Friedrich Hinterberger

Eco-efficiency of regions

How to improve competitiveness and create jobs by reducing environmental pressure

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# Eco-efficiency of regions

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Introduction

How to improve competitiveness and create jobs by reducing environmental pressure

The purpose of this paper is to present the concept of eco-efficiency as a valuable contribution to a sustainable regional development in the European Union. Eco-efficiency and dematerialization strategies are more and more successfully established at the business level where practical and easily understandable methods and management tools have been developed and applied in the past years and decades. On this (micro) level, many cases have been identified where environmental protection on the one hand and competitiveness as well as the creation of jobs on the other are as a general rule no longer trade-offs but complements.

On the regional level the situation is somewhat different. Although sustainable development is increasingly integrated in EU-policies the knowledge about the application of eco-efficiency concepts for the regional level is lagging behind.

Therefore this paper aims at setting out:

- the principal relevance of eco-efficiency for regions as a core contribution for reaching the broader concept of sustainable regional development,
- possible fields and sectors of regional policies with a particular suitability for the implementation of eco-efficiency methods,
- opportunities and limits of eco-efficiency strategies for regions.

Chapter 1 starts with a short presentation of the concept of eco-efficiency together with examples of successful applications. Chapter 2 looks at the role of the regions within the European Union and at the EU Regional Policy. Chapter 3 presents principal guidelines for orientation purposes, on the bases of which strategic objectives are derived. Then (4), fields of activity are identified and discussed.
1 The concept of Eco-efficiency

The concept of eco-efficiency has been developed for the business level. A prominent definition comes from the World Business Council for Sustainable Development (WBCSD), which says that eco-efficiency

“is reached by the delivery of competitively priced goods and services that satisfy human needs and bring quality of life, while progressively reducing ecological impacts and resource intensity throughout the life cycle, to a level in line with the earth’s estimated carrying capacity.”

Characteristic features can be summarised as follows:

**Eco-efficient processes**

Making resource savings and reducing risk or impact in processes allows companies to diminish the costs of production and site operations within their own fence line.

**Re-valorising by-products**

Co-operating with neighbouring and partner companies can offer several opportunities to re-valorise wastes and by-products by making these materials valuable alternative resources and experiencing cost benefits at the same time.

**Creating new and better products**

Products and services, following ecological design rules with new and enhanced functionality, offer companies new and more profitable business opportunities and increased market shares, and cost savings.

The main objective of eco-efficiency is therefore

“raising the resource productivity, which is the ratio of the resources used to the value added.”

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**Increasing eco-efficiency in the business sector: three examples**

**Pago**, a producer of fruit juice, implemented technical changes in the cleaning processes of their fruit bottles and achieved some notable efficiency gains: a reduction of water consumption by a factor of 10 (minus 90%), a reduction of heat consumption by a factor of 10 and a reduction of mass flow by a factor of 10! Pago is saving about 50,000 Euro per year with the new process design.

The carpenter **Kappeller** designed a new multi-media desk. Special importance was attached to the durability and the lifetime of this new product. It was designed in a modular mode and the portion of non-renewable basic materials was minimized. Kappeller grants a 30-year guarantee on this high-quality piece of furniture including services for repairing and maintaining.

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3 Cf. Görlach, B./Hinterberger, F./Schepelmann Ph. (1999)
4 Cf. Manstein, Ch./Schmidt-Bleek, F. (1999)
In a joint project of several firms, the construction of a resource-efficient “kindergarten” was supplemented with detailed analyses of the construction design. Compared with a typical modern wall construction combined with an oil heating system, a light-weight timber post and beam construction combined with a pellet heating system results in a resource efficiency have gained by a factor of 5.

On the macro level of a country’s (or Europe’s) economic development, eco-efficiency has been defined as “de-coupling growth of welfare from use of nature”. This means more value with less impact for the entire economy.

Since the mid-nineties, Sustainable development and the integration of environmental protection into other policies is an explicit goal of the European “constitution” (the Amsterdam treaty). In simple terms, this means that three goals should be guiding all policies:

- A sound economic development: growth of quality of life, stable prices, and high employment rates etc.
- Protection of the eco-sphere: cyclic use of renewable resources, preference for renewable ones, and preservation of the assimilation capacity of nature.
- An equal distribution of chances: between individuals, generations (inter- and intra-generational equity) and regions.

This is of special importance for regional policy.

2 The role of regions in Europe

The political dependence of regions on the national states varies strongly in the European Union. The figure below shows roughly how regions can be classified.

