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A TRANSITION TOWARDS SUSTAINABLE MATERIALS MANAGEMENT IN FLANDERS

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ABSTRACT

The way forward towards a more sustainable use and management of materials needs a system approach and radical innovations. Focusing on one phase in the materials cycle, or on one flow will not yield a successful solution for the increasing complexity of environmental problems and resource deficiency. Flanders is for example forerunner in recycling, but yet the total yearly amount of waste does not shrink considerably. Policy and efforts for a more sustainable use of resources and materials are very scattered, there's a resource policy, a product policy, a waste policy,... Sustainable materials management needs to escape this lock-in, structural changes are needed at the level of our societal systems by transitions.

This article gives an overview on the principles of transition management and how they are implemented by the Flemish network for sustainable materials management. Special focus is on the long term goal setting for a regional sustainable use and management of materials and on the transition agenda building in Flanders. The different phases of the transition process are discussed and the example of one of the transition pathways, the efficient closing of the materials loop path, is elaborated in this contribution.

1 INTRODUCTION

World reserves of raw materials and minerals are shrinking. Governments are aware that more efficient use of materials and energy is mandatory. Furthermore, due to economic and demographic growth, mountains of waste are increasing. Continuing in this way, we rapidly reach the limits of environmental, social and economic resilience. Government interventions to control and restrict waste deposits are inadequate. They operate at the end of the supply chain and fail to take into account interdependencies between production, distribution and consumption. Profound societal transformations are needed to reach a more sustainable “regime” of material use. Such a transformation implies changes in the physical, legal and social infrastructure as well as in the mindsets, values and attitudes of many social actors. Recent literature on Sustainable Development and Corporate Social Responsibility stresses the importance of a learning approach to enhance the capacity to take into account these systemic interdependencies and to implement such transformations[1]

In this paper we present the case of the Flemish initiative (a region in Belgium) to start up a transformation from waste control to sustainable material usage. Flemish waste policy could easily be described as a success story. Twenty five years ago Flemish government didn’t have any policy at all regarding waste treatment; nowadays in international statistics Flanders has one of the highest rankings related to sorting and recycling of waste (see Fig. 1). Nevertheless total amounts of waste stays stable and no progress can be made anymore based on end-of-pipe measures. Therefore the Flemish public enterprise for waste management started an initiative "transition towards sustainable material usage".

The goal of the process is twofold. On the one hand, there are the objectives concerning the content: what direction should Flanders as region go? What is the (desired) target, how should our materials management look like within 30 years? Which experiments should be set-up to move towards this target? On the other hand, a specific approach has been chosen to manage this complex process, more specifically transition management is implemented to initiate, substantiate and sustain the process towards a sustainable materials management.

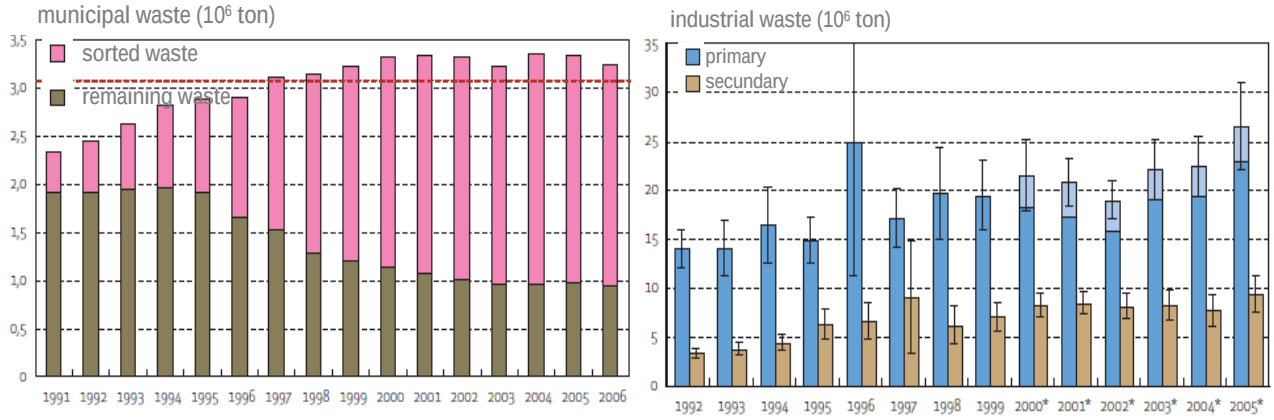

Figure 1: Evolution of (a) municipal and (b) industrial waste in Flanders [2]

