science' connected to 'technical exploitation', followed by 'imaginative laps' that precede all upswing phases in a Kondratieff long wave (see also Rothwell & Zegveld, 1981).

Much scientific discussion has also emerged on the question whether new technologies are a result of a demand pull or a technology push. A great deal of confusion in this field has arisen however, because of a fuzzy use of the term new technology; especially because the motives and impacts of process, product, institutional, and managerial innovations may be quite
different.

Technology as the 'society's pool of knowledge regarding the industrial arts' (Mansfield, 1968) is however not a homogeneous knowledge asset, but is marked by a wide variety of different appearances ranging inter alia from small-scale to large-scale forms and from traditional to advanced activities. In the past years, much attention has been focused on new technologies, as it is a widely held belief that technological change may be one of the driving forces for new economic progress in an era of stagnation and structural change (cf. Nelson & Winter, 1982; Rosegger, 1980).

The locational analysis of high-tech as a major form of new technologies is still underdeveloped: a clear theoretical framework is lacking, and various case studies provide sometimes only anecdotal observations (see Malecki & Varaiya, 1986; Nijkamp, 1990c). Nevertheless, a few more structural spatial development patterns seem to emerge. High-tech firms are increasingly dividing their activities into routine (or standardised) and non-routine (or innovative) operations. The non-routine (mainly R&D-oriented) activities tend to be concentrated in only a few locations marked by significant agglomeration advantages such as good geographical accessibility. For instance, Hekman (1980) indicates that American computer firms tend to maintain their innovative activities in only a few regions (such as California, Texas, or Massachusetts). Standardized production and assembly operations are either moving into small towns or peripheral areas or into low wage Third World countries (cf. Bluestone & Harrison, 1982).

Next, non-routine activities in the high-tech sector rely heavily on skilled and professional labour input, so that the quality of the residential climate (including sociocultural amenities) becomes a major locational motive for high-tech firms (see also Brotchie et al., 1985; Hall, et al., 1983). Similar results were found by Oakey (1981) who came to the conclusion in a study on the British instruments sector that skilled workers largely determined the location of production. This result was supported by Malecki (1984) and Oakey (1983) who observed that locational preferences of technical personnel exert a large influence on the location decisions of R&D. This personnel appeared to attach a high priority to cultural, educational, and employment opportunities in urban areas.

With regard to routine activities, especially of multi-plant corporate organizations, it is evident that low-skill labour is still the main input. In as far as low-skill employment is abundantly present in various regions, it is mainly the wage level which determines the locational pattern of these standardized activities (Hanson, 1980). It should be added, however, that these activities may be fairly capital-intensive, so that ageing and life cycle processes of capital stocks may also exert a significant long-term impact on industrial location patterns of high-tech firms.

In addition, it has to be mentioned that a large concentration of high-tech activities may lead to congestion phenomena, especially if innovative firms create spin-off effects which lead to a rise in routine activities. Premus (1982), for instance, observed that in recent years there has been a tendency of American high-tech firms to move from the Sunbelt states to the
Midwest due to bottleneck factors (such as high wage rates, high land rents, insufficient areas for industrial expansion, high local taxes, and traffic congestion). Clearly, this 'crowding out' phenomenon caused by mutual exclusion of competitive firms may also be related to the firm's position in a product cycle. Similar results were found for Scotland by Cross (1981), for the Netherlands by Hoogsteijling, et al. (1986) and Wever (1984), and for Germany by Wettmann (1983).

Another (important) locational determinant of the high-tech sector is its orientation towards an accessible communication and information network infrastructure so that this sector is either located in nodal points of a physical communication infrastructure or in areas near research and educational institutes (Levy, 1983). This may also lead to job-hopping, for instance, in Silicon Valley.

A final relevant component of an innovation infrastructure of the high-tech sector is the availability of venture capital (Rothwell, 1982), especially in those countries which are marked by regional variations in the provision of venture capital. This may especially hold true for large countries (such as the U.S.A.) with segmented markets for venture capital. In small countries, however, it is plausible to assume that regional differences in venture capital hardly exist, so that this is not a location-specific factor (though it may be a generic determining factor for technological innovations in the country as a whole).