<table>
<thead>
<tr>
<th>Classic unitary states</th>
<th>Unitary states devolving power to local authorities</th>
<th>Unitary states devolving power to the regions</th>
<th>Regionalised unitary states</th>
<th>Federal states</th>
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</thead>
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<tr>
<td>Luxembourg</td>
<td>Denmark</td>
<td>Portugal</td>
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<td>Switzerland</td>
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<td>Greece</td>
<td>Norway</td>
<td>United Kingdom</td>
<td>Spain</td>
<td>Austria</td>
</tr>
<tr>
<td>Ireland</td>
<td>Sweden</td>
<td>France</td>
<td>Spain</td>
<td>Germany</td>
</tr>
</tbody>
</table>

Tab. 1: A typology of regional government in the EU

Notes:
[1] The United Kingdom was a classic unitary state until powers were devolved to Wales, Scotland and Northern Ireland in 1999 whence it became a devolving unitary state.
[2] Finland is in the process of devolving powers to some of its regions.

Consequently the scope for political decisions of regions towards eco-efficiency varies. Public authorities, however, are just one group of the important regional players: Companies, households, environmental organisations etc. pursue their own strategies and are equally important for an integrated strategy towards sustainable development. Which need to be related to the administrations’ strategies and vice versa.

As the economical disparities between the European regions are considerably large, the Regional Policy of the EU aims at reducing these differences. Financial instruments such as the Structural Funds, the Cohesion Fund for the Member States and the Pre-Accession Aid for the future candidate countries in Central and Eastern Europe are supposed to support economic and social cohesion.

The spending is usually directed by focussing on social and economic factors. Environmental concerns are not integrated with the same importance, even though sustainable development and the improvement of the environment is a declared goal of the European Union. The narrow socio-economic focus of Regional Policy is in contrast to the objectives of the Union which are defined in Article 2 of the Amsterdam Treaty which directly refer to sustainable development in connection with the social and economic goals of the Union.

Especially for the formulation of such financial measures it is important to have indicators, according to which the appropriateness of the instrument can be judged. In the field of social and economic development, the gross domestic product (GDP) and the employment or unemployment rate are two widespread, generally known and accepted indicators. This also applies to the objectives to be achieved (continuous growth and a high level of employment).

If we look for a general measure of environmental pressure that is capable of “competing” with these generally used indicators, particular significance should be given to the material input indicator, because

- it provides a comprehensive representation of the impact of human activities on the ecosphere
- a positive correlation can be assumed to exist between the material input and many damages which are often difficult to capture
- The indicator for material input can also cover water consumption if it is defined appropriately.
- decreasing inputs are expected to result also in decreasing outputs of the economic cycles.

Therefore, the total material flows/input have been established by the European Environment agency as a key indicator within a core set of relevant environmental indicators, which could become a rough equivalent to the GDP or the unemployment rate for the environmental dimension of sustainable development.

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7 The financial support is usually planned as a long-term investment. The next funding period in the EU Regional Policy has been designed for the years 2000-2006. The amount of money has drastically increased in size: 235 billion Euro within the next seven years (in comparison with 150 billion ECU between 1994 and 1999). 65 % of all EU-expenses for the environment (about 5,7 billion ECU from 1994-1999) are spent in the framework of the Regional Funds. Cf. Schepelmann, Ph. et al. (1998).

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<table>
<thead>
<tr>
<th>Indicators for SD</th>
<th>GDP</th>
<th>Unemployment rate</th>
<th>Total material flows</th>
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<tr>
<td>Economical dimension</td>
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<tr>
<td>Environmental dimension</td>
<td>Total material flows</td>
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Fig. 1.: Indicators for Sustainable Development

At the level of policy strategies, this would correspond to a commitment to the objective of dematerialization and eco-efficiency that was discussed above. For a successful implementation, political action should be addressed to all system levels, which will be dealt with in the next chapter.

Existing data on the total material use per capita could enable an ecological evaluation of the Structure Funds Policy. The Total Material Requirement (TMR) in tons, developed by the Wuppertal Institute for Climate, Environment and Energy, is mentioned here as one of the most prominent approaches in this respect. Data for assessing the material flows in the EU 15 have recently been published in the regular indicator report of the European Environmental Agency.

Corresponding regional data, however, is not yet available.

3 Eco-efficiency of regions: what regions can do

The potential benefits of the eco-efficiency concept are often ignored or underestimated. We already emphasised the important role of eco-efficiency within the concept of sustainable development and made clear that the regional level is actually very meaningful for the implementation of an eco-efficiency strategy.

In the context of globalisation it is frequently argued that attractive business locations will have to accept lower wages or social benefits. Altvater/Mahnkopf, however, point out that such measures do not correspond to the norms of competitiveness, as a reduction of wages goes hand in hand with a decreasing qualification - a decisive factor in the global competition. Similar arguments can be made about the “soft factors” or “soft infrastructure” (environment, culture and other social factors). We might even argue, that wages tend to decline in line with reduced quality of the environment, culture and other social factors.

