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A METHOD FOR ENVIRONMENTAL SUSTAINABILITY* ASSESSMENT: THE CASE OF THE POLISH REGIONS

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Integrated planning for regional development is relatively new in Poland, following the reform of the territorial administration in 1999. The strategic plans now produced by the regional parliaments are crucial research documents, particularly for their orientation to environmental and regional sustainable development objectives. This research developed and tested an assessment framework of issues for each regional plan. This was framed first in terms of internal regional objectives, and second in terms of their role in national level plans and policies. Such vertical integration of planning systems is a major challenge for European multi-level systems of governance. The assessment framework uses a system of indicators and indices, comparing regional versus national conditions and trends, based on a simple rational/maximal model. The methodology was designed to be transferable to other territorial levels, and may become a practical tool for evaluation of structural funding in similar regions across the EU. The methodology will benefit from further enhancements, in particular for the indicator set used for the 2000–2010 regional sustainable development model. However, at this stage in the development of Polish strategic planning, it aims to

*The Road Towards Sustainability. A Historical Perspective, Baltic University Program, Session 1, Uppsala, University, Uppsala, 1997, pp. 28–32.

provide a starting point for sustainability impact assessment of all major policy proposals, in the spirit of the Göteborg principles for European sustainable development.

Keywords: Environmental sustainability; regional strategies appraisal; strategic environmental assessment (SEA); integrated assessment practice.

The Purpose and Scope of the Study

The aim of the research presented here was to evaluate the strategies for regional (voivod[1]) development adopted by the regional councils in 2000 and 2001 in terms of their implementation of environmental protection and sustainable development (SD). This aim may therefore be decribed in general terms as an evaluation of the eco-orientation of these strategies. It is also, in a sense, the evaluation of their "ecoinnovation",[2] in other words, the extent to which the strategies aim at implementation of SD in the generally recognised sense of the term. Sustainable development was understood in the present research as a harmonized set of actions aiming towards reaching four systemic orders: ecological, social, economic and spatial (Kołodziejski, 1997). Due to the very broad context of sustainable development and high level of its conceptual generalisation (Pezzoli, 1997), clear distinction between technological versus ecological sustainability (Baltic University Program, 1997) and additionally low quality of available statistical data, the emphasis in the research was put on the environmental aspects of this paradigm. Implicit in the main aim of the study is the realisation of a number of indirect aims and several stages in the research. In the first stage, all the documents of strategies were analysed to extract from their contents all the issues relating to RSD and environmental protection. In the next step, the issues were ordered, ranked and assessed by number and scope of stipulations referring to RSD and environmental protection. Parallely, the work on listing and computation of SD and environmental protection indicators was started and evaluation of regional SD and environmental protection was performed based on analysis of these indicators for the years 1998–2000. At this stage it became apparent that formulation of recommendations addressed to regional planners would require extrapolation of SD and environmental protection indicators for the years

[1] Voivod (pl. województwo) is a nut 2 level of spatial and administrative division of the Polish territory that is now divided into 16 self-government regions (voivods), which are governed in the four-level governance system by both the central government and self-government administration.

[2] The term "ecoinnovation" is understood in the present article in the broad meaning — as all actions (new ideas, behaviours, products and processes) affecting positively the environment and its sustainability in contrast to Klemmer (1999) who limits this term to expenses on R&D aiming at decreasing environmental impacts. The ecoinnovativeness of the analysed regional strategies may be considered as a specific case study exercise in the Strategic Environmental Assessment (SEA), aiming at monitoring and analysis of the conditions of implementing the RSD.

to come. The conceptual model in its maximal and rational variants was created (see Fig. 2) as a conceptual tool for such exercise. Evaluation of the strategies, this time against the desirable scope of stipulations in order to successfully implement policies of environmental protection and RSD aiming towards national sustainability, was the last step in the process, which resulted in the synthetic evaluation and allowed recommendations concerning the strategies' necessary validation (see Fig. 8).

The process is set out in Fig. 1. Soon after the work on the evaluation of the strategies was undertaken, it became apparent that it would not be enough to analyse quantitatively the numerous individual stipulations of the strategies (both the diagnostic and operational parts), as well as the whole range of measures. In order to achieve the aim set for the research with relative objectivity, it was necessary to carry out an indicatory analysis that would, first, enable the range of diagnoses (drawn up on the principles of the SWOT analysis) presented by the regions to be evaluated, and, second, allow an assessment to be made of the current state of progress of the regions in environmental protection and SD. It was necessary, then, to identify the regional determinants for environmental sustainability, in the context

