Discussion Papers 2009.
Old and New Borderlines /Frontiers/ Margins 29-39. p.

ARE ENVIRONMENTAL CONDITIONS AMONG FACTORS BEHIND NEW SPATIAL PATTERNS?

MAREK DEGÓRSKI

Introduction

In the perceptions of many, the environment and landscape have been, and still often are, minor parts of the socio-economic system, whose management is frequently in conflict with regional development, both in spatial and purely economic terms. Investigation of the link between being green and being successful economically has thus been a core topic from the spatial management point of view (*Walley – Whitehead,* 1994; *Schaltegger – Figge,* 1997; *Degórski,* 2007, 2008a). It is now ever more common for scientists and those involved in the planning of regional development to seek out structural solutions that allow a pro-environmental policy to be pursued en route to economic success, where the latter is expressed, not merely in terms of amounts of resources used, but also in regard to optimised spatial management. Today's environment is having a value attached to it – *inter alia* through assessment of its potential to generate energy, to supply biotic resources and to satisfy people by way of its possession of valuable landscape features (*Degórski,* 2008b). In short, it is being treated as an important factor behind regional economic development, joining with the economic and social factors in determining directions that development is to take, ways in which it is to be achieved, means of implementation and consequences.

The aim of this paper is thus to offer a new view on the environment and its role as regards local and regional development, as well as to assess environmental conditions as factors potentially underpinning new spatial patterns.

The environment as a factor behind regional development

Since the level of public awareness of the environment is growing in many countries (and especially those that are most highly-developed), ever greater weight is being attached to the role the natural environment plays as an integral part of the megasystem of the geographical environment, where this is deemed to encompass both the socioeconomic and physical systems. Those two systems are mutually interlinked by way of interaction, which is to say that each is to the other as an object is to its surroundings (*Degórski,* 2005). In the context of the structure and

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functioning of geographical space we also perceive the multifunctional nature of the natural environment, and the significant role it plays in shaping both human quality of life and health. Since these functions are not merely natural or ecological in character, but also have clear economic and social sides (not least in terms of supply of natural and mineral resources, the absorption of pollutant emissions and accumulations of waste and the provisioning of opportunities for rest and recreation thanks to the resources of habitat and landscape present), it is more and more usual for them to be deemed an element in the development of a given region or whole country (*Łaguna,* 2004; *Degórski,* 2007).

Because society's view of the environment's role has been evolving in many countries, opportunities for further improvement in people's living conditions are now deemed to lie, not merely in economic and social development, but also in care for the natural environment, this being manifested first and foremost in optimisation of the use and management of its potential (*Dupont* et al. 1998; *Berbeka,* 2005; *Murphy,* 2006). A part of this involves the incorporation into regional policy of the idea (at least) of sustainable development, with an awareness that the latter's implementation demands the attendant introduction and pursuit of a series of logistical activities and socioeconomic solutions (WCED, 1987). Where engaged in, such activity very often proves a factor capable of activating economic development in the given region, this reflecting the need for new investment if the production of pro-environmental facilities is to be engaged in, infrastructure in water, wastewater and waste management built or modernized, and new solutions applied in power supply and transport. There is thus an inevitable development of such economic sectors as construction, commerce, transport and services.

It is most easy to note the need for action to optimise the quality of the natural environment and the capital-intensiveness thereof in countries most seriously behind when it comes to introducing sustainable development principles. The CEECs offer a very good example here. Prior to their EU pre-accession and accession periods, these countries pursued a characteristically liberal policy as regards care for the natural environment, particularly when it came to the limiting or minimising of the negative impact of anthropopressure on the functioning of the natural system. The inclusion of these states into EC structures required their adoption of regulations in force in the Union, including as regards the protection and management of the environment in line with sustainable development principles. Adjustments of the basic standards as regards environmental quality have been requiring huge financial outlays. As of the end of 2003, the necessary funding to achieve goals arising from the environmental *acquis* was found to amount to between almost 12% of the GDPs achieved by Lithuania and Slovenia and some 71% of the GDP generated by Estonia (*Degórski,* 2007).