A suitable top down strategy to react to the downward spiral of wages is regionalisation. It increases the value of the region, as an answer to the globalisation of the economy and the declining ability to act by the national states. The role of regional networks of economic actors seems to increase relatively to that of the national state. On the other hand, a “bottom-up” strategy for increasing the value of the region can also be identified. This includes communication between communities (e.g. traffic and waste problems; water and energy supply etc.)

9 Cf. EEA (2000)
3.1 Principal guidelines

The present objective of regional policies is to create equal conditions of life in the regions. It is aimed at the alignment of the considerably diverging financial and material conditions through economic growth, transfer of funds and the supply of material goods. A different approach, focussing on the improvement of the quality of life while taking regional differences into account, is suggested. Here, the different regional potentials in societal, economical and ecological terms are taken into account, as well as the individual aspects of quality of life.

That means that the existing potentials of a region should be developed (within ecological guard rails) in order to support a high quality of life. Under this guiding principle the region is regarded as an area to fulfill the basic needs of its inhabitants on a high and sustainable level.

The following principles are complementary to this guiding principle:

• Orientation of the demand for goods and services within the region,
• Creation of job security (in the long term),
• Protection of the ecosphere.

This can be reached, as already pointed out, through a strategy of dematerialization:

• reduction of the total material and energy flows contributing to a long-term protection of resources.

If eco-efficiency strategies are pursued and a reduction of material flows can be reached, it will simultaneously lead to other positive effects: Lower costs of production, less emissions and waste, protection of the landscape, increasing tourist attraction, higher job security and social cohesion; just to name a few.

3.2 Strategic Objectives

For modelling a comprehensive eco-efficiency strategy at the regional level it is necessary to look at the regional economic processes from a point of view that goes beyond the area in question. The imports and exports in and out of a region are crucial when trying to develop an eco-efficiency strategy. As it can be seen from Figure 3, the status quo is generally characterised by relatively small quantities of material and energy flows within the region, whereas the imports and exports are dominating. The grey arrows indicate the “ecological rucksacks”: all materials that are required for producing and transporting the product without being part of the final product. The black arrows, on the other hand, are direct material inputs being part of the product.

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12 Cf. Dietmar Kanatschnig et al. (WWW)
In the course of a dematerialization strategy a regionalisation of the economy is both facilitated and required. This would result in a wide regionalisation of the material, energetic and informational processes ("In-ward Orientation"). Together with the construction and fostering of co-operative relations between all parties involved it is possible to gain increased regional independence, competitiveness and stability. The activities of agriculture, firms, households and communities should aim at an increasing circulation of the regional economy. Proximity should therefore emerges in all areas of life. Furthermore, regional resources should be used taking into account their regional peculiarities. This would result in a reduction of the material- and energy flows between the regions (through the increased circulation of the regional economy and the increased use of regional resources) and within a region (because of the increased resource efficiency of regional products and services).

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14 Cf. BUND / MISEREOR (Ed.) (1996)
Figure 4 shows such a situation, where the regional economy becomes more competitive while the environmental burdens are reduced.

It should be made clear that autarky is by no means a desired outcome. Regional economic forces and potentials should rather be mobilised without relying on external forces. This aims at mobilising the regional potentials. There are, however, constraints to such a development, as a regional strategy for certain goods or services is economically or ecologically inefficient or simply not feasible.

A re-orientation of regional policy towards a more sustainable development path involves that by and large intraregional material circles and value-added chains are shortened through enhanced regional co-operation. The promotion, establishment and fostering of networks in the region between producers, consumers, public authorities, interest groups and other relevant actors are a decisive factor when pursuing an eco-efficiency strategy.
“Systemic Competitiveness” for regions:

The concept of systemic competitiveness was developed at the *Institute for Development and Peace (INEF)* at the University of Duisburg in Germany.

The core statement of this concept emphasizes that long-term competitiveness and successful economic development is not only created and maintained on the micro level (the level of single enterprises), but demands collective action on all levels of economic activities.

The concept thus identifies four key levels of action: the **micro, meso, macro and meta level**. For the establishment of systemic competitiveness of regions, all four levels have specific implications:

- **On the meta level**, visions of the regional development strategy will foster the regional identity.
- **The macro level** for regions refers to the policy of province and local governments, which should secure stable framework conditions for economic activities within the region.
- **Factors for competitiveness on the meso level** include the establishment of regional research and development centers, promotion of education and regional environmental policy.
- **The micro level** comprises small and medium-sized enterprises and their regional clusters.

Where is the link to the eco-efficiency strategy for regions?

The pursuit of an eco-efficiency strategy on all four levels within the region can make an imperative contribution to the maintenance and improvement of the systemic competitiveness of the region. Material flow management on the regional level thus can serve as an instrument to stimulate innovative development potentials, to create new business opportunities and thus promote the creation of new jobs.