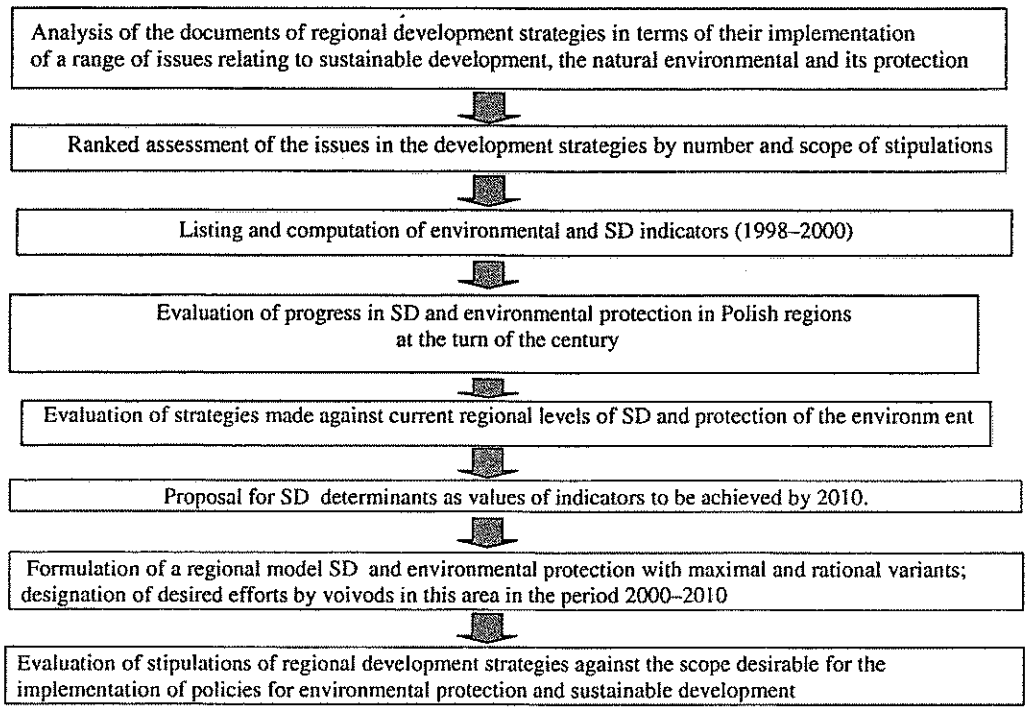

Fig. 1. Simplified scheme for the course of research into the ecoinnovation of voivod development strategies.

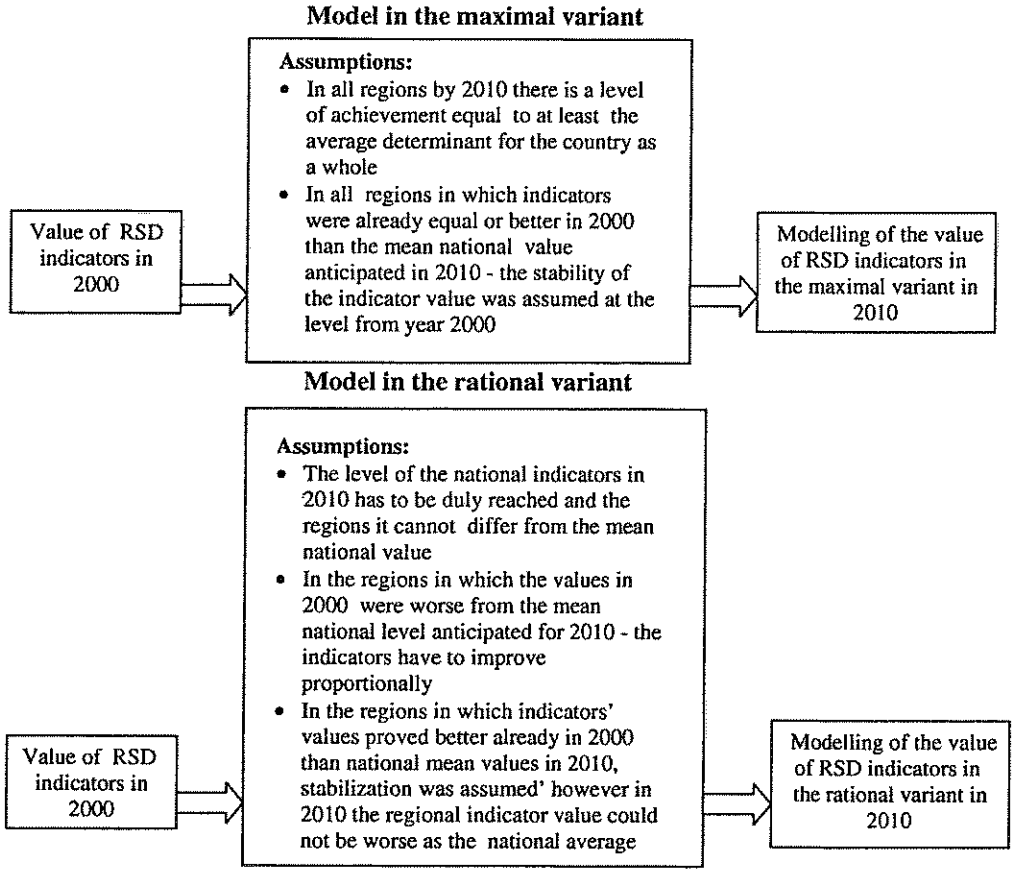

Fig. 2. Conceptual model of RSD in Poland.

of the anticipated values of pre-planned indicators used in formulating a regional model of sustainable development and environmental protection.

This model was worked out in two variants, the maximal and the rational. The resulting designations from the assessment of the 16 strategies have been used for comparison with the set of regional indicators as well as with the range of desired regional actions, both in environmental protection and in SD. This procedure has revealed a gap between what has to be done objectively to strengthen RSD and what is likely to be done as set out in the strategies.

Conceptually, the model has been constructed as shown in Fig. 2.

Environmental Sustainable Development Indicators

The selection of indicators was made primarily with reference to the scope of development strategies. They have been chosen to enable the objectives of the strategies to be evaluated. Seventeen indicators were used to evaluate the SWOT analysis in