2 THE TRANSITION MANAGEMENT APPROACH

1. The concept of transition management

Transitions are transformations which changes the society in a fundamental way and take place in a generation's time[3]. These changes can be technology shifts or socio-economic paradigm shifts or – in most cases – a combination of both. There are many examples of transitions in the recent history, e.g. the shift in the fourties and fifties from bio-based plastics towards fossil oil based plastics, which were more durable and cheaper[4], or the transition of maritime transport from sailing boats towards steamships, or the transition from high birth rates to low birth rates in Western Europe. Such transitions evolve in four stages along an S-curve (see Fig. 2). Transitions occur spontaneously in our society, but not always (or rarely) in the direction of more sustainability. It is believed they also can be managed, not by a top-down policy, but with supporting measures, influencing and adapting. Therefore new modes of governance that, more adequately than current governance approaches, deal with the complexity and unstructured nature of 'sustainability' problems and which involve a large variety of stakeholders is needed.[5, 6]

Transition management finds it scientific origins within complex system theory, social theory and multi-stakeholder interaction theory [1]. Typical for transition management is the system approach. Systems are extremely complex and system failures have to be overcome by more than only corrections by the market. Examples are institutional barriers, weak networks, knowledge or technology lacks, … Transition managements is searching for directions and offering methods to influence the flow of a transition towards a more sustainable state by:

1. developing a long-term vision (typical a generation's lifetime) as framework for short term action.
2. experimenting in niches (micro level)
3. and learning from this experiments for the macro-level, learning-by-doing
4. stimulating radical changes instead of incremental evolutions
5. active role of multiple actors, setting-up new coalitions between actors. The government is a facilitator, rather than a omniscient administrator. Transition management is a stakeholder-oriented and participatory process.
6. options are kept open, conscious of the uncertain structural context of the system we aim to transform

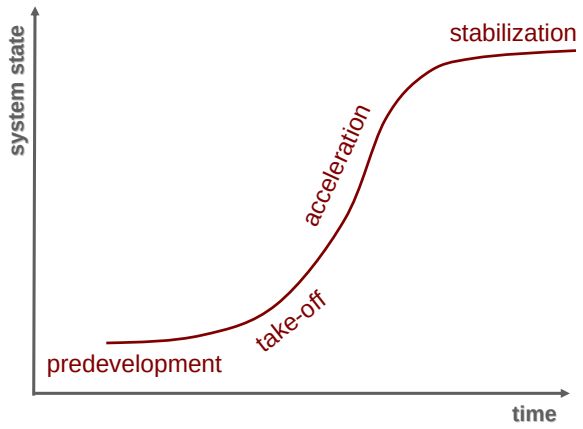

Figure 2: Evolution of a transition

A transition management cycle consists of four different transition phases [7]:

1. Analysing and structuring the problem and developing a long term vision, here on sustainable materials management in Flanders. Selection of priority themes.
2. Development of visions in the priority themes and pathways towards these visions, combined in a transition agenda.
3. Setting up and initiating experiments and initiatives, mobilizing networks
4. Assessment and evaluation of experiments, (social) learning and translation to the corporate level.

2. The transition management process in Flanders for sustainable materials management

A transition management process on sustainable materials management has been initiated and supported by the Flemish government and the Public Waste Agency of Flanders (OVAM) since mid 2006. The first two stages of the transition management cycle have been completed now, and a number of experiments are being defined (see structuring of the transition process in Flanders, fig. 3). The network consists of about 60 members, a representative sample of all actors: industry, universities, NGOs, governmental administration. Members are carefully selected for their visionary ideas and ability to act independently from the organisation they are working for. It has been explicitly chosen for working in the shadows of politics and media until the end of phase 2. The process considers the materials use (products and processes) in their whole life cycle and the interaction of materials with society, economics and environment. The focus is on the regional opportunities in Flanders.

A second goal of the process started up in Flanders is to learn more about the abilities of transition management as a new governance approach. The approach has been successfully adopted by the Dutch government for the Energy transition e.g. and recently transition management finds its way towards new initiatives in the UK, Germany, Austria, Switzerland and Finland.