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The concept of the relation between outlays on the environment and economic effects

The complexity of the environment-society-economy system is such that the search is on for attractors, i.e. equilibrium points attracting each trajectory of a given dynamic system, notwithstanding the fact that non-linearity of socio-natural relations is a factor in certain conditions creating systems characterised by metastability (*Domański,* 2008). The potential of the natural environment may thus be regarded as one of the more important functional elements to the ecological and social system (*Glasson,* 2000; *Morris – Therivel,* 2000; *Degórska – Degórski,* 2003), being the generator of its development and thus capable of giving the measurable and definable economic effects that shape new patterns in multifunctional geographical space (*Degórski,* 2003, 2007).

Today the environmental economy is associated with a diversity of views on the economic impacts of pro-environmental investments, particularly those associated with the protection of the environment and the landscape and the effort to maintain or raise an area's attractiveness. In line with the model for the attainment of economic success as set against outlays on the protection and optimal utilisation of environmental resources (as developed by *Schaltegger – Synnestvedt,* 2002), there are three possibilities through which relations between outlays and obtained effects are likely to be shaped. Each of the presented solutions has its advocates and opponents. However, precise analysis of the solutions proposed by the aforementioned authors makes it clear that all of them are possible, the actual economic effect obtained being dependent on a series of conditioning factors both endogenous and exogenous (*Figure 1*).

The courses to the curves show very clearly that increased outlays on integrated protection of the environment and the landscape do not automatically bring measurable attendant benefits for the economy. Indeed, there are cases in which, notwithstanding the increasing of outlays (line C-B-A), the final effect is the same, which is to say that the curve is found at the point of departure for economic success (ESo). Frequently, however, pro-environmental investment does bring measurable economic success and generates measurable benefits (as curves achieve point ES). Some environmental economists thus assume a straight line relationship whereby profits increase directly with outlays on optimising the protection and utilisation of the environment's potential (dashed line).

There is of course no straight translation from outlays deployed to profits obtained in the context of the protection and utilisation of the potential of the environment. All types of activity in the defined spatial unit must meet three main conditions, i.e.

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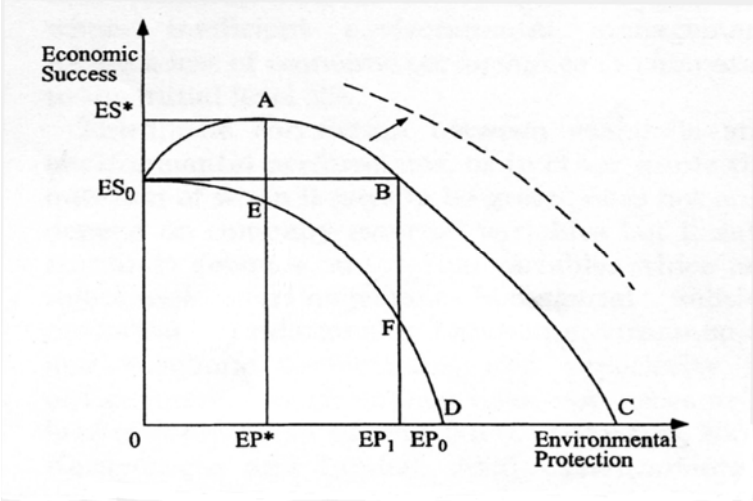
– possess a very precise valuation of environmental potential – first and foremost as that relates to natural resources and the landscape, and hence allows for precisely defined protection of its most valuable fragments;
– have a defined development strategy that takes account of the optimal utilisation of natural potential, making reference to the sustainable development concept providing for the rational management of natural space;
– see account taken – in general policy for a region's development – of the separate sectoral policies, where these include such an environmental policy as will allow assumed economic goals to be achieved, while pro-environmental solutions are retained and able to impact upon the quality of life.

Figure 1

Possible relations between between corporate environment protection and economic success



Source: According: Schalteggera and Synnestvedta, 2002.

In the highly-developed countries, ever more attention is being paid to quality of life, this reflecting the role of a high-quality of the environment and aesthetically valuable landscape features when it comes to the development of the residential function, as well as the quality of food produced, high-quality drinking water and clean air. The achievement of ever higher standards of living requires that decisionmakers pay more and more attention to the spatial order, and to the sorting out of the relationships ongoing between rural and urban space.