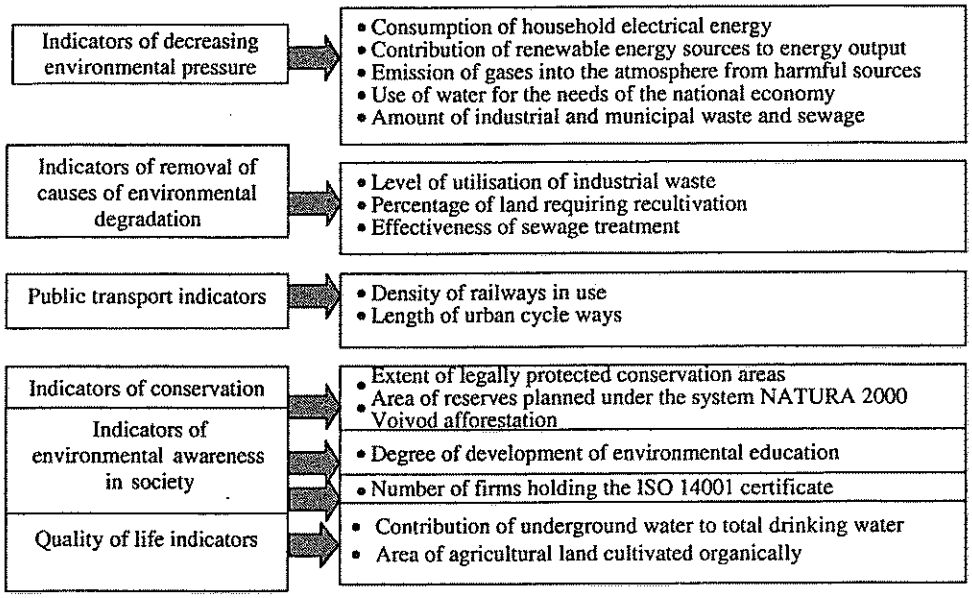

Fig. 3. Selected indicators of environmental sustainable development used for the assessment of regional strategies.

the strategies. Twenty-two indicators were used to evaluate the range of strategic tasks planned, most of which may be recognised as indicators of environmental sustainable development (Fig. 3).[3]

As some of the indicators were applied in the evaluation of both parts of the strategies (diagnosis and goals), they total 35 in all. All belong to one of three groups of indicators, classically distributed with respect to their bearing on the natural environment, i.e. indicators of state, impact and response (OECD, 1991, 1993). The indicators were also divided into static and dynamic (slow and quick to change). However, owing to lack of data, it was not possible to determine the rate of change for all the dynamic indicators analysed, in particular for the years 1998–2000 and, in a few cases, 1995–2000. This resulted from the fact that in 1998 the administration reform of the country took place and 49 "small" voivodeships were transformed into 16 "bigger" voivodeships, more and more often called "regions".[4]

The data sources used to calculate indicators were various; however, most of them (21 indicators) originated from government statistics (Central Statistical Office). The data of the Inspection for Environmental Protection, maps presented in selected number of publications (see References) and Internet were sources of all remaining information included in the research. The quality of the data was appraised by the

[3]Compare: Communication from the Commission, Structural indicators, Brussels, 8.10.2003 COM(2003) 585 final, Annex I, p. 6, http://www.cordis.lu/rtd2002/indicators/home.html.

[4]See footnote 2 for explanation.

authors in terms of their reliability and completeness. Both the criteria were assigned to each of the indicators separately. Presentation of all these specific criteria exceeds the framework and size of the present article.

The values calculated for the indicators were divided into few classes, particular attention being given to the indicators of pressure on the environment and its quality as well as the response to this pressure (Figs. 4 and 5). The values of the indicators represent the range of features from most to least favourable numbers describing ecological sustainability.

The spatial schedule presented in Fig. 4 points to the most favourable situation with regard to the indicators of environmental sustainability in the following voivods: *Pomorskie*, *Warminsko-Mazurskie*, *Lubuskie*, *Podkarpackie* and *Dolnoslaskie*. The following regions are characterised by a clearly unfavourable situation: *Lodzkie*, *Mazowieckie* and *Wielkopolskie*. The lack of concerted effort

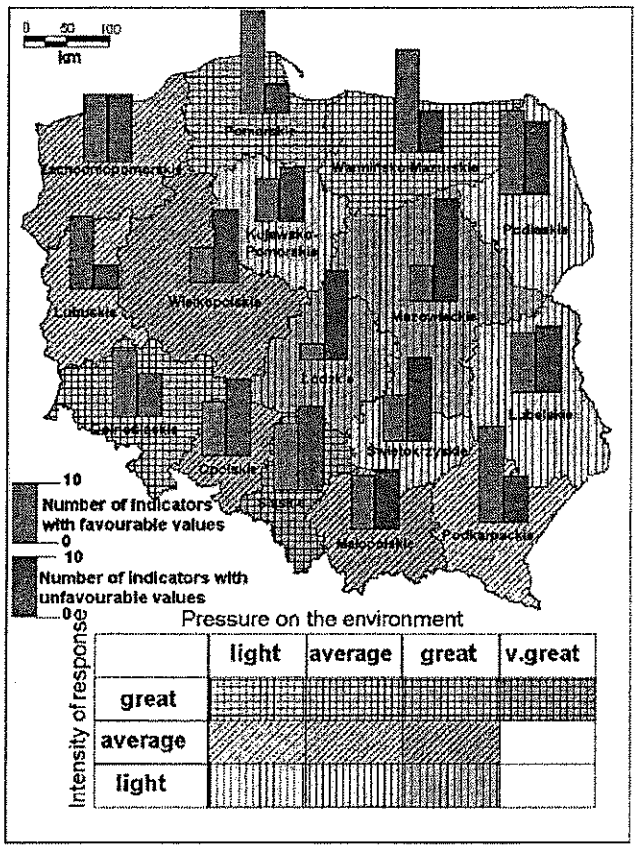

Fig. 4. Numbers of indicators with the most and the least favourable values in relation to the classification of voivods according to intensification of pressure on the environment and the degree of progress made in environmental protection.