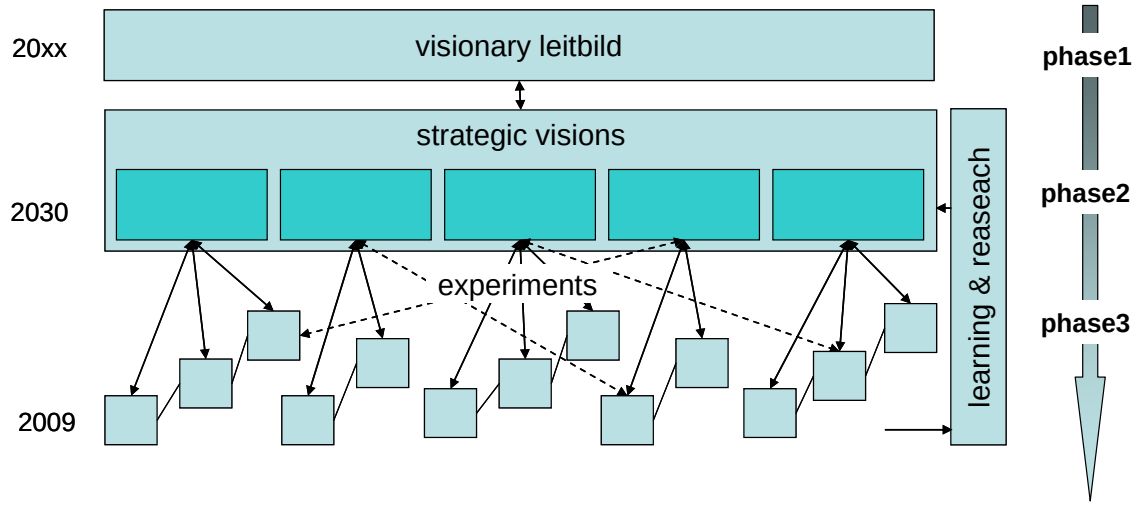

Figure 3: Structuring of the sustainable materials management transition process in Flanders

3 A LEITBILD FOR SUSTAINABLE MATERIALS MANAGEMENT AT THE REGIONAL LEVEL

1. A vision of the future

In a first phase of the working of the Flemish transition network sustainable materials management, a long-term vision or leitbild on how a next generation should ideally deal with resources and materials. In the following paragraphs, a brief overview of that leitbild is given.

Central in this picture of the future is a *high-grade closing of the material loops*. We will not use less material products, but the new resources needed have to decrease drastically. This can be realized either by closing the loop in the biosphere and/or in the technosphere. With a high quality closing we mean a *responsible cradle to cradle* principle, in which the level of energy input needed for establishing the loop is taken into account and minimized, together with the capacity of nature to cope with the loops which rely on the biosphere. *New types of enterprises* will be needed to guarantee the materials flows are optimally geared to one another and kept into loops.

It is quite evident a *high level of materials knowledge and innovation* is needed. This implies not only thorough knowledge of material characteristics and properties (especially knowledge of new properties on a nano-scale), and how to manipulate it to design extended functionalities of materials, but equally valuable is the knowledge of how to manage the lifecycle of the products (*ex ante*) and of the route (*ex post*) that materials will be travelling. While a broad-ranging assortment of new renewable and renewed base materials will be generated, the risks of toxic and hazardous materials within the chain are mapped out and kept under control by strong ecological criteria, and with *minimized harmful consequences* as a result, either here or elsewhere, today or tomorrow.

The economy grows towards a socially imbedded *service economy*, in which services are creating added value and wellfare. Materials will be considered as "*common goods*", expecting them to meet, at any moment in the chain, certain defined quality requirements in order to enable their (re)utilisation. The traditional model of fragmented material management of purely private goods will fade out to give way to a *material infrastructure policy*. In that respect, we talk about a 'renewed stewardship' of resources. Clusters, organized groups or networks, and the communality of enterprises and social actors give form to the material infrastructure. The *integral material control* that underpins this infrastructure is a combination between a regulatory model (based on the registration of 'best available technology' materials), a logistical model (based on the traceability of those materials/products) within the chain, and the state-of-the-art material technology itself. The regional authorities create the regulatory framework for a *correct pricing standard* for its materials and related services, without shifting the burden of ecological and social pressure to foreign countries or other sectors.

Businesses have assumed *responsibility for the entire life cycle* of their product. Furthermore, consumer demands for a transparent chain have in the meantime become the rule, and *alert consumers* play an increasingly important and active role in the traceability of materials and closure of loops.

The supporting role of the public authorities vis-à-vis the new integrated materials management policy will bear results as to their broader social role: new inter-sectoral cooperative partnerships, a great number of new services, the creation and the sharing of knowledge, mobilisation of the creativity and engagement on the part of the consumers, the anchoring of new employment opportunities, plus improvements in people's prosperity and well-being, etc. It also provides for an enriching, *synergetic interaction* amongst the involved actors, e.g., society, industry, the academic world, and the public administration.

2. Current bottlenecks

Several bottlenecks in our materials system impede the realization of this vision nowadays. The most important ones are:

1. The focus of materials policy on end-of-life solutions (waste policy) which is very successful in Flanders, but do not offer opportunities any more for further decreasing of the impact of materials on the environment and on economics. To this adds the fragmented materials policy consisting of parallel waste policy, resources policy, product policy and innovation policy.
2. An economical system based on materials, versus shrinking and scarce materials resources. Flanders is extremely dependent and vulnerable for its materials resources.
3. Market prices in which the ecological cost is not fully internalized
4. Well-fare is often considered as equal to well-being
5. A globalised economy versus local decision levels
6. The increasing sustainability awareness does not yield a more sustainable attitude

There are of course also some opportunities nowadays for making a transition towards more sustainable materials successful, such as the rapid development of new materials and material processes, the momentum created by the awareness of climate change and the tendency to new societal consciousness by industries (CSR) and consumers.