This may involve the promotion of closer producer-consumer-relations as well as variety of networks and co-operation that are conceivable:

Co-operation on the enterprise level, be it vertical (along the value-added chain) or horizontal (common use of infrastructure for synergy effects); or in the case of a commercial area: politics, administration, business and environmental associations and the involved citizens should co-operate. Evidently, the partners for co-operation and the suitable form of co-operation vary accordingly to the respective task.

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The idea of fair share of wealth and resources is an important idea in the concept of sustainable development. In this context the eco-efficiency of region has cooperative dimension: it involves setting examples of functioning eco-regional systems, but contains also an aspect of knowledge transfer and cooperation. As some regions are less favoured than others, the idea of regional eco-efficiency can help a fairer wealth share by developing local economies that are less dependent of the economies of richer regions.

There are, however, certain barriers that prevent the potential partners from co-operation:

- External (economic) general conditions: These can influenced first and foremost by politics and usually lie beyond the scope of regional policy.
- Actually or presumably conflicting of interests: e.g. on tax revenue, competence, influence (price policy) etc. The analysis and mediation of potential conflicts of interests or potential synergy effects is, however, time-consuming and costly; a fact that can be a barrier for itself.
- Internal organisation: The partners fail to fix clear goals, the distribution of competence is far from being optimal or cultural barriers (e.g. communication problems) exist. Here, the exchange of information is essential. Additionally, external advice should be sought.

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16 Cf. Institut und Vereinigung für ökologische Wirtschaftsforschung (1996)
4 Fields of activity

After presenting the general view on how to achieve eco-efficiency on the regional level, we now want to present several fields of activity in which contributions to a substantial reduction of (global) material flows can be taken at the regional level. Most of the measures presented in the following are not sufficient per se to enforce an extensive eco-efficiency strategy in a region. Nevertheless, it is important to have a solid basis on which a more comprehensive approach can be built on. Therefore it is suggested to analyse the specific regional potentials in order to find out the fields, where measures can immediately be taken in an environmentally most effective and economically most beneficial way.

Good chances for co-operative processes exist, if all participants can expect advantages. These can either be financial (a more efficient use of funds, increased sales etc.) or strategic (e.g. higher strategic stability through a reduction of competition). Generally, reasons for co-operation are as manifold as the potential partners. As long as the compromise found within a partnership offers benefits to all participants, co-operation will be an important means for promoting eco-efficiency in a region.

4.1 Regional material flow management

Material flow management is a core element of a successful regional eco-efficiency strategy. The principle idea is that, first, the entire life cycles of products (including their development, production methods and their disposal) should be the subject of examination. Second, all involved decision-makers are supposed to co-operate in order to meet three fundamental objectives:

- Reduction of the material input: through a qualitatively and quantitatively improved selection of the material used.
- Eco-efficient use: The resource efficiency should be optimised in technical cycles. This can be reached through e.g. extension of the period of use, dematerialisation or an increase of the use efficiency.
- Reduction / adaptation of the material output: The materials leaving the anthropocentric technosphere should either be quantitatively reduced or qualitatively less harmful. The concept of an ecological waste management offers the necessary tools for this task. Moreover, it implies that this objective should already be addressed to in the phase of material extraction.

The starting-point of such a strategy would be at the enterprises level: the inputs should be examined with regard to their original source and the outputs to their final destination. This would automatically imply that a wider area is analysed – the regional level or beyond.

Such a thorough analyses offers distinct advantages for the companies:

• Ecological and economic weaknesses of products can be detected, which leads to:
• Identification of cost reduction potentials throughout the value-added chain. This can, for instance, be achieved through:
• Vertical co-operation with suppliers, customers and other relevant parties.
• Exchange of input materials (substitution materials with a lower material intensity).
• Taking advantage of internal or external possibilities for re-use, recycling etc.
• The facilitation of the use of cost-benefit analyse instruments (because more information is available).

**Resource Management in Kalundborg, Denmark**

One of the favorite cases presented by industrial ecologists is the story of the spontaneous but slow evolution of the "industrial symbiosis" at Kalundborg, Denmark. This web of materials and energy exchanges among companies (and with the community) has developed over the last 20 years in a small industrial zone on the coast, 75 miles west of Copenhagen. Originally, the motivation behind most of the exchanges was to reduce costs by seeking income-producing uses for "waste" products. Gradually, the managers and town residents realized they were generating environmental benefits as well, through their transactions.

In Kalundborg, some producers’ wastes are the raw material inputs for other production units in the region. The waste of a power station for example is delivered to a gypsum factory, non-usable district heat is used by the community of Kalundborg, and the surplus water steam of the power station is an input to the processes of a biotechnological factory, whose yeast is used for feeding pigs.