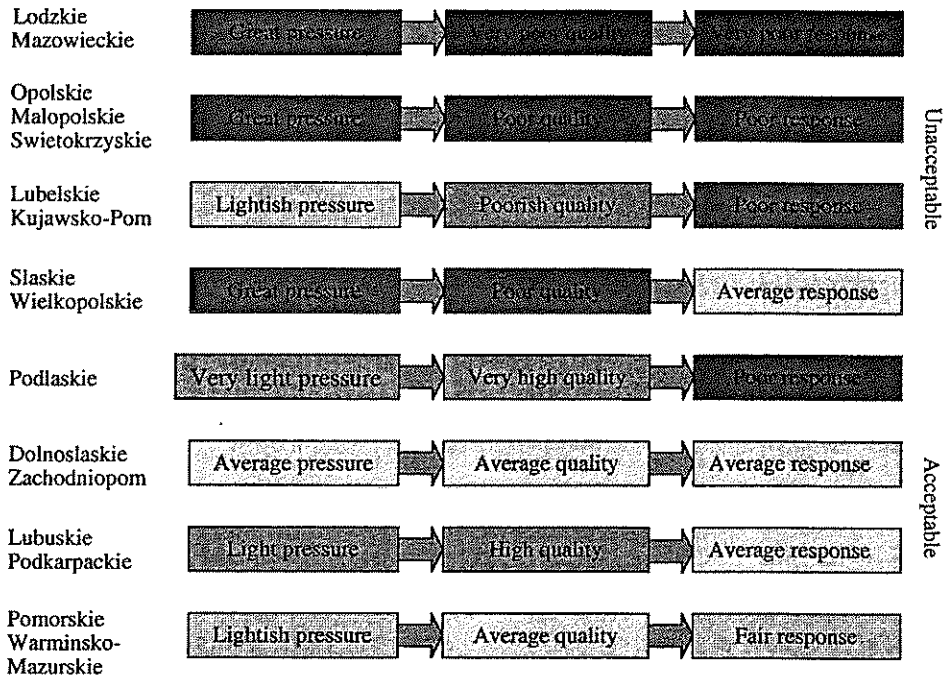

Fig. 5. Types of voivods' responses to regional environmental and SD issues.

in support of environmental protection and sustainable development gives particular cause for concern in the central and eastern regions of Poland. The diagnosis goes some way towards discrediting the traditional stereotype of southern Poland as the part of the country that fares worst in terms of ecological criteria. Although the true quality of the environment must still be reckoned as one of the poorest in the country (although with respect to some parameters the central regions are even worse), the response to its problems has been robust and gives reason to hope for an improvement in the situation. This contrasts with the often non-environmentally friendly stance taken by communities in the regions recognized hitherto as the most environmentally unpolluted; for example, *Lubelskie* and *Podlaskie*.

The indicatory analysis reveals the state of progress of the regions in carrying out measures for the protection of the environment and achieving the goals of sustainable development. This may be expressed in the form of generic types of the responses of the voivods to the challenges of ecological sustainability (Fig. 5).

The indicators used in the research also serve to analyse the dynamic changes emerging at a time of increased pressure on the environment, and measures to protect it. The widespread view that the natural environment improved in every respect during the 1990s in Poland, resulting in a decrease in environmental pressures, is in fact only partially true. Several manifestations of pressure on the environment, for

example, the use of household electrical energy and the use of artificial fertilisers in agriculture, indicate a distinct increase, which may be causing a deterioration in air quality and the quality of surface and underground water or soils.

However, the most disturbing sign of environmentally unsustainable development in the country, standing out ever more starkly in the second half of the 1990s, is the way in which public expenditure on environmental protection and related causes plummeted. Between 1998 and 2001, it fell by half in some regions (*Pomorskie*, *Slaskie* and *Malopolskie*), while in the country as a whole it fell by over 30 percent. Such a dramatic drop in the public expenditure, in absolute terms as well as when reckoned in terms of population, mainly as a result of a general financial crisis of the state, cannot be justified either with respect to reducing the pressure on the environment or where improvement in its quality is concerned.

A Model for Sustainable Development and Environmental Protection

In order to assess the effectiveness of strategies for environmental protection and SD, objectives and targets have to be identified for specific regions. To this end a model for environmental protection and sustainable development has been drawn up. The Second National Ecological Policy, the Environment 2010, Our Future, our choice, European Union New Policy for Environmental Protection,[5] the concepts of "ecogrowth," such as Factor 4 (Weizsäcker *et al.*, 1995) and Factor 10 (Schmidt-Bleek, 1994), and of Ecological Space (Carley and Spapens, 1998) are, as a rule, adequate instruments to describe these aims at the national level or at the level of a national grouping. On the basis of these sources and the authors' own studies (Kistowski, 2003), the priority was to define the values for the indicators of sustainable development, namely the values for the indicators that are desirable to achieve before a set time limit in the country as a whole. The time horizon was set at the year 2010, while treating as starting values the indicators worked out for the year 2000. This time span is somewhat short from the perspective of long-term SD; this date was chosen in relation to the average distance of the time horizons of the regional strategies, which range from a few years to over 10. The values for the SD indicators for the country as a whole were calculated for 15 out of over 30 that were adopted in the research (Table 1). For the remaining indicators, in particular those concerning environmental management and education, it was not possible to identify the specific anticipated values for the determinants, but it can be asserted that in all likelihood they should be subject to improvement in all regions.

[5]The Sixth Environment Action Programme 2001–2010, Commission communication — full text, Office for Official Publications of the European Community, Luxemburg, 2001, pp. 14–25.

Table 1. Anticipated mean values for SD and environmental protection indicators for Poland in 2010.

