

MOVING TOWARDS A CIRCULAR ECONOMY IN THE NETHERLANDS: CHALLENGES AND DIRECTIONS

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INTRODUCTION

Resource efficiency is one of the major challenges facing our society in the 21st century. The growth of the world population, the increase of consumption of materials and the rise in the production of waste is leading to growing scarcity of some key resources, more volatile prices and severe impact on the environment. This problem of resource efficiency will even exacerbate as a result of the staggering increase in urbanization. In 1950 30 per cent of the world's population was urban, while in 2014 54 per cent resides in urban areas. By 2050, 66 per cent of the world's population is projected to be urban (UN, 2014).

In order to decouple economic growth and development from the consumption of finite resources, we need to move from a linear to a circular economy. A circular economy is an economic and industrial system based on the reuse of products and raw materials and the restorative capacity of natural resources. It attempts to minimize value destruction in the overall system and to maximize value creation in each link in the system (World Economic Forum, 2014).

The Netherlands aims to move towards a circular economy. Since the 1980s attention is paid to closing the loops of products and materials. At present, we recycle 78% of our waste, incinerate 19% and landfill only 3%. Within Europe, the Netherlands is one of the leaders when it comes to processing and recycling waste. However, although considerable progress has been made, the Netherlands still has a long way to go in grasping the full potential of a circular economy.

This paper will address the challenges of making the transition towards a circular economy in the Netherlands. Before focussing on the experiences gained in the Netherlands, the concept of the circular economy will be explained in more detail. The main message of this paper is that the circular economy provides significant opportunities to increase resource efficiency and at the same time generate economic, environmental and social benefits. However, in order to grasp these opportunities a transition should be made at system level, in which all relevant actors are involved and take their responsibility.

MOVING FROM A LINEAR TO A CIRCULAR ECONOMY

In order to increase the resource efficiency of our industrial system, we need to move from a linear to a circular economy. In this way, we can decouple economic growth and resource depletion as well as keep sustainable returns on the long term. This approach safeguards the long-term resilience of our economy and will offer ample opportunities. In a linear economy, goods are manufactured from raw materials, sold, used and then discarded. In contrast, a circular economy is an industrial system that is restorative or regenerative by intention and design (World Economic Forum, 2014). It is based on circular business models aimed at

reducing the need for virgin raw materials. This is accomplished by rethinking how production chains can become closed loops. The circular economy aims to become a new paradigm that essentially changes the functions of resources in the economy: waste material of one (industrial) process will be input for another and products will be repaired, reused and recycled (The Circle Economy, IMSA, 2013).

The circular economy recognizes a bio-cycle and a techno-cycle with distinctly different design criteria. In the bio-cycle, biomass returns into the biosphere after product use – either directly or in a cascade of consecutive use. The techno-cycle contains inorganic products and materials such as metals and plastics. These materials should stay in closed loops to ensure circular use of non-renewable resources and to prevent potential pollution (Ellen MacArthur Foundation, 2012).

The benefits of a circular economy are predicted to be significant. The Ellen MacArthur Foundation calculated that a subset of the EU manufacturing sector could realize net materials cost savings worth up to 630 billion euro p.a. towards 2025—stimulating economic activity in the areas of product development, remanufacturing and refurbishment (Ellen MacArthur Foundation, 2012). McKinsey & Company estimated that between 2.9 and 3.7 trillion dollars in cost savings could be achieved by the increase of resource productivity worldwide (McKinsey, 2011). For the Netherlands alone, TNO projected earnings of about 7.3 billion euro per year (TNO, 2013). Besides direct financial benefits, the circular economy can also lead to indirect benefits. It promotes the development of new knowledge, triggers innovation, creates new business and jobs and increases the security of supply of resources.