The foregoing remarks lead to various propositions which may be further tested in empirical studies on locational patterns of the high-tech sector:

1. Non-routine (R&D-oriented) high-tech activities are sensitive to communication, information, and accessibility, so that their location may be expected to be present in nodal points of a spatial network.
2. Routine (standardized) high-tech activities and operations may exhibit a more scattered pattern due to crowding out and congestion effects.
3. High-tech activities recruiting highly skilled employees attach a high priority to a favourable residential climate near major urban agglomerations.
4. The location of high tech in small countries will not be influenced by the wage level and the presence of venture capital, in as far as in a small country significant regional differences in these locational factors do not exist.
5. The high-tech sector is strongly oriented towards a highly skilled labour pool, so that absence of such a labour pool leads to either a friction on regional labour markets or to a move of firms to more favourable areas.

In general, new technologies appear to require a specific skill of specialized people, so that they exert a severe claim on specific (mainly high-skilled) segments of the labour market (implying mainly a filtering down mechanism through which more qualified employees always receive the best positions, even in case of unemployment), thus causing a selective friction in some parts of the labour markets. In various countries this has led to the emergence of so-
called internal labour markets marked by in-house training and education at the firm level. Such a development is essentially based on the exploitation of tacit skills at the firm level and can hardly be examined in a macro context. This situation leads to the seemingly paradoxical situation that scarcity and abundance can simultaneously coexist in a national labour market, although clearly in certain professional and urban/regional segments large discrepancies between demand and supply may arise.

There is also an important cross fertilization with the current emphasis on 'Post-Fordist' industrial strategies and company organization. This draws upon evidence found in all European nations, of moves by companies in the late seventies and early eighties towards more flexible regimes of capital accumulation and relationships with customers and suppliers over space. This greater flexibility has been fostered by advances in information technology at all levels, and is in turn sponsoring many innovations in process engineering and in organisational form. All participants in such companies, owners and managers and workers, are finding themselves under pressure to recast their relationships, in both formal and informal contracts (Scott and Storper, 1986).

It should also be noted that within the technology-to-firm relationship two different processes can be distinguished, viz. the establishment of new firms based on the new technology, and the introduction of this technology by existing firms. These processes are associated with different factors. For instance, a main factor in the establishment of new firms seems to be the presence of a reservoir of potential entrepreneurs (low entry barriers). A further important distinction should be made between the generation of new technology within the firm and the adoption of new technology by the firm.

In any case, from recent cross-sectional studies at the micro level it appears that the (relative) location or orientation to the urban core region has diminished in importance as an explanatory factor for differences in innovation activity. Manufacturing firms located in large urban areas do not exhibit a larger degree of innovativeness than firms located elsewhere. This raises questions about changes in growth strategy and the spatial requirements to survive successfully in different urban environments.

The implications of the element of space for innovation research can be further outlined by means of the concepts of new technology systems and innovation cycles. The concept of New Technology Systems (NTS) was introduced by Freeman et al. (1982) in order to provide a frame of reference for analyzing the swarming of classes of innovations through new Schumpeterian firms initiating an upswing in investments and new jobs. Thus an NTS usually emerges as a 'family' of innovations, starting from product innovations but also pertaining to further improvements and applications of some (related) basic innovations for both product and process technologies. Clearly, many analytical efforts have been made to come to grips with the specific conditions favouring the emergence of an NTS (see Davelaar and Nijkamp, 1989a). The seedbed (or incubation) conditions are usually multidimensional in nature, as initial innovations evoke often a string of further innovations (cf. Metcalf, 1981 and Granstrand, 1986).
A related concept is that of an innovation cycle (IC), as described among others by Abernathy and Utterback (1978), Rothwell and Zegveld (1982) and Sahal (1980). The idea of an IC refers to a continuous restructuring process within an NTS by making a distinction between the time trajectory of product and process innovations (see Figure 3).

Clearly, the IC reflects a learning mechanism (see Nelson and Winter, 1982). As a consequence, an IC implies a creative diffusion process with a shifting emphasis from product to process technologies. This process also has clear spatial dimensions (see Davelaar and Nijkamp, 1989b). One may argue that such a process starts with an incubation phase (Malecki and Nijkamp, 1988), followed by a catching-up phase (Batten and Johansson, 1987) and a competition phase (characterized by market saturation). The hypothetical space-time trajectory of the pertaining NTS is sketched in Figure 4, where a dichotomy has been assumed between central and peripheral areas. Thus Figure 4 reflects essentially a dynamic incubation framework.

In previous studies on the Dutch manufacturing industry (see Davelaar and Nijkamp, 1989b) it has been demonstrated that the dynamics of this sector are nowadays to be found in non-metropolitan (i.e., intermediate and peripheral) zones. Apparently this sector was showing an IC marked by 'old line' activities which were already spread from central areas to peripheral areas.