Specification of rsd indicators	Value 2000 (x)	Value 2010 (y)	y/x Poland
Reduction in household energy use (per capita-KWh/year)	662.8	331.4	0.5
Increase in energy output from renewable sources (%)	6.71	13.00	1.94
Reduction in emissions of gases into the atmosphere (per capita-ton/year)	5.27	3.375	0.64
Increase in the density of railways in use (km/100km^2)	7.2	8.0	1.11
Reduction in the use of water in the national economy and households (per capita-m^3/year)	269.4	199.0	0.74
Reduction in the release of sewage into water and soil (per capita-m^3/year)	64.7	64.7	1.00
Increase in general level of sewage treatment (%)	87.9	94.0	1.07
Reduction in the area of land requiring recultivation (%)	0.23	0.1	0.43
Increase in the utilisation of industrial waste (%)	76.9	88.5	1.15
Increase in the extent of legally protected conservation areas (%)	32.5	33.3	1.025
Increase in the area of reserves under the system NATURA 2000 (%)	13.3	15.0	1.11
Increase in woodland and green areas (%)	29.17	30.0	1.03
Increase in drinking water derived from underground sources (%)	63.03	80.0	1.27
Area of agricultural land cultivated organically (%)	0.063	10.0	159.0
Increase in the area of coverage by digital environmental maps	0.444	1.0	2.25

The basic issue of the research at this stage was fixed upon as defining the values of the determinants given in Table 1 for each of the 16 voivods. This problem arose from the fact that the National Ecological Policy has defined the anticipated values of indicators for the entire territory of the country without indicating such values for particular regions. In 2002, most of the regional strategies were not yet elaborated and/or in force and it was necessary to create a model defining the respective range of actions that would achieve the national goals of the environmental policy by the end of the year 2010. It has to be emphasized that Polish law requires conformity of regional policies with the national policy and as from the year 2003 regional authorities have a legal obligation to formulate such policies.

To resolve this problem, a model, presented earlier in Fig. 2, was constructed with two variants, maximal and rational. In the working of this model, Matlab v.6 was used. The model was elaborated to answer the following questions:

1. What should be the main themes of regional actions for ecological sustainability?
2. How intense these actions should be?
3. Are these necessary actions included in the regional strategies?

The model has a static character and enables 2010 prognosis of regional SD, based on known values of indicators for the entire national territory. It has been assumed that the model should: be simple and enable repeatability; enable optimisation of assumed action programmes and their intensity; include specific situation, assets and positioning of the regions (in 2000) in the national development processes.

The maximal variant of the model establishes that by 2010 there is a level of achievement in each region equal to at least the average for the determinants for the country as a whole for the year 2010. This is, however, not very realistic and may be referred to as the "benchmark", or the values that should be aimed at in the second variant of the model, the rational. Efforts have been made here to make the "endeavours" to be undertaken by particular regional communities more evenly distributed between the voivods than is the case in the maximal variant. This was done by employing the procedure of minimising the sum of the deviations of a determinant value in particular voivods from the mean value for that determinant in the country as a whole. The fundamental prerequisite remains, however, to determine the mean value for a national determinant in 2010, although the regional determinants may vary from one voivod to another.

In Fig. 6, four examples are given of desired changes in absolute values for parameters of sustainable development between 2000 and 2010, calculated for the rational variant of the model. The gauge of the intensity of effort that should be made in specific regions is the difference between the absolute values for a parameter at these dates (presented in bars in Fig. 6). So, for example, if the amount of energy produced from renewable sources is to be increased by a similar degree in all voivods, the reduction in the emission of gases should already be distinctly greater in *Lodzkie* and *Slaskie* and slightly greater in *Dolnoslaskie*, *Wielkopolskie* and *Mazowieckie*. A reduction in the use of water is of fundamental importance to *Mazowieckie*, *Swietokrzyskie*, *Wielkopolskie* and *Zachodniopomorskie*.

An analysis of the values of 15 indicators of changes desired in the first decade of the twenty-first century enabled seven types of regional environmental policy to be defined (Table 2). The types of regional environmental policies needed to obtain regional SD have been set up proportionally to the range and intensity of actions categorized in three groups: infrastructural, preventing or liquidating reasons of degradation of the environment; as well as "soft" measures enabling, i.e. actions protecting nature or optimising environmental management. Policy type I contains the least range of least intensive actions and Policy type VII the broadest range of most intensive actions aiming at regional SD. The most concerted efforts in this area should be made by the voivods of central Poland, *Lodzkie*, *Mazowieckie* and *Wielkopolskie*, and only slightly less intense efforts are called for in *Slaskie*