Thus, the opportunities for a circular economy are promising. However, in practice many obstacles stand in the way of achieving the transition process. Different barriers need to be overcome, such as:

- institutional barriers, as a result of vested interests in the existing business models
- organizational barriers, due to a lack of coordination and orchestration at system level
- legal barriers, caused by existing legislation that hampers innovation
- economic barriers, because of a focus on current business models
- behavioral barriers, driven by consumers who refrain from changing their attitude and way of doing things
- technological barriers, originating from prevailing incremental innovations

The Netherlands has attempted to eliminate these barriers, but did not succeed yet in resolving all of them. Below, I will discuss how far we have come since the 1980s when we started policies on waste management. Next, I will describe the initiatives presently taken to enhance the circular economy. The focus will be on the importance of regional initiatives, particularly on the Metropole region of Amsterdam.

HISTORY OF RESOURCE MANAGEMENT IN THE NETHERLANDS

An important starting point for the Dutch waste management policies was the motion of Ad Lansink accepted in Parliament in 1979. This motion provided a hierarchy in the waste management approach (the ‘ladder of Lansink’). Priority should be given to preventing and limiting the generation of waste, followed by promoting reuse and recycling, and then incinerating waste and finally disposing of waste in landfills (Lansink and de Vries, 2010).

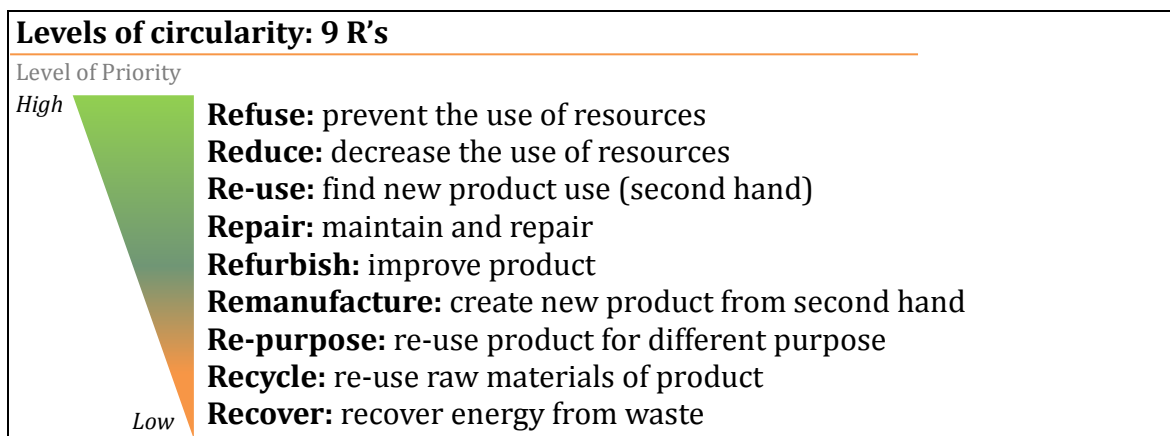
It took ten years before policies on prevention and reuse of waste were elaborated. In 1990, thirty priority waste streams were selected for which ambitious waste implementation programs were formulated. These waste streams varied from tires, batteries, packaging to used oil. This new approach triggered the prevention, reuse and recycling of waste streams tremendously. Simultaneously, a new environmental industry was born, based on the development of all kinds of waste management and recycling technologies.

As reuse and recycling also requires products, which are designed for these purposes, the Netherlands also introduced policies since the 1990s to promote the ecodesign of products (Cramer et al, 1994). This led to a variety of initiatives within industry to improve the environmental performance of products and to design for reuse and recycling. These initiatives formed an inspiring breeding ground for the adoption of comparable approaches, which became popular after the turn of the century, such as the Cradle to Cradle approach (McDonough and Braungart, 2002).

Since the turn of the century, Dutch policies on waste management gradually moved into the direction of resource management. Waste was more and more seen as a valuable resource of which new products could be made. However, it was still quite a challenge to put this philosophy into practice and close the loops of products and raw materials.