In constructing a model for outlays on the environment as against economic success, it is necessary to determine also the so-called maximum incremental social

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tolerance irreversible costs (MISTIC) index, since this provides for an assessment of the level of readiness in society (not least in its organizations introducing green solutions, if often only at great expense).

The urban-rural relationship

One of the main factors influencing the shaping of structures in geographical space is the development of areas of both urban and rural settlement, as well as of the spatial and functional linkages between them. The sprawling of urbanised areas leads to the anthropisation of the environment and the fragmentation of natural space, and thereby to a weakening of both the cohesion of natural-system linkages and the environment's biotic potential. In Poland, areas that have undergone marked anthropogenic transformation currently account for some 4.8% of the country, while the rate of increase is at present of 0.1% per decade on average. From among the directions as regards the re-designation of agricultural and forest land for non-agricultural purposes, there is a particularly noticeable increase in the share of designated orchard land (from 26.4% in 1990 to 47.7% in 2006). Other trends to changes in land function tend to fluctuate much more (e.g. when it comes to transport and/or industrial functions).

Within spatial development and the functional relationship ongoing between rural and urban areas it is possible to distinguish three main stages of interaction between the two categories of spatial structure (*Figure 2*). The first is characteristic for the state of both rural and urban structures taking shape – in which there is not yet any spatial limitation on development, while the linkage between countryside and town is mainly in the nature of a producer-client relationship. In the history of world economic development, these features were characteristic of the stage at which towns and villages were first located. Today it is confined to areas of low population density and weak economic development. With time, there is spatial development of urbanised areas as both towns and villages develop. There arises a greater functional dependence between city and countryside, as well as an overall development of areas settled. The result of this is ever more far-reaching fragmentation of the natural environment, and its anthropisation. The further development of settled areas both rural and urban leads to the ever-greater spatial integration of the two. This stage of development thus witnesses a blurring of the boundaries between settlement units, clear cases of urban sprawl, and hence very much enhanced pressure imposed by human beings on the natural environment. The shaping of a new spatial structure requires that planners take great heed of the need for spatial order. For even in such anthropogenically transformed environmental conditions, order remains a factor of significance creating a new pattern in space and determining the value of land. If we take care to ensure a high-quality environment

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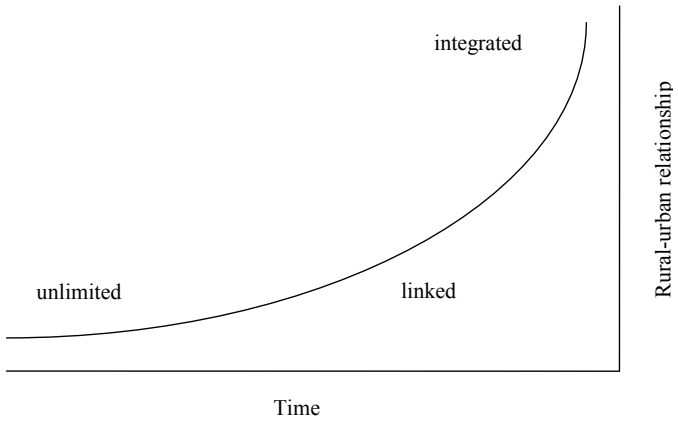
that maintains high sanitary standard and retains valuable landscape features, then the capital invested in undertakings of the above kind can be expected to bring a measurable economic effect.

Figure 2

Relationship between rural and urban areas



Source: Author's own construction.

Energy supply

A further conditioning arising out of the environment's potential and capable of influencing the structure of geographical space and the landscape concerns the energy potential it is associated with. That potential is expressed in terms of the non-renewable and renewable energetic raw materials. It is very much upon the breakdown to the use of the different resources and the ways in which they are won that the quality of the environment and attractiveness of the landscape depend to a very great degree. Today, for example, there are many local communities asking themselves about the aesthetic environmental costs of wind farms or the creation of other new spatial structures (*Niecikowski – Kistowski,* 2008). However, the most important issue from the point of view of the functioning of the environment is the breakdown for the use of the different fuels, these ranging across from the fossil fuels to the renewable energy sources (*Figure 3*).

