Innovative land use management systems and their logistic improvement:

INSTRUMENTS OF REGIONAL *MATERIAL FLOW MANAGEMENT*

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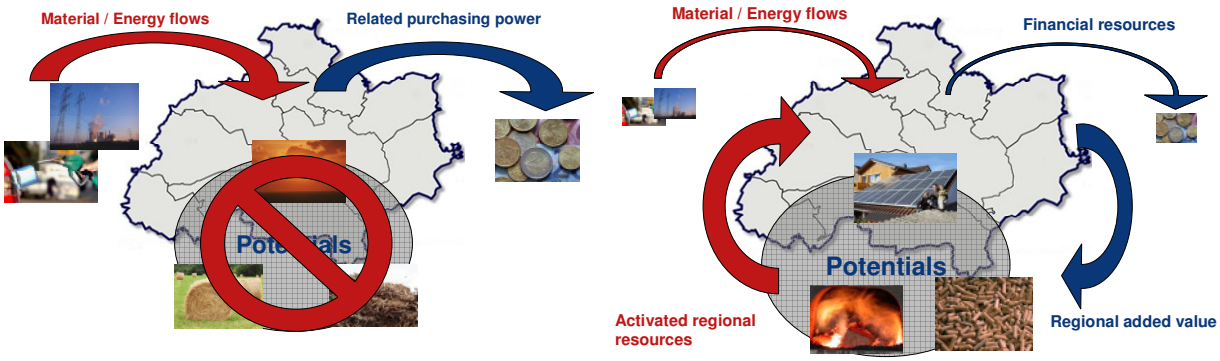
Material flow management in regions

Regions are supplying themselves with energy and raw-materials from national and international systems from foreign countries. Just a small part of added value has been taking place yet in the region. The local resources from regions have been used inadequate and inefficient. That's why many financial flows are leaving the region. In addition, increasing energy- and commodity-prices have the effect of a decreasing bying- and economic power. The regional citizens have to pay more for the same service (heat, light, food, mobility) without generating an additional value.

The improvement of material- and energy-flows in a region is carried out with the aim of closing the cycle of materials and substitute in renewable and regional resources.



Through the use of regional resources it is possible to retain capital in region. Regional business cycles would be strengthened. The use of regional potentials demands new technologies, highly qualified employees and capital. Furthermore, it can create new services and products with a smart management in the same offer of occupation and an improved capital flow.[2]

A main task of material flow management is to break-up of sectoral views to the point of a systematical view of regional structures. It develops the option of cooperation, for example added value by circuitry.

The rudiments of industrial material flow management also have to be transfused of communal area municipality. In a material flow management concept on communal level the community is also a system with different material flows. There are a lot of material flows, some examples are:

- Organic substances and nutrients like nitrogen und phosphate
- Waste and residues from household, industry and trade-business,
- Waste water and residues from waste water conditioning like clearing sludge,
- Biomass-potentials from agriculture and forestry or
- Fossil fuels and renewable energies like sun- und wind energy.

The challenge for regional material flow management is to use and combine this large amount of materials in an efficient manner. Additionally, it can be achieved, that the service life of used materials would be stretched. And finally, recyclable residues are used in a cost efficient ways.

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[2] IfaS (2008): New ways in a sustainable industrial society - Zero-Emissions-Network

Waste or Resource – Problem or Opportunity?

The target of regional biomass utilization is to realize, that organic waste can be a precious resource. Taking a look at 600 kg of organic waste: They can be dumped or they can be recycled as a high grade organic fertilizer. From an energetic point of view, the biogas that is produced during fermentation equals 50 litres of petrol.

The available economic data of the lop recovery on federal state level displays a significant wood potential. A study of the IfaS from 2008 including all earnings and costs of green waste recovery for the federal state of Rhineland-Palatinate, Germany, showed: total earnings of 700.000 € (delivery, compost selling) versus total costs of 6.5 million. Yearly net costs for lopping thus reach 5.6 Mio. € and urgently require an efficiency rise. As wood chips from lop can be burned, the emerging thermal potential can reduce exploitation pressure of forests.[3]

An example for the practical implementation of a thermal lop-use is the utilisation in communal heat-systems. The communities based bottom-up project and employs accumulating wood from the vegetation besides roads to heat wood chip heating systems in schools.
Another example in Rhineland-Palatinate, Germany, is the mixture of lop from two collection sites with higher grade wood to win a quality fuel. Such public-private-partnerships attain an activation of the raw material wood within regional-added-value-chains.