The first reason is that the Netherlands had invested for years in incinerators that could process waste. In order to move towards higher degrees of recycling and reuse, the number of incinerators was doomed to decrease over time. In order to avoid stranded assets, deliberate policies should be introduced to close the older, less efficient incinerators first and replace them by specialized recycling and reuse activities. This requires political will and courage both at national and local government level.

Secondly, it requires that consumers and companies separate their waste in such a way that these waste streams can be optimally brought back into the cycle. Different levels of circularity can be distinguished, starting at the highest level 'refuse' and ending at the lowest level 'recover' (see priority scheme below):



Thirdly, for all these forms of circularity specific provisions should be created. The first signs thereof are already present or in development, for example repair and second hand shops, companies that refurbish or remanufacture products and companies that recycle specific waste streams, such as plastics, paper and cardboard, glass and metals. However, we are still in an early phase when it comes to closing product and material cycles at a high level of resource efficiency. Nowadays, front running businesses drive innovation across new materials

recovery methods and material substitution and aim at closing material cycles. However, this does not happen yet on a large scale. The way forward is to make the activities of these frontrunners mainstream.

Fourthly, legislation sometimes hampers innovation and the transition towards circularity in general. For instance, under certain circumstances EU legislation prohibits the use of waste as a resource. In the past, this legislation was put in place to prevent abuse of waste. However, nowadays it prevents using waste leaving a production facility for the purpose of making new products or materials. Another example is the difficulty to get permits for an innovative production facility that is going to produce new products or materials. As the licensing authority is not familiar with the new techniques, they are reluctant to provide permits right away.

Finally, moving towards a circular economy requires transition management, based on the following guiding principles (Rotmans, 2003; Grin et al, 2010):

1. All relevant actors should be involved in the change process.
2. Changes should take place at the micro-, meso- and macro levels.
3. A long-term vision should guide the short-term actions.
4. There should be room for experimenting and learning, because a transition process cannot follow a predetermined path. It is not a top-down manner of managing, but rather a subtle way by stimulating transition processes towards a more sustainable state. One should continuously adapt, learn and respond to new situations. Learning is therefore crucial in the pursuit of sustainable development.
5. Connections should be made between innovative practice experiments and changes at the system level.
6. One should be aware of the context specificity, the selection and empowerment of frontrunners and the composition of a transitional arena.

Based on these guiding principles the Metropole region of Amsterdam has initiated an ambitious programme, called 'The Metropole region of Amsterdam as Circular Resources Hub'.

THE CASE OF THE METROPOLE REGION OF AMSTERDAM

The Metropole region of Amsterdam has joined forces to move towards a circular economy because of the great opportunities it can offer to the region. Their vision is that it can lead to cost reduction, create new business and employment, and save resources and energy. In addition, it can stimulate the development of knowledge, innovation and start-ups, and increase the provision of supply of key resources. Thus, it offers societal merits in all respects: People, Planet and Profit.

The Metropole region of Amsterdam is in an outstanding position to become a leading circular resources hub in Europe. It is a comparatively densely populated region in which large amounts of products and materials circulate, and many innovative and sustainable entrepreneurs are active. The region has an excellent logistic network across all transport modes (including a main harbour and global airport (Schiphol) and prime railways and roads), and a coordinated spatial planning. It composes of a broad spectrum of economic activities and knowledge infrastructure, while societal support is present for initiatives in the area of the circular economy.

The mission of the Metropole region of Amsterdam therefore is to have achieved an international outstanding position as a circular resources hub of Europe by 2020. The strategy to realize this mission is fivefold:

1. *To get an overview of the main waste streams in the region and the extent to which these streams are already recycled or reused. This overview forms the basis for action.*
2. *To identify opportunities for the region to strengthen business development, employment and innovation focused on creating a circular economy.*
3. *To pursue those activities that fit in the strategy of the Metropole region as a circular resources hub.*
4. *To set up online and offline communication that increases publicity and communication on the Metropole region of Amsterdam as a circular resources hub.*
5. *To strengthen the involvement and consciousness of citizens about the circular activities of their region.*