The process by which energy-consumption structures evolve displays clear periods of stabilisation and marked variability. The latter are induced by such external determinants as rising demand, the discovery of new energy sources and concern for the environment.

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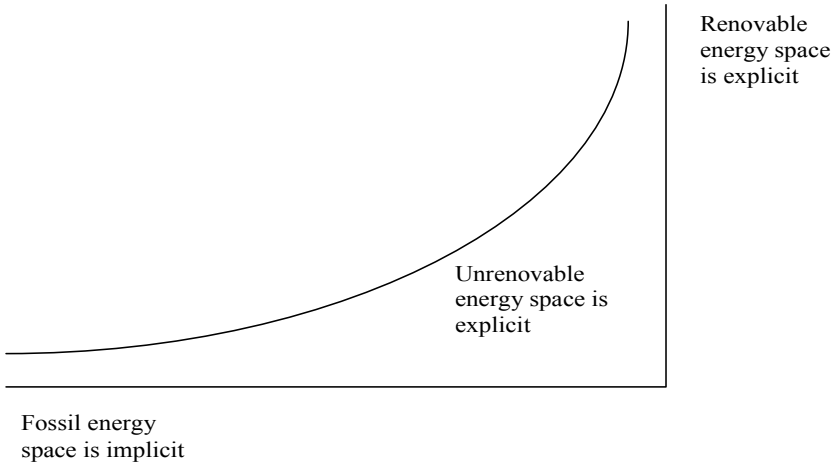
Figure 3

Transition of energy space – phases and stability



Source: Authors own construction.

Energy demand is determined by factors such as economic activity, weather conditions and behavioural patterns among consumers. In order for the use made of different sources of energy to be optimised, energy and environmental models are applied, their task being to obtain the maximum profit in economic terms, while minimising negative impacts for the environment. As R. *Domański* (2006) noted, energy can be embodied as a common denominator for both ecological and economic formulae. Many countries' interest in using these models to generate socio-economic policy only gained in significance in the wake of the energy crisis of the 1970s. At that time, the public was made aware of the real prospect that non-renewable energy resources might run out, while the increase in energy prices was seen to be an unpredictable one. In turn, there was a defining and scientific demonstration of the negative impacts on the environment associated with the burning of fossil fuels, especially the solid fuels. Thus people started to try and optimize the use of energy sources, and to lower the rate of increase in energy consumption vis-à-vis the rate of growth in GDP. Thus, for example, in the EU-15, the years 1995 – 2001 brought a 17% increase in GDP, in association with just a 5% rise in energy consumption. In the years just prior to that it had still been the case that energy consumption had to grow faster than the rate at which GDP was increasing (*Environmental Signals*, 2004). Unfortunately, however, the energy-intensiveness to be noted in the new Member States differed markedly from that among the old Fifteen. The lowest indicator for energy-intensiveness in 2006 (as expressed in terms

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of TOE/GDP) was characteristic of Denmark (c. 100). At the same time, the average calculated for the Fifteen was of c. 200 points. In comparison, Poland's figure is of more than 450, while that for the 10 new Member States acceding in 2004 taken together was of more than 700 points.

Following its 2007 enlargement to 27 countries, the EU with its 500M+ inhabitants was making use of around 18% of the world's energy. The dominant fuel in EU countries is oil (40% of total consumption), though the fastest-growing source is natural gas, for which the EU now accounts for over 25% of all consumption. Natural gas usage has increased through both higher overall demand for energy and a decline in the relative role played by coal consumption from 20% in 1991 to 16% in 2007 (*Austvik*, 2007; *Eurostat*, 2008) Nuclear energy output has been quite stable, accounting for around 13% of total energy consumption. HEP offers a further 4%, while renewable sources taken together (wind, geothermal, solar, biofuels, etc.) account for just 2%. What this shows is that the fossil fuels (oil, gas and coal) continue to account for almost 83% of the energy consumed in the EU countries. This in turn necessitates a further, far-reaching transformation in the use made of the different raw materials, in order that an optimal solution from the points of both the environment and the economy can be arrived at. Obviously, changes of this kind will bring attendant evolution of the spatial structure, as well as the creation of new patterns in line with optimisation of the use made of the environment's potential, including as regards renewables.