Cultural landscape – a challenge for open minds

The only constant in cultural landscape evolution is the change. In practical terms, the change appears in a regional specific manner. The regional biomass is bordered by economical, ecological and social structures. It can be used in different ways and dimensions.

The subject of a diversified land-use with regard to increasing demand for bio-energy potentials substantially influences the decision „if- or if not to exploit the necessary land-use alternatives to forestry". Regarding only the marginal return for the production of wood as a raw material compared to the established crops, there is not enough incentive for farmers to change their current land-use system.[4]

When looking at the increase of wood production on agricultural land and the mobilisation of wood within the cultural landscape, some on-going challenges are striking.

- Land consumption
- Climate change and - protection
- Nature conservation
- Regional added value

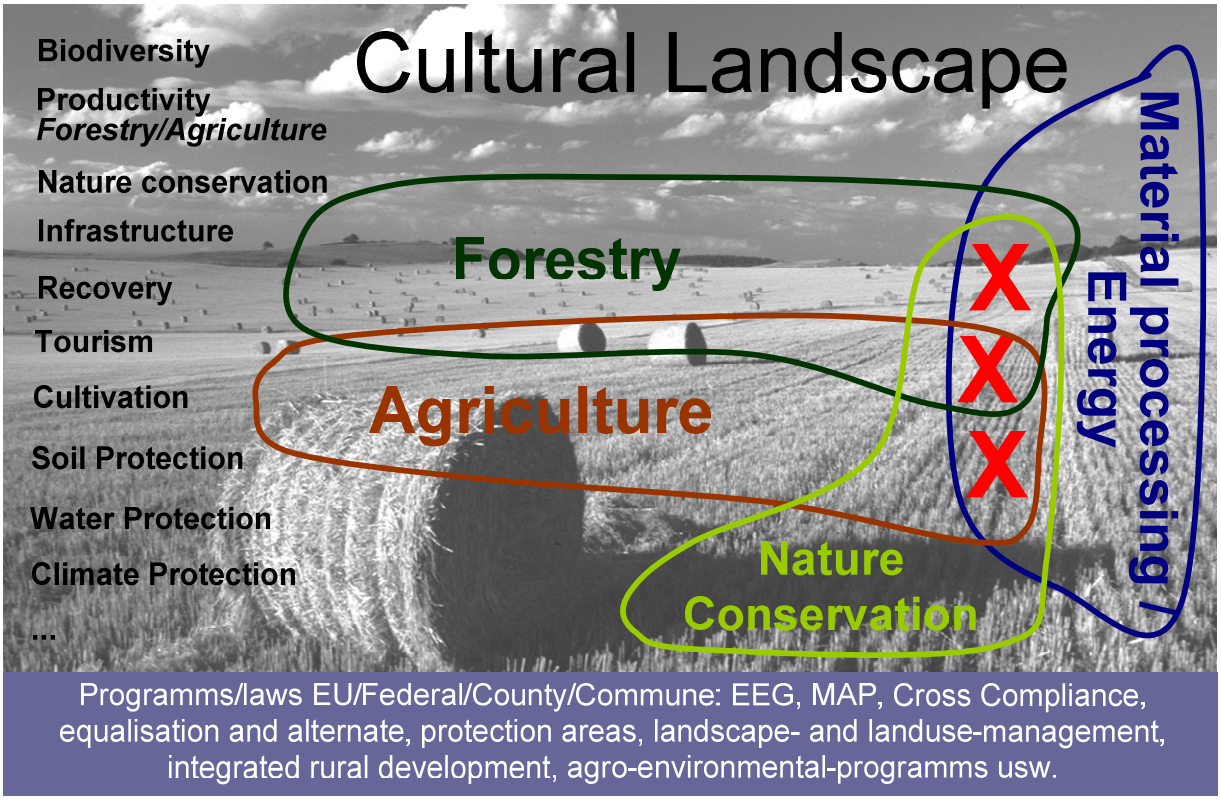
Land consumption in Germany due to settlements and roads show the threat of the natural resource.

The use of material- and energy flows happens at the interface between traditional land-use sectors agriculture and forestry. Nature conservation remains a main target.

The diversity of functional requirements to our cultural landscape reveals, that in Germany we have reached a regularisation density difficult to overlook for the individual. Advancing segregation of the open landscape following individual needs - like nature conservation here and intensive production there, groundwater protection, recreation…) will not be able to deal efficiently with future challenges. The costs rise for energy and maintenance of the cultural landscape, a new way of thinking needs to develop.