The investments for building up this network have paid off after three to five years. At the same time huge amounts of primary raw materials and emissions could be saved. To make such an development possible for all sectors of the regional economy, ecological and economic indicators are necessary: The reduction of resources on the one hand mustn’t lead to hazardous waste one the other hand. Together with a transparent environmental reporting an offensive marketing was developed which portrays the region as a reliable and innovative location. The region describes its environmental quality objectives in a development concept. It promotes the settlement of enterprises which agree to an increasing resource productivity. This economic concept brought the region advantages in image and competition. By this, the defined environmental targets became a locational quality factor for those enterprises which settle in this region.

An important aspect for a successful realisation of regional eco-efficiency is sufficient information for all participants. In particular, a lack of information might occur about...
Eco-efficiency of regions

- The possibilities to obtain renewable energy, raw-materials or products made out of these within or beyond the region and
- the total material flows of different technologies, semi-finished products or other production inputs.

Regional advice centres for sustainable resource management could make a considerable contribution for the initiation and/or maintenance of an ecological-economical and social development. Here, regional authorities and public private partnerships can play a special role.

Small cities play an important role for the implementation of regional eco-efficiency.

The Local Sustainable Development Network (LSDN) is an interesting illustration of what can be attempted in terms of development of specific know-how associated to sharing of knowledge and the creation of jobs.

Representing an innovative way of implementing Agenda 21, this EU supported project with a total budget of 4 million Euros is a cooperation of five small European towns (Dormagen, Fürstenwalde (Germany), Toro (Spain), Redange (Luxemburg), and Tulln (Austria)).

Each European partner records and analyses its experiences in the use of biomass with a study of material flows. With local partners, innovative concepts for the use of biomass for energy and heat production are developed and applied. The project further includes seminars, advanced Internet communication, youth exchanges which are used to create a dynamic of cooperation and awareness raising.

The advantages of such a strategy are manifold:
- Cost minimisation through the use of already existing facilities.
- Energy agencies are close-to-customers and could, moreover, use the link (as regards content and methodology) between energy and material use.
- Regional development agencies, on the other hand, could use their business relations to optimise economic and ecological goals of concrete business projects through increased resource productivity.

Additionally, research & development should play an important role as well. Existing information on eco-efficient regional development should be exploited by the promotion of (pilot) projects.

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20 See www.lsdn.de for details
4.2 Small business strategies

Kambium- an example for material flow analysis in kitchen production

Kambium, a producer of solid wood kitchen, is an example for the practical application of material flow analysis. The material intensity analysis includes the whole life cycle of the kitchen, that means from the raw material extraction to the production of massive trimmed timber, the assembly of shelves to the finished kitchen, the using phase and the recycling or disposal of the kitchen. The comparison with a standard plywood kitchen showed that in a lifelong focus the solid wood kitchen used a thirteen times higher input of biotic materials (wood, crop) than the plywood kitchen. But on the other hand the plywood kitchen has an four times lower input of inorganic materials like minerals, fossil energy sources, rocks, water and air.

Kambium has also a clear regional strategy. In transport management the company concentrates in external transports (delivery of goods). On the one hand the company has a distribution border of 100 km, on the other it has international transport linkages. To get low transport intensity by short distances the company uses for instance granite from Verona/Carrara instead of granite from South Africa.

A broad range of existing management tools can be applied at the business level. Since 1990, the Paris Office of the environmental program of the United Nations has forced the technique of "Cleaner Production (CP)"22 throughout the world. Cleaner Production means "the continuous usage of an integrated preventive environmental strategy on processes, products and services to increase their efficiency and to reduce the implied risks for humans and environment". For production processes, CP includes the saving of material and energy, the avoidance of toxic substances in processes as well as the reduction of many toxic emissions and waste. For products CP is concentrated on the reduction of environmental changes along the whole life chain (from the acquisition of raw materials to the final disposal).

More comprehensively, the MIPS approach integrates material flows from cradle (the extraction of resources to grave (the final deposition of the waste after a maximum of achieved services provided by the product). MIPS stands for the Material Input per Unit of Service and is an indicator for measuring the environmental impact potential of products and services. The material input includes all natural resources that are used for the production, using and disposal of the product. The sum of the material input (MI) is related to the service or use (S) of any product, for example the lifetime of the product (MI per S = MIPS). There are two basic strategies to reduce the MIPS-value of a product:

a) Decreasing the material input by technical changes/improvements
b) or increasing the number of services (for example: extending the lifetime of the product).