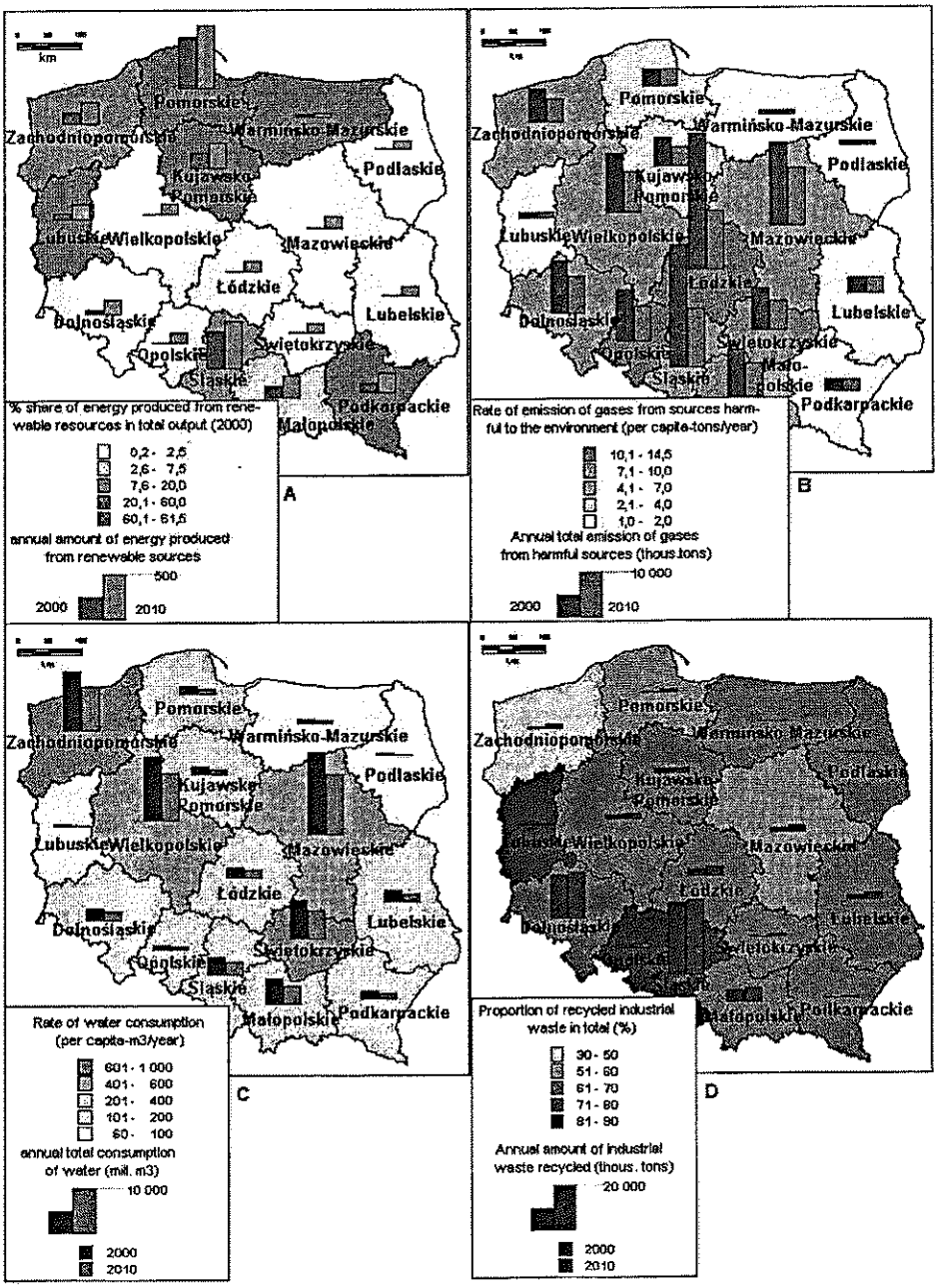

Fig. 6. Desired absolute values for 2010 for selected indicators of SD shown against those for 2000: (A) increase in the amount of energy derived from renewable sources; (B) reduction in the amount of gases released into the atmosphere from harmful resources; (C) decrease in water consumption; (D) increase in the utilisation of recycled industrial waste.

Table 2. Proposal for regional policy types in relation to environmental protection and sustainable development in Poland.

Voivod	Infrastructural measures aimed at prevention of degradation			Infrastructural measures aimed at liquidation of degradation			"Soft" measures" – conservation/ environmental management			Type of policy
	Broad	Medium	Narrow	Broad	Medium	Narrow	Broad	Medium	Narrow	
Dolnośląskie										V
Kujawsko-Pomorskie										IV
Lubelskie										IV
Lubuskie										I
Łódzkie										VII
Małopolskie										VI
Mazowieckie										VII
Opolskie										III
Podkarpackie										I
Podlaskie										II
Pomorskie										II
Śląskie										VI
Świętokrzyskie										III
Warmińsko-Mazurskie										I
Wielkopolskie										VII
Zachodniopomorskie										V

and *Malopolskie*. The least pressing action is needed in *Lubuskie*, *Podkarpackie* and *Warminsko-Mazurskie*. Relatively mild policies should also be pursued in *Podlaskie* and *Pomorskie*. In the remaining regions policies should be implemented at a medium level of intensity.

The Objectives of the Voivod Development Strategies in the Context of Ecological Goals

The developmental strategies of the voivods, adopted by the regional councils for the first time in 2000–2001, were drawn up on the basis of sharply differentiated assumptions and methodologies. They are therefore not easy to compare. In the research, only part of which is presented in this article, the strategies were evaluated by applying various criteria to analyse both their diagnostic components (mainly the SWOT analysis) and their operational components (tasks and projects), with respect to their implementation of the range of issues contained in them relating to environmental protection and sustainable development. In this summary of the research the focus is on the characteristics of the operational side of the strategies. Most of the stipulations of the strategies are ranked in four (occasionally three) categories, the first being a single-sentence expression of the vision, mission or priorities set up in the regional strategy. At the next level of the strategy are the stipulations which cover the

issues analysed and which vary greatly in number from a mere handful to a total of over a hundred. Much of the greatest involvement in environmental and ecologically sustainable development action is shown by *Wielkopolskie*, *Zachodniopomorskie*, *Warminsko-Mazurskie* and *Kujawsko-Pomorske*. Next in order come *Podlaskie*, *Dolnoslaskie*, *Slaskie*, *Lodzkie* and *Pomorskie*. The fewest stipulations dealing with these matters are found in the strategies of *Opolskie*, *Lubelskie*, *Lubuskie* and *Podkarpackie*. In terms of action directed at environmental and sustainable development, the lead is taken, when taking the stipulations of their strategies as a whole, by the regions of *Wielkopolskie*, *Kujawsko-Pomorskie* and *Warminsko-Mazurskie* (>25 percent of the total number of stipulations) and *Dolnoslaskie* and *Lodzkie* come out worst (5–10 percent).