In a recent study on the incubation conditions of new technology firms, Davelaar and Nijkamp (1989c) have analyzed the spatial patterns of various firms based on various characteristics such as firm size, 'old or new line' features, internal or external R&D divisions, etc. Their analysis has demonstrated that 'new line' firms are more oriented toward the generation of product innovations than are 'old line' firms. On the other hand, however, the large 'old line' firms in particular appeared to be forerunners in the generation of process innovations. These results largely confirm the innovation life cycle concept. According to this concept the generation of product innovations will be especially important in earlier phases of the life cycles of industries and technologies. In later phases, however, the main emphasis of the innovative activities will become increasingly oriented towards further improving process technologies.
Firm size appeared to be important in the capability of a firm to generate product and process innovations. However, the Dutch results also suggested that firm size is particularly important in the generation of process innovations. Internal and external R&D efforts appeared to be also important in generating both product and process innovations. However, internal R&D efforts appeared to be more important for the generation of product innovations than for the generation of process innovations.

As far as the spatial dimension is concerned, the results indicated that the most urbanized municipalities perform relatively poorly regarding the generation of (high quality) process innovations, but not in terms of the generation of product innovations.

Concerning this spatial dimension the results also suggested that the importance of internal and external R&D efforts for the generation of product innovations varies - and in an opposite pattern - according to the degree of urbanization. Further, external R&D efforts appeared to be especially important in the most urbanized areas, while firms located in the less urbanized areas appeared to be more dependent upon their own internal R&D capabilities. These results indicated that despite the small scale of a country such as the Netherlands the geographical dimension also plays an important role in the generation of product and process innovations.

A major question in spatial innovation research is the dissemination of new knowledge. In this respect many contributions have been made in recent years, focusing attention on the diffusion of technological knowledge (see e.g., Kamann and Nijkamp, 1990). It turns out that the shape and structure of networks is highly decisive for the spatial pattern of diffusion.

The previous observations lead to the following conclusions for regional development policy. Regional policy cannot be strictly controlled by means of technology policy, but regional policy can ease new developments in two respects:

- it may facilitate the generation of new technologies by favouring the incubation potential (the seedbed conditions) of a region, inter alia by means of communication infrastructure, educational facilities, focused support for small and medium-sized industries, etc.
- it may favour the diffusion and adoption of new technologies, inter alia by means of information centres.

Current Dutch regional policy uses the above framework, where the main responsibility rests with the market forces of individual firms, but where equity is favoured by exploiting the potential of a region through the removal of non-economic barriers and through the creation of networks (see Nijkamp, 1990a).
4. Environment and Regional Development

In recent years a new dimension has entered the scene of regional policy, viz. the need for an ecologically sustainable economic development, not only at a global but also at a regional scale. In general, a concerted socio-economic development requires a compromise between material growth and environmental constraints (including environmental quality and vital natural resources). Although in different countries the conditions under which such a balanced development may come about will show much variation, the conflicting nature of the above objectives is evident in all countries. Especially in a short-term perspective the conflict between material growth and environmental quality may be rather severe; in a long-term perspective a mitigating effect may emerge, since a continued economic growth needs a sound resource base whilst a structural protection and upgrading of environmental quality presupposes economic growth. Such a co-evolutionary development (Norgaard, 1984), in both the developed and the developing world, seems to be a necessary condition for an ecologically sustainable economic development, as it takes for granted that economy and ecology do not conflict with one another. Such a co-evolution which is also based on equitable development options for present and future generations, does however not necessarily reflect mutual positive spill-over effects between the economy and the ecology, an idea which is more recently echoed in the notion of ecologically sustainable economic development.

It is clear that the spatial aspects of sustainable development can be examined from the viewpoint of either (1) local trends causing global impacts or (2) global trends leading to local impacts. An illustration of the first type of problem is the poor natural resource management in some countries, which threatens both the physical basis of these countries and destroys also the vulnerable eco-system of our planet to an unprecedented extent. In other cases, over-grazing and deforestation at a local scale may lead to soil erosion, sedimentation, flooding and salinization at a global scale. The second issue concerns the local scale of environmental impacts emerging from global trends. Acid rain, erosion, desertification, destruction or the ozone layer, eutrophication, ocean pollution and resource extraction are taking place at a world-wide scale, but their impacts can clearly be observed at a local or regional scale. Thus the global-regional interdependence of environmental problems confronts us not only with quantitative changes, but also with qualitative (or structural) long-term changes at all places on earth (cf. Bartelmus, 1986). This calls for a new view on spatial economic-environmental problems and policy issues.