4 IMPLEMENTING THE TRANSITION MANAGEMENT: TRANSITION PATHWAYS AND EXPERIMENTAL PAVES

The conceptual long term vision of the transition network, has been subdivided in a second phase into priority themes. For each of these themes, a medium-term vision (2030) has been developed, pathways and experiments on these pathways defined. The five themes briefly are:

1. Closing the loop: from managing the impact for each phase in the materials loop separately towards a high quality structure and organisation closing of the entire chain
2. Beyond the scarcity of resources towards new intelligent and sustainable materials. This is the materials innovation route.
3. From materials intensive consumption of goods towards a materials efficient service economy.
4. A conscious society that takes care of its resources, instead of unconsciously and unlimited consuming of resources
5. Green plastics: . a re-conversion of the petro-chemical cluster towards a new raw material base thanks to biomass and recycling.

5 EXAMPLE OF ONE OF THE MATERIALS INNOVATION PATHWAYS

One of the themes considered the effect of materials innovations on the ability to close the loop, on more material-efficient production and on more efficient materials use. Three major pathways have been deployed for this theme: materials designed for closing the material life cycle, 1 to 1 production (less material intensive production), and high quality materials with combined functionalities. Here, the effect on closing the material cycle will be further described. Closing the loop is needed to decouple resource demands

from economical growth. Nowadays, Flanders imports 50% of its domestic materials consumption, a situation that is aimed to be 80% in 2030.

Closing the loop in the technosphere is one of the routes to realize this objective. A first step is a better understanding and control of material flows. The recycling potential for mobile phones is e.g. 40000 ton/year (400 million units worldwide). In 2006, only less than 1000 ton has been recycled in reality after first or second use [8]. There is an enormous gap in the potential and real output of recycling. A enhanced use of MFA and extended IO is needed. A second step is the increase of reverse logistics. Economic incentives have to be worked out for stimulating the reverse logistics. In a later phase, a material or product owner will be responsible for the material throughout the entire cycle. Other participants in the material cycle will have the right to transform and use the material under the condition of co-ownership. A current example is the life cycle of Lithium, in which a limited number of companies are distributing, following and recollecting Lithium in a number of applications such as batteries and glass ceramics. Along this route, better knowledge of recycling techniques in the technosphere, design for disassembling and tracing and tracking methodologies have to be developed and scientifically underpinned.

Parallel to the closing in the technosphere, in which logistics and recycling plays an important role, there is a route of developing new biobased materials. It is not sustainable to reserve land and claim crops destined for food, but there is a lot of potential in the waste streams of food production and of non-food plants, like cellulose, gluten proteins,... An example is the use of flax fibres in composites. The challenge is not solely scientific/technological: knowledge present in laboratories only finds very slowly its way to industrial applications because of a lack of demonstration projects and funding to bridge the gap between the lab-scale and industrial processes. A further step in the development of biobased materials is the synthetic mimicry of natural materials, based on nantechnology, molecular chemistry, biotechnology and classical materials science. New C-sources will be tapped by contolled/synthetic direct conversion of sunlight in material.

A third route towards better closing the material life cycle is an enhanced attention for local production. There are a lot of long distance flows without added value but with a high environmental cost. Making shorter, more local physical loops is certainly not in contradiction with a more globalised commercial and knowledge society, but has to be decoupled from it: it is more sustainable to transport bits instead of matter. An example is the experiment of the Dutch Clearinghouse experiment, which stimulates the use of local subcontractors for serving the local market. Initial indications show that, even if only 10% of a European product were to be handled through a clearing house (and this is a conservative estimate), this would save 30% of the kilometers currently being driven, which would save over 15 million euro per year.[9] More local, flexible and energy- and material-efficient production technology is a second step in this route. They can also be used for the production of spare parts for reparations.

CONCLUSION

A summary of the principles of transition management has been given. Transition management is a way to tackle complex system failures by developing a long-term vision, experimenting and learning, in a multi-actor process. The Flemish government installed a transition management process for sustainable materials management. A long-term vision has been developed and pathways to this vision set out. This process has brought together all actors in Flanders and resulted in a lot of new collaborations. One of the pathways is further presented in this article. Currently, experiments are initiated along these pathways, the first results are to be expected in a year time.

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