A quantitative analysis of the terms of the strategies is, however, only the prelude to the research, the goal of which is to establish the extent to which these conform to the anticipated values of indicators in particular spheres of desired action. Only an analysis of the range of measures to be undertaken, looked at in the context of the models of sustainable development and environmental protection presented earlier, may provide a partial answer to the question as to whether regional strategies in Poland are conducive to sustainable development. The next stage of this analysis was to determine the number of measures that are essential from the point of view of sustainable development and which were omitted in the strategies as well as measures which were included in the strategies but which, from the point of view of sustainable development, are redundant (Fig. 7). This analysis revealed the greatest deficiencies in measures relating to environmental protection and sustainable development in the strategies for the voivods of *Lodzkie*, *Lubelskie*, *Mazowieckie*, *Podkarpackie* and *Swietokrzyskie*. The voivods whose strategies showed the fewest omissions of measures indispensable or advisable for implementation were *Slaskie*, *Malopolskie* and *Podlaskie*.

A slightly lesser issue than the omission of desirable measures is the inclusion of measures that appear redundant in terms of regional needs. This is not to say that they should not be implemented locally in some parts of the voivods. However, on the regional scale these measures are not significant. The voivod of *Warminsko-Mazurskie* showed the highest number of these "redundant" measures, a total of 13 being found here, while *Pomorskie* (8), *Lubelskie*, *Podkarpackie* and *Wielkopolskie* (6 each) also had a fairly high number of such measures.

In general, when assessing the completeness of the strategic measures in the sustainable development and environmental sphere in the context of the terms of the model in its rational variant and the regional environmental policies identified, the strategies of the following voivods emerge most strongly: *Kujawsko-Pomorskie*, *Lubuskie*, *Malopolskie* and *Slaskie*, while the weakest were *Lodzkie* and *Lubelskie*,

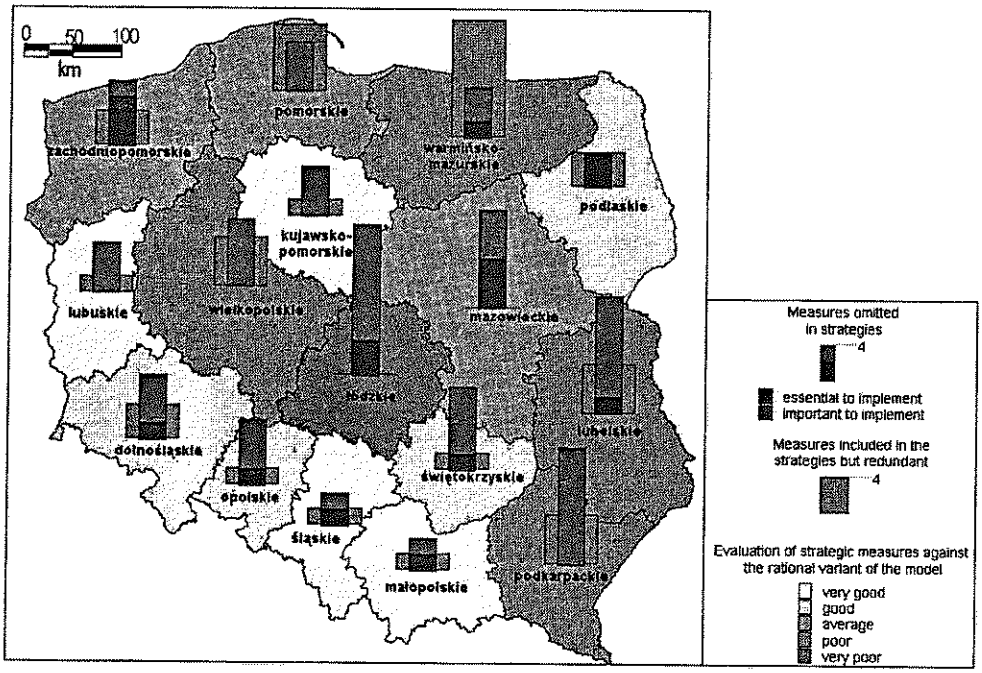

Fig. 7. Number and synthetic evaluation of measures dealing with environmental protection and sustainable development omitted in regional strategies and those included but redundant in terms.

Podkarpackie, *Warminsko-Mazurskie* and *Wielkopolskie*. The remaining strategies are, with certain reservations, correct.

Conclusions

In applying these results to an evaluation of regional SD, it has to be stated that the majority of voivod regional strategies in Poland do not ensure a satisfactory level of environmental protection or progress in SD. When taking into consideration all the criteria employed in the evaluation of the strategies, i.e.

- the quantitative assessment of the diagnostic parts of the strategies (SWOT analysis),
- the quantitative assessment of the operational parts of the strategies (measures),
- the assessment of both these parts in the context of environmental and sustainable development indicator values,
- the assessment of the strategic measures against a model in its rational variant,

it can be seen that 11 strategies call for considerable supplementation and improvement (Fig. 8).