It is thus no surprise that in recent years the idea of sustainable development has become a key concept in economic planning and resource management. Clearly, the interpretation of this concept is not always unambiguous and definitions of this concept are abundant, ranging from continued economic growth to steady state economies where economic growth mainly serves to compensate for environmental depreciation (a more extensive overview of definitional problems can be found in Archibugi and Nijkamp, 1989; van den Bergh and Soeteman, 1990 and Pezzey, 1989).
According to the Brundtland Report, the idea of sustainable development reaches far beyond environmental protection, as it means a process of change in which the exploitation of resources, the direction of investments, the orientation of technological development and institutional changes are made consistent with future as well as present needs. Consequently, sustainable development is not a fixed state of harmony, but rather a balanced, adaptive process of change. This would then be characterized by a dynamic Pareto-optimal trajectory in which progress in either the economic or the ecological system (all quantitative and qualitative changes in the economy that offer positive contributions to welfare) would not be to the detriment of ecological sustainability (all quantitative and qualitative environmental strategies that serve to improve the quality of an ecosystem and hence also have a positive impact on welfare).

It is clear from the above remarks that sustainable development issues are manifesting themselves in various forms. An extremely important form, which at the same time also reflects various of the above mentioned conflicts in a spatial context, is land use and its related resource use. For example, deforestation in Brazil may be necessary for agriculture or energy supply in a regional economy, but it is extremely detrimental to global ecological stability. Housing construction in densely populated areas (e.g., the Randstad in The Netherlands) may be necessary from the viewpoint of a growing population and a decline in family size, but deteriorates at the same time the quiet and visual beauty of an ecologically vulnerable area. Thus to a large extent land use may be regarded as a focal point of sustainable development policies in a spatial setting. This also leads to the necessity to specify more precisely the interactions between different resource and land use options in a given area and the spillover effects from and to other areas. Such a more local and regional orientation is not only imposed by the nature and mechanism of economic and environmental interactions, but also by the spatial demarcation and competence of all policies that are directly or indirectly concerned with land use. This brings about the issue of regional sustainable development (RSD) in relation to land use. The various relationships are represented in Figure 5.

![Figure 5 Relationships in regional sustainable development](image-url)

From the viewpoint of land use, there is a clear need to pay more explicit attention to
the spatial scale of environmental phenomena. In a global system all processes are in principle endogenously determined, whereas in a meso system (e.g., a single country, or region) a considerable part of the relevant economic and environmental processes is exogenously determined (e.g., scarcity and prices of external resources, imported pollution, climatic conditions, etc.). Such external influences do not have a uniform impact on all regions of a global system. For example, global warming of the atmosphere may lead to a rise in total organic production in the world as a whole, but will no doubt lead to differentiated socio-economic and ecological disasters in various regions of the world. Thus both economic and ecological processes have an unequal impact on different regions. Furthermore, regions of a global system form an open set of mutually interacting areas, so that a certain change in one area has consequences for other areas. For example, Arntzen (1989) has shown that spatial mobility of human activities in an open system of regions - as a result of periods of drought - may induce resource pressure in other areas in a developing country. Thus, on a regional level of analysis there is much scope for various spatial trade-offs: interregional, regional-global, and also intertemporal. The foregoing means that **regional sustainable development** (RSD) is a particular type of sustainable development in an open spatial system (see also Kairiukstis, 1989).

Regions, as open systems, generally utilize possibilities to import resources, to trade goods and services and to export excess waste. These efforts to deal with uneven distributions of resources and assimilative capacities of natural ecosystems in maximizing welfare may form an important factor in determining the sustainability of a region's economic development. It may also involve negative impacts on future generations in other regions.

Besides regional variation and regional interaction, there is another reason for focusing attention on a regional scale, viz. the fact that from a management and control viewpoint a regional system is more suitable than a global system, witness also the fact that policy-relevant indicators, objectives and scenarios can easier be formulated at a regional level. In the literature, this is often referred to as planning regions, which denote those areas that form the spatial basis for regional development programmes, i.e., that allow for certain planning objectives to be attained in the most efficient way. This means that from a regional angle there is more scope for an operational and policy-relevant analysis of sustainable development.

From a welfare viewpoint on RSD, it makes now sense to define RSD as a development which ensures that the regional population can attain an acceptable level of welfare - both at present and in the future - and that this regional development is compatible with ecological circumstances in the long run while at the same time it tries to accomplish a globally sustainable development. Consequently, RSD has to fulfil two goals: (1) it should ensure for the regional population an acceptable level of welfare, which can be sustained in the future; (2) it should not be in contrast with sustainable development at a supra-regional level.