21 Cf. Manstein, Ch./Schmidt-Bleek, F. (1999)
22 See http://www.unepie.org/Cp2/home.html for details
From "Eco-Profit" to MIPS design: successful business strategies

One of the most successful tools for the enhancement of cleaner production is the model of "Eco-Profit", developed and promoted by the city of Graz in Austria. Eco-Profit is a co-operation project on the community level that is economically profitable for the local enterprises but also contributes to the improvement of the environmental situation. Under the headline “Advising and Promoting instead of Regulating and Punishing”, the main source of the success of Eco-Profit is a particularly interactive process between economy, science and local/regional administration. In this process, specific measures for the reduction of waste and emissions are commonly developed and realized. The voluntary work on environmental improvement by local enterprises in Eco-Profit projects is rewarded by the local or regional administration by an official award.

Eco-Profit has been successfully applied in nearly 200 enterprises in Austria and is in the meantime internationally introduced.

In a two years pilot project supported by the European Social Funds some 50 small and medium enterprises from Carinthia (Austria) have been involved in a MIPS training course. They have improved the performance of their products, they have designed new eco-intelligent products and they have developed new marketing strategies by using the MIPS-indicator (see the three examples given above).

4.3 Regional and environmental planning

Material intensity targets should be integrated in environmental planning. The product- or plant-related MAterial Intensity Analysis (MAIA) would be the appropriate methodology for evaluation at the project level. This helps in detecting not only potentials for reducing material flows but could also bring out cost reduction potentials.

"PROREGIS - Resource Productivity Registries"

Resource productivity factors for new materials must be established on a continuing basis. Existing resource productivity factors can change over time. Therefore, they must be periodically re-evaluated. From a scientific as well as from a practical point of view it appears necessary to establish registries for resource productivity factors.

The Factor 10 Innovation Network is currently studying conditions for collecting, generating, and validating natural resource productivity data - on behalf of the German research

25 For further information see: http://www.factor10-institute.org/PROREGIS.
ministry and the Austrian innovation ministry. The results are quite likely the starting point for a European initiative to build up Resource Productivity Registries - PROREGIS centres. It seems useful to establish regional PROREGIS centers, well interconnected with all others and exchanging data on a routine basis. It would also seem furthermore appropriate to establish central PROREGIS institutions, for instance for the EU and East Asia, and perhaps later on a global basis. This should ensure an overview of local and regional developments. For the regional PROREGIS centers regional-specific data should be collected, administrated and reported.

4.4 Agriculture and food industry

In the agricultural sector unsustainable developments are the loss of jobs, increasing energy consumption, an increasing burden on water and ground soil, declining food quality and the loss of decentralised supply structures. This is mainly due to concentration, intensification, specialisation and mechanisation in all fields of this sector, often caused by the EU-Common Agricultural Policy.26 Long ways of transport and high material flows are the result of this policy.

Similar to the timber industry, it regionalisation of processing, marketing, consumption and waste management should be promoted. The creation of value within the region should be a paramount objective.

Suggested Measures:

- Improve regional marketing, co-ordination and an image of the regional agricultural sector.
- Consumers should be well informed about the quality of regional goods and regional advantages.
- Development of financial aid programmes.
- Regional and ecological training farmers.
- Stimulation of regional networks between farmers and processing enterprises in order to make use of synergy effects and to establish a quality management.
- Regular regional fairs for the creation new business and customer relations within the region.

Regional energy policy

An excellent example for decentralisation and the use of renewable energy sources are the biomass plants in the region of Güssing/Burgenland in Austria. The substitution of regional resources for imported energy has been a regional objective for the last ten years. Supported with EU-Structural Funds ten out of a considerable number of biomass-plants have been

26 Cf.: Bringezu (2000).
constructed. This project turned out to be very successful, as it created 46 jobs, reduced migration from the area, and encouraged small and mediums-sized enterprises to move into the region. Because of the success in Güssing, renewable energy became a funding priority in Southern Burgenland in the next programming period of Structural Funds from 2000 to 2006. Plans are now underway to supply the entire district of Güssing, with its 27,000 inhabitants, with renewable energy sources.

### 4.5 Construction

The construction of buildings is not only material and energy consuming, but also an important emission factor (esp. sulphur dioxide emissions, nitrous oxide emissions and carbon dioxide emissions). Principles for “greener” construction could be as follows:

- **Use of renewable energy sources**: e.g. solar power for water heating
- **Reduction of environmental impact**: preserving the site’s integrity and natural characteristics; selecting with have lower material and energy intensity and those that are produced locally.
- **Resource conservation**: selecting materials that have at least some recyclable content
- **Minimising construction waste.**
- **Installing water- and energy-efficient devices** can conserve resources while reducing operating costs.
- **Improving indoor air quality**: Energy-efficient buildings are more airtight and therefore hold greater potential for the improvement of indoor air quality.
- **Connecting to the community**: Placing green building projects within easy access of public transportation, medical facilities, shopping areas, and recreational facilities decreases the need for automobiles and encourages bicycling and walking. In addition, successful green buildings blend into the community, preserving natural and historical characteristics, and will utilize existing infrastructure in order to reduce urban sprawl.