In spite of focusing on environmental aspects of sustainability in the research and in spite of having selected the indicators that mainly referred to different aspects

of environmental protection, most of the formulated recommendations arising from the constructed model of sustainability 2000–2010 include also other aspects of RSD. Reaching the objectives and levels of indicators assumed in the model such as: improvements in the infrastructure of environmental protection, decreasing gas emissions to atmosphere or waste water discharge to water reservoirs is not possible without instruments allowing to manage effectively social and economic systems. Among such instruments regional and spatial planning, proecological tax

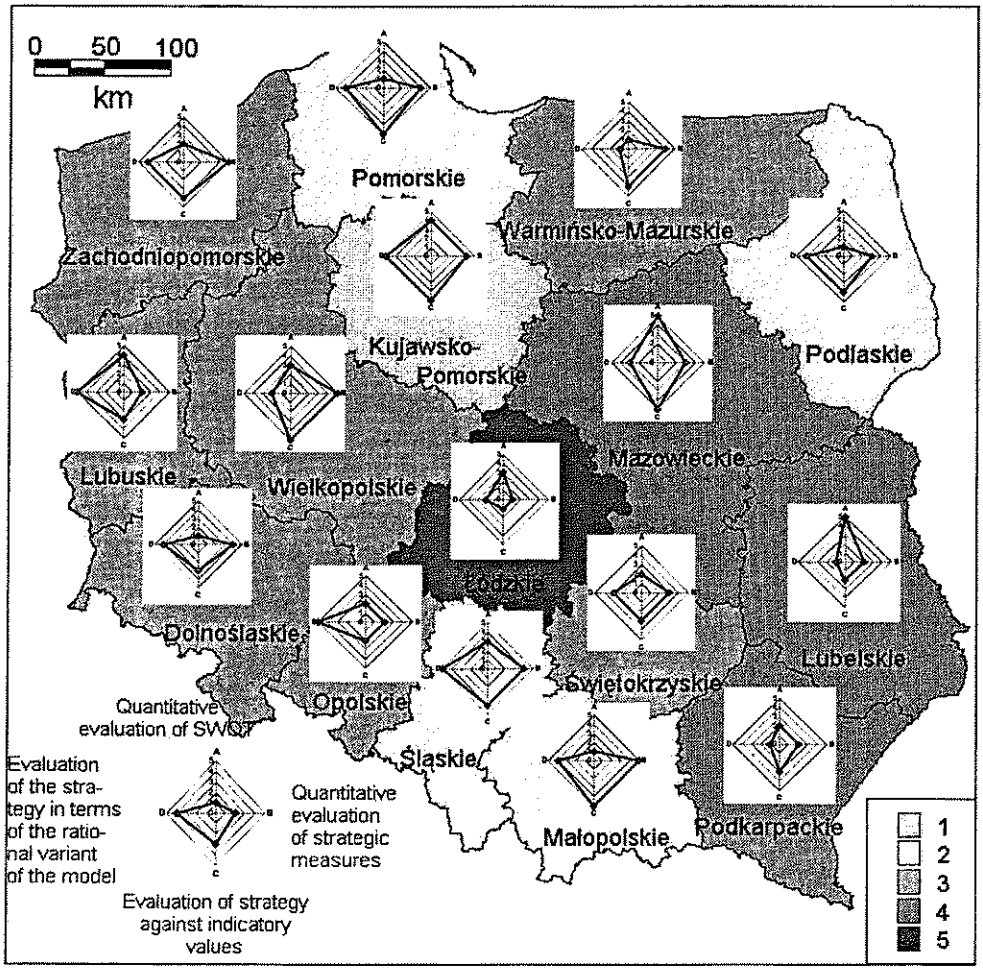

Fig. 8. Spatial schedule of synthetic evaluations of rsd in regional strategies and recommendations concerning their necessary validation.

Recommendations for validation (with reference to shades):

1. Strategies have a good foundation for regional SD and require only slight supplementations
2. Strategies have a good foundation for regional SD and require some supplementations
3. Strategies do not have satisfactory foundation for regional SD and require considerable supplementations
4. Strategies have a weak foundation for regional SD and require extensive supplementations
5. Strategies with poor foundation for regional SD which need to be reworked to include eco-development aspects

reform, changes in institutional forms and mechanics of multilevel governance system including systems of sectoral management and their horizontal integration, introducing innovative proecological technologies and last but not least integrative and multidisciplinary education should be mentioned. Legislation reforms are needed to make use of these instruments possible in Poland. Apart from this considerable financial contributions both from national and the EU budget will also be required.

Currently, the Second National Development Plan for the years 2007–2010 is being constructed in Poland. This Plan will be the guide-post for financial allocations of the structural funds. The results of the research presented in this article should, in the opinion of the authors, become an important criterion for allocating means of the structural funds that will support reaching objectives of environmental regional sustainability.

The results of the research may also be implemented directly to regional strategies and policies with regional environmental policies (their next edition is planned soon) on top to reach more sustained development and better level of environmental protection.

The objectives of the presented RSD and environmental protection model have been constructed in such a way that reaching them at the regional level will at the same time enable meeting the objectives of the Second National Environmental Policy for the entire territory of the country. The way for making development more sustainable was thus delineated for both regional and national levels with the intention to assure consistency of anticipated change and vertical integration of policies.

Range and quality of the available data limited the number and kind of indicators used in the research. This is an additional signal and conclusion arising from this process. Better data for more and better indicators as well as aggregate indicators are needed in particular for the regional level. This conclusion is addressed mainly to national statistics system as well as to regional governments who in the near future will have to overtake certain obligations in this field upon themselves.

In the course of the investigations that have been carried out, the need has become apparent for considerable modifications to the procedures and methodology for drawing up voivod strategies for development (particularly in the diagnostic parts). There is also a need to:

- broaden the information base as indicated above;
- improve methodologies for modelling the processes of environmental protection and sustainable development and their inclusion into strategic planning at the regional level.

The methodology presented in the article aiming at measuring regional SD could be adopted, in the opinion of the authors, for other evaluations.

After amendments the methodology may serve in evaluation of results in the projects financed by EU structural funds with respect to their supporting SD. The methodology should be developed further in order to include also more economic indicators and processes as well as indicators of social progress and improvements.[6] The focus in the methodology is on environmental protection issues due to reasons explained in the article.

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[6]Compare: Communication from the Commission, Structural indicators, Brussels, 8.10.2003 COM (2003) 585 final, Annex I, pp. 10–11.