The latter definition implies that RSD for a single region should be compatible with global sustainable development. Consequently, if all regions of a global system are marked by RSD, the development in the global system will be sustainable as well. Clearly, the RSD paths
of specific regions may have different characteristics because of specific regional circumstances (e.g., availability and use of natural resources and socio-economic capital, environmental vulnerability and resilience, and socio-economic distribution of income and employment), so that it is not easy to typify RSD in general.

The notion of RSD is essentially based on a simultaneous realization of three different objectives:

A. economic progress and/or potential of the area concerned;
B. ecological values and/or constraints of the area concerned;
C. the economic and environmental interest of non-directly involved parties (other regions; different generations).

These three objectives are certainly mutually conflicting, at least in the short run, as a maximization of objective A, B or C will affect the two remaining ones. This can also be illustrated by means of the following Möbius triangle representing the relative share of each of these three objectives.

![Figure 6. A Möbius triangle for three conflicting objectives.](image)

In the long run, however, these three objectives are less conflicting; instead of substitution even a situation of mutual complementarity (or co-evolution) may emerge. A critical success factor for RSD may then be interpreted as a particular crucial variable whose availability or presence is able to enhance - in a qualitative and/or quantitative sense - the performance of at least one objective without reducing the performance of the remaining ones (a Pareto-optimal condition).

Clearly, because environmental and socio-economic variables influence each other mutually in an interrelated system, a coherent policy is necessary in order to find a balance between these variables. A coherent policy does not mean, however, that it should automatically be implemented at one centralized level. When decentralizing national policy, however, some difficulties may arise:

- regional or local agencies may strive for maximization of welfare of their own region, thereby neglecting the interregional effects of some of their activities/measures
environmental media may differ as far as their spatial coverage is concerned. This implies that the planning regions will overlap, which in turn will create coordination problems.

Decentralization of environmental policy may be justified because regional authorities are in a better position to identify regional preferences and to implement regional targets, and they will normally be better informed than national authorities regarding the implementation or successes of environmental policy instruments. Horizontal coordination between economic and environmental policy may also lead to more efficiency.

In this context it might be useful to distinguish between institutional policy aspects and executive policy aspects. Institutional policy aspects are related to the distribution of responsibilities over various policy levels (constitutional power). Executive policy aspects are related to decisions taken during the policy period to ensure that the policy goals are achieved (executive power).

It has become clear from the above that RSD offers an additional problem but also a new challenge for regional development policy. New challenges are related to the potential of less favoured regions to offer a higher quality of life, e.g. for high-tech and service sectors which regard environmental quality as a sine qua non. Furthermore, such regions might also play an important role in the production of environmental technologies, as the profile of such 'green regions' might be more easily linked to 'green technologies'. Altogether, RSD is likely to have a profound impact on the traditional position of regions in a national or international economy, a situation which becomes even more important nowadays, since the social costs in densely populated or industrialized areas (e.g., environmental pollution or congestion) become excessively high if a strict policy of 'polluter pays' or 'user charge' is pursued.

5. Concluding Remarks

The scene of regional policy has shown remarkable changes in the past years, a phenomenon which can be explained by means of the policy life cycle concept. Market forces have become a respected ingredient of regional policy, but it has not led to a disappearance of regional policy. Instead, the focus has been directed much more rigorously than in the past on the essence of regional policy, viz. the creation of new seedbed conditions which would make the region more competitive. Especially three focal points have come to the fore in recent years, viz. infrastructure, technology and the environment. This re-orientation has led to a shift in, but not to a decline of intensity of regional policy in most European countries.

In a reflective and retrospective sense, the question may be asked whether the above experiences and lessons can easily be transferred to other continents or small or open economies (like New Zealand). Any comparison is of course always difficult given specific and unique features of each country. But a few observations can be made at least.
A policy trend toward devolution does by no means imply that there is no care for regional policy, but its scope has to be changed. A free market orientation runs the risk of increasing regional discrepancies and - without directly interfering at the sectoral or firm level - it is important to make the system of regions as competitive as possible, by providing all regions with sufficient access to national-international markets by means of transportation-communication infrastructure and information about (or incentives for) new technology. Besides, economic restructuring may incorporate various types of external costs (e.g., environmental decay, diseconomies of scale etc) and policies should then be addressed toward enhancing environmental quality and ensuring an ecologically sustainable regional economic development. In this respect, neo-Pigovian views on economic policy are to be linked to neo Schumpeterian views on (regional) economic evolution and neo-Vernonian views on the incubation conditions of cities and regions. Consequently, there is scope for regional economic policy in small-scale and deregulated economies.
References


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