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**The reconstruction of buildings as a chance for climate and employment**

In 1998 the German trade union for Building, Agriculture and Environment (IG BAU) and Greenpeace started a project called “Improving Employment and Environment”. The objective was to point out that and how the conversation of the environment can create and secure jobs. By the means of a “Certificate for Employment and Environment” the house owners shall be motivated to energetically renew their buildings (e.g. by the improvement of windows or the isolation of building-walls). The requirements to obtain a certificate include energy

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28 Cf. Center of Excellence for Sustainable Development (WWW)
consumption less than 100kWh/m²a (which equals about 10l fuel oil), the restricted use of non-renewable materials and the obligation to obey to working, health and wage regulations. An accompanying study determined a scenario that an investment of 15 Billion DM a year – these are 3% of the total investments in this branch – between 1999 and 2020 would have the following impacts:

- Permanently secure respectively create 430.000 jobs, of which 174.000 would be in the renovation business,
- Reduce the energy-costs of buildings up to 50% and the CO₂ Emissions up to 58% in reference to the year 1999,
- Provide an extensive save of resources that will reach about 68 Mio. Tons in the year 2020.

The necessary investment program, which needs to be supported by government funding, would be counterbalanced by an increase in revenues for social security and direct as well as indirect taxes. Furthermore, because of the improved employment situation, the expenses for social contributions decrease.

### 4.6 Procurement

Effective environmental protection requires contributions beyond regulations. Public authorities themselves should set positive examples. “Green Purchasing”, as it is often referred to, offers two major advantages: First, there is a good chance that people imitate the public authorities in their purchasing behaviour. And second, the market-access of the suppliers of eco-efficient products and services is improved or, in the case of a new product, a market can be created.

The relevance of public procurement in the EU is obvious as it accounts for 11% of the GDP.

The recommended steps towards an eco-efficient procurement system are listed below.

- A procurement policy should set up criteria according to which products or services are screened. Already existing concepts (TMR, Factor 4...) should be preferred.
- An examination should produce a strengths/weaknesses-profile of the actual procurement practice, from which a new
- Procurement programme can be derived and applied.
- Simultaneously an ecological procurement management system should be developed, which serves as a control institution.

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30 Cf.: Bartenstein M. (1999)
Possible fields for a „green purchasing“ approach are office equipment, motor vehicles (+ equipment), building & construction, energy & water supply, horticulture & landscape planning, waste management. All these fields are equally important for private consumers.

### Eco-efficiency and public purchasing

An eco-efficient public purchasing helps relieving the environment and supporting the development of sustainable consumption patterns and the bringing onto the market and market penetration of eco-efficient products and services.

In Carinthia (Austria) exists an initiative to founded a so-called **eco-efficiency exchange**. The basic idea is that eco-efficient products and services are collected in an Internet databank to transfer the information to the purchasers of the public administration. In this way the eco-efficiency exchange shall operate as an intermediary between supply and demand of eco-efficient products. By this means consumers receive a concrete overview about ecological and economic optimised products and producers and suppliers of such products ought to break into new and concrete markets.

### 4.7 Regional waste policy

Generally, avoidance and utilisation should have priority, but when treatment and disposal of waste are inevitable, regional and local co-operation is especially important and (eco-)efficient. Comprehensive concepts of a regional sewage combine (?) should cover all tasks to be fulfilled by communities and a region as a whole. If feasible, natural treatment methods should be preferred. To give an example, reedbed systems provide a natural self-purification system, which exploit the oxygen transporting properties of reeds and plants to facilitate microbial elimination of organic material. Moreover, small-scale reedbed systems have a tremendous potential for both reducing the cost of sewage treatment and for recycling nutrients back into the soil. Examples of this sort of biological wastewater treatment plants have already successfully been completed in many European regions.

### Regional management of household organic waste

Eco-efficiency may be applied to the management of organic household waste. In this domain, Lower Austria has been very successful in implementing composting at the regional level. By weight 46% of the total household waste is composted in Lower Austria (including home composting). From 1988 to 1998, the amounts of home composting have multiplied by 3 or 4. By preventing the treatment chain 14,5 million Euros are saved every year with home

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32 Contact: [http://www.faktor4plus.at/](http://www.faktor4plus.at/)
composting. From the beginning a decentralised policy was defined: “As much home composting as possible Separate collection when home composting is difficult As much agriculture composting as possible As many decentralised small composting plants as possible As many regional composting plants as necessary” 250 people have been trained in composting between 1990 and 1995 becoming real intermediates toward the population. Every year the lower Austrian „müllometer“ informs the local citizens about the performances. This management of organic waste enables an important reduction of the pollution from landfills and the amounts of waste to be dealt with and contributes to soil protection.