Ecosystems services

As human populations grow, so do the resource demands imposed on ecosystems, and the impacts of our global footprint. Our human use of natural resources began from the moment of our appearance on Earth and has never stopped growing since. However, the increase in the level of anthropopressure being imposed upon the environment is not linear in nature, but goes through stages of stabilisation, as well as of very much reintensified pressure. An example of a period of very strong anthropopressure on the environment was of course provided by the Industrial Revolution. The 20th century also witnessed humanity's very severe exertion of pressure on the environment, this reflecting the geometric increase in the human population and the attendant needs to produce food, to obtain sources of energy and to find space to meet the needs of the settlement network. The pressure in question transformed ecosystems greatly, though it also made people aware that the latter of themselves possess a certain potential from which benefit can be drawn.

Specifically, humankind benefits from a multitude of resources and processes that are supplied by natural ecosystems. Collectively, these benefits are known as ecosystem services, and include products like clean drinking water and processes

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like the decomposition of wastes. Ecosystem services are distinct from other ecosystem products and functions because there is human demand for these natural assets. Services can be subdivided into five categories:

- provisioning, such as the production of food and water;
- regulating, such as the control of climate and disease;
- supporting, such as nutrient cycles and crop pollination;
- cultural, such as spiritual and recreational benefits;
- preserving which includes guarding against uncertainty through the maintenance of diversity.

In considering the relationship between humankind and the environment in ever-greater detail, some authors (like *Holdren – Ehrlich,* 1974; *Ehrlich, P. R. – Ehrlich A. H.,* 1981) show how ecosystem services support life through:

- the purification of air and water,
- the mitigation of droughts and floods,
- the generation and preservation of soils and renewal of their fertility,
- the detoxification and decomposition of wastes,
- the pollination of crops and natural vegetation,
- the dispersal of seeds,
- the cycling and movement of nutrients,
- the control of the vast majority of potential agricultural pests,
- the maintenance of biodiversity,
- the protection of shores from erosion by waves,
- protection from the sun's harmful ultraviolet rays,
- the partial stabilization of climate,
- the moderation of weather extremes and their impacts,
- the provision of aesthetic beauty and intellectual stimulation uplifting of the human spirit.

Consequently, society is coming to realize, not only that ecosystem services are threatened and limited, but also that there is an urgent need to evaluate trade-offs between immediate and long-term human needs. This is, for example, true of the need to estimate the pedosphere's capacity to supply enough food in the form of crops for the inhabitants of given regions of our planet (*Myers,* 1983; *Prescott-Allen, R. – Prescott-Allen C.,* 1990). To help inform decision-makers, economic value is increasingly being attached to a wide range of ecosystem services, this often being based on the cost of replacement by anthropogenically-driven alternatives. The ongoing challenge of ascribing economic value to nature is prompting transdisciplinary shifts in how we recognize and manage the environment, in social responsibility, in business opportunities, and ultimately in our future as a species.

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Conclusions

The presentation here of selected issues associated with the shaping of interrelationships between the natural environment, society, the economy and culture, and capable of conditioning spatial development, makes it very clear that the system of the natural environment is a fully-fledged player in the shaping of new spatial patterns and in the setting of directions to spatial development and regional economic development. It has now come to be important for the economic aspect to planning and accounting *vis-à-vis* spatial policy to take account of the potential of the natural environment, as well as optimisation of the latter's use. This is particularly the case when it comes to functional conceptualisations of socio-economic systems. Society's demographic development plus growing pressure on the environment resulting in ever greater fragmentation plus impairment of natural resistance to external factors ensure that there is an increasing demand for areas in which the landscape has only been transformed to a limited extent. In line with the increase in the number of inhabitants, the exhaustion of mineral resources and the reduction in the area of arable land, we are witnessing increases, not only in the prices of non-renewable mineral resources, but also in the prices of food – especially organic food (i.e. that produced traditionally, without the agents intensifying production). In this context, the environment is emerging as one of the basic determinants shaping the structure and development of space.

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