A constant decision making process needs professional organisation of material flows and the activation of biomass potentials. It's in the community's responsibility to develop cultural landscapes meaning a bottom-up approach to activate raw materials.

[3] IfaS (2007): Research of alternative recovery of lop in Rhineland-Palatinate
[4] WBGU (2009): Welt im Wandel – Zukunftsfähige Bioenergie und nachhaltige Landnutzung



Decreasing constraints with the tool of material flow management

In practice, there are several well structured approaches which can also be combined to achieve the target of successful mobilisation of wood resources and to develop the agroforestry potential in cooperation with the actors.

1. Concepts of added value in land-use-management
2. Information and communication approaches
3. Operational projection: Biomass-logistic-centres

1. Concepts of added value in land-use-management

Multi-purpose concepts provide several options for actions to reduce constraints of wood mobilisation and agroforestry implementation. But their organisational level is often demanding. Currently, the national research network conducts studies to combine multiple-use options on agricultural land without collisions of interest with the farmers work.

This is done to yield possible synergy effects between reasonable biomass production and applied nature conservation. To develop those regional multi-purpose concepts, the „agricultural toolbox“ is used[5]. Following the princeples of applied Material Flow Management, the cropping systems as sources and the processing as sinks are connected and merged in a local land-use strategy.

[5] WAGENER F., HECK P., BÖHMER J., CORNELIUS R., GEBHARD R. M., SCHERWASS R., KRECHEL R., MICHLER H.-P., WERN B. (2008): Final Report: Preparing study ELKE, Phase I

Alternative land-use to forestry can be either a well-directed agroforestry-system or the mobilization of currently unused wood potentials as for example the lop in many communities. Agroforestry systems can provide multiple-use options for example food production, bio-energy supply, nature conservation, recreation and more. It could become important within prospective strategies of nature and resource-conservations.

In practical, the implementation of modified landuse-management-systems starts with a broad "as-is analysis" identifying the modules of extensive land-use systems. Those characteristic landscape elements serve as so-called raw-material or energy sources. They are linked horizontally, and thus have a spatial connection to potential heat or demand sinks in the region. An important focus is the rapid integration of regional available supply and distribution logistic[6]. An example would be to link wood resources from sustainable agroforestry to a local bio-energy resource center. When processing and distributing the wood, the center prepares the base for a continuous supply of a bio-energy facility.

By this management concept, a successive progressing of extensive land-use systems as a module of cultural landscape development takes place.

2. Information and communication approaches

Generally, information and communication approaches are the base to reach practitioners when it comes to new proceeding or system modes. A compact format of the available knowledge eases the first impression. From that point on, different options can be explored. Communication is the key tool to inform and unite actors of a whole region to act cooperative.

In 2008 the research project „Regional strategies for sustainable biomass use" (RUBiN) of the institutes IZES & IfaS within the framework of INTERREG IIIA was completed. The result was the foundation of a working group for short rotation coppice (AG KUP), dealing with topics of actor's interest, for example:

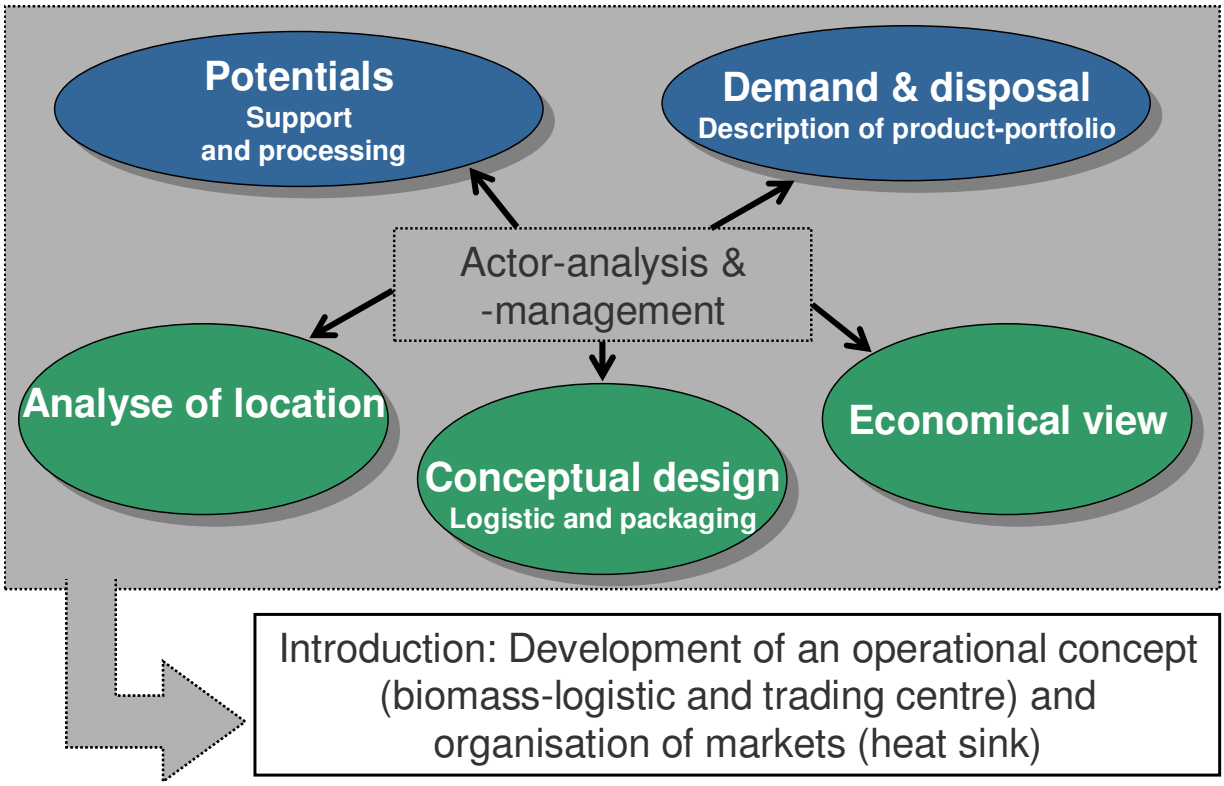
- Connect and exchange regional experiences from practical-areas
- Procedure recommendation for future measures of cultivation
- National organisation of networks
- Project development
- Legal framework
- Regional harvest technologies and business markets
- Installation costs (reasonable minimum size area) and expected amount of coverage as well as possible sponsoring guidelines[7]

An actors-network consisting of actors from agriculture and forestry, logistic and energy suppliers, operators of energy facilities together with public representatives was formed. Main focus is on transforming segragated approaches into holistic approaches on a system level to increase regional added value.

3. Operational projection: Biomass-logistic-centres

From such a network, precise working approaches can be developed based on a demand-oriented profile[8]. A positive result is the establishment of regional biomass or raw material logistic centers acting as a strategic control center for the commercialisation of for example energy wood products. Raw materials are fractionated and supplied by customer-demand. In this way, they can be integrated in current or future recovery chains.

[6] WAGENER F., HECK P., KÖHLER R., OSTERMANN G. (2008): Development of an energy-tool for the FUL/ PAULa-consultant and biotop-adviser in Rhineland-Palatinate within a pilot-project in Vulkaneifelkreis
[7] IfaS (2008): 3. Report of the project „Regional strategy of a sustainable implementation of biomass-utilisation (RUBIN)
[8] Wagener, F. (2009): Forests – alternative land use management systems



The few existing centres cover a diverse range since they were initialised by different sectors like forestry, waste management or on a communal level. They conduct different graded raw material and recovery chains, from mere raw material to complete service supply like „heat“ or „heat-power“ using contracting systems.

Resume – Compile solutions for practice

It is possible to implement landscape-use instead of landscape-conservation and synchronically increase biodiversity. New and adjusted land-use systems to traditional forestry are available, but have to be activated.

A paradigm change concerning land-use seems necessary:

- From maintenance to sustainable use - available biomass potentials can be used to relieve the energy wood sector
- Sustainability also as a base for the management principles for integrated land-use strategies, which can increase the wood production on agricultural land.

The bottom-up principle is an adequate approach for the activation of wood potentials and the stabilisation of the region on a communal level.

- Alternative land-use-concepts to forestry exist, but have to be activated and realized.
- Necessity for a paradigm change in handling landscape:
  - Means from conservation to utilization
  - using available potentials (regional relief of energy-wood-markets)
  - Sustainable management-principles support integrated regional land-use-strategies (cultivation of agro-wood)
- And finally: Activation of potentials and consolidation of regions through bottom-up-principles:
  - Development of practical-tools using interdisciplinary research
  - Modified organization-structures, e.g. „multi-functional“ communal cultural-landscape-manager
  - Social supported by EU- & federal-programs, e.g. development of environmental measures in agriculture with result-oriented financing

Development is a question of local and regional management by integrating partners in networks.

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