The management of organic waste has been defined at the level of a region. It aims at a closed cycle with very little import and exports. Hence, Lower Austria represents a complete model for eco-efficiency for organic waste management as it allies all the possible options of collection, with home collection, door to door, collection centres, garden use, local and regional plants.

Solid waste should, likewise, be avoided or further used. Suggested are more information schemes about avoidance, optimisation of collecting systems for waste or the organisation of exchange opportunities for second-hand goods. The region of Aachen (Germany) would serve as an example, where communities, companies and several information centres and initiatives work together to run a combine for the utilisation of old electronic and electric appliances. 95% of the materials can be reused, while simultaneously creating employment opportunities in the region, especially for long-time unemployed, which are given the chance to qualify with training-on-the-job.35

4.8 Tourism

A sustainable, eco-efficient tourism strategy combines higher tourist attractions with lower material and energy flows. The negative effects of mass tourism should be overcome by a more decentralised structure, a careful infrastructure-planning scheme, a corresponding marketing strategy etc.

The Rhoenschaf

In Germany's Rhoen region, farmers united, to market the Rhoenschaf, the local sheep products. Chefs of the region created appealing recipes and helped in promoting a cultural heritage. Buying the wool, meat or salami directly from the source is another form of preserving a breed and a unique landscape.

Since 1987 the BUND (Association for Environment and Nature protection in Germany) has been taking measures to help preserve the best advertisement carrier for a region -- the Rhoenschaf.

5 Indicators for regional sustainable development

Many examples show that important steps toward sustainable development can be made especially on the regional level. To see if these efforts suffice, it is crucial to have a monitoring system at hand to measure the overall development of a region toward sustainable development. From the statements made earlier it follows that indicators of total material flows activated by a region within and outside its borders are an important “headline indicator” for that, which can be compared with figures of economic performance (GDP) and the social situation (employment, distribution of income). Such a procedure has been applied to some European countries as well as EU15 (see EEA 2000). A pilot study exists for a German region: Northrhine Westfalia and the Ruhr area. The methodology allows for a comprehensive monitoring of a regions’ development toward sustainable development.

The material intensity of the Ruhr area

In a pilot study for the highly industrialized Ruhr area, the material flows activated by production and consumption processes in that region were investigated. The results show that in 1990 337 tons of material (without water and air) were used within and outside the region per employed person on the average, only about 25 % of which within the Ruhr area.

The physical stock of that region, i.e. the amount of products, infrastructures and machinery (which can be measured by the physical input including imports minus outputs of waste and emissions) grows per year by almost 1/3 of the inputs, which is about 100 Mio t/year.

The methodology developed in Wuppertal can be applied to measure, report and control if a region meets the goals set by regional sustainable development plans or similar statements. It can be discussed with stakeholders to see and decide which further actions should be taken if the results of the monitoring are not sufficient.

Besides the domestic inputs of natural resources, the so-called “rucksacks” of these direct material flows should be accounted. This comprises the material inputs required in other parts of the world to produce imported goods as well as overburdens and waste produced at the extraction sites of domestic resources.

The core of such a set of headline indicators should be:

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36 See http://www.ansi.okstate.edu/breeds/SHEEP/ for details.
Eco-efficiency of regions

<table>
<thead>
<tr>
<th>Goal</th>
<th>Indicator</th>
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<tbody>
<tr>
<td>Economically sustainable development</td>
<td>GDP/growth</td>
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<tr>
<td>Environmentally sustainable development</td>
<td>Total material flows (TMR, TMC)</td>
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<tr>
<td>Socially sustainable development</td>
<td>Employment</td>
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</tbody>
</table>

Such a set of indicators is methodologically derived from the standards of national as well as company economic accounting. It would not only allow for comprehensively measuring the eco-efficiency of a whole region (in terms of value added per ton of kg of materials used) but also relate the result to the monitoring of national economies, Europe as a whole, on the one hand, and single projects, products or companies/households on the other.

Moreover, political decisions on the regional level can be judged beforehand according to the probable effects on the proposed indicators so that there possible contributions to the goals of (economically, environmentally and socially) sustainable development can be evaluated. We therefore consider the introduction of such a monitoring system as an important step towards sustainable development on the regional level.

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Other related Internet sites:

Regionen der Zukunft
The competition “Regionen der Zukunft” is a new form of regional promotion. This site presents all details of this competition (participants, projects etc.).
www.zukunftsregionen.de

Oekoregio.de
Information on ecology and sustainable development in the region (esp. for “Nordrhein-Westfalen)
www.oekoregio.de

Research Centre for Environment and Health
Model projects for a sustainable economy
Main focus: regional economy
www.nachhaltig.org

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Conferences, research and literature on Industrial Ecology
http://www.indecol.ntnu.no/

Extensive Link-list - industrial ecology:
http://indecol.mtroyal.ab.ca/mrc99/ielinks.htm

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