The precondition for success is the positive effort of energetic citizens, innovative entrepreneurs, advanced knowledge institutes and a government that can stimulate, facilitate and connect these parties. Some initiatives can be taken by municipalities themselves such as promoting the separation of waste by consumers and companies and developing advanced platforms to reuse, refurbish and remanufacture products. However, other initiatives require coordination at a higher scale, primarily the region, to set up cost-efficient recycling facilities. Thus, it requires a clear division of tasks and responsibilities among the municipalities involved in order to develop into an outstanding circular hub. Governors of the region have recognized this precondition and are willing to act accordingly.

The Metropole region of Amsterdam does not start from scratch in moving towards a circular economy. The municipalities have already set up or are preparing initiatives in this context. For instance, the city of Amsterdam is collaborating with the main Waste Energy Company to gradually shift the strategy from incineration to reuse and recycling of the household and company waste. The most advanced incinerator, which recovers energy highly efficiently, will remain in operation while the two older incinerators may be gradually phased out in the course of time. At the same time, new recycling activities will be set up for the different waste streams. With the main water company Waternet, the city of Amsterdam collaborates on recovering all kinds of nutrients and other resources from the municipal waste water streams. The city of Almere gives priority to the development of a highly advanced recycle and upcycle station and the creation of optimal value from biomass. Moreover, Almere will host the Floriade in 2022 and will promote in that context the zero waste city and local food production. The municipality of Haarlemmermeer focuses on the bio-based economy, Cradle 2 Cradle construction and a test facility for start-ups in these areas.

The challenge for the Metropole region of Amsterdam is to coordinate and accelerate those circular activities that need to be set up at regional scale. In total there are more than 70 to 80 important waste streams circulating through the region. As a start, the most promising waste streams to be recycled or reused will be selected first. For each of these waste streams a tailor-made approach is followed. All actors of the product chain related to the waste stream are represented in the preparations. Initiators that can act as change agents are identified and asked to take the lead. A number of brainstorming sessions with the main actors are held to identify the opportunities, need for research and innovation, and potential for business development in the short and long term. Last, concrete actions are formulated and carried out.

At present, several of such circular initiatives are getting off the ground or are in preparation. The main lesson we learned until now is that the success depends on a number of main drivers that are relevant for all initiatives. First, there should be one or a limited number of initiators who act as inspiring change agents. Secondly, cooperation across the product chain (including end-users) is key, including trust and mutual respect. Thirdly, new financial and organizational arrangements are important to create a convincing business case. And finally, additional tailor-made incentives need to be attuned to the specific product-/waste stream at stake. Below, I'll give some examples of the approach we have adopted, viz. the construction- and demolition-, plastic- and biomass waste.

THREE CASES OF CIRCULAR INITIATIVES

1. Closing the loop of construction- and demolition waste

Reuse and recycling of raw materials in the construction sector is no new phenomenon. Since about 40% of all waste streams are related to this sector, the urgency to deal prudently with these resources was already expressed in the late 1980s. However, compared to 25 years ago the technological possibilities for resource-efficient reuse and recycling are much greater. This holds for example for recycling of concrete, granulate, bituminous roofing, metals, glass and for reuse of products (such as wood, natural stone, walls, facade slabs and other, still usable products).

Recently, attempts are made to recycle and reuse the whole construction and demolition cycle much more resource-efficiently than before. An example is the Circle City initiative in Rotterdam. A social housing corporation, a sustainable demolition firm, a recycling company and a municipal cleansing company joined forces - and were able to implement a sustainable demolition strategy with a positive business case. The added value was clear: it led to efficiency improvement in the demolition and construction process and to cost savings, new jobs and environmental merits.

The region of Amsterdam aims to copy this Circle City example. Precondition is cooperation in a consortium of companies and implementation of new financial and organizational arrangements. Moreover, a virtual marketplace for the supply and demand of recycled materials needs to be created to enhance the use of these materials at large scale. In addition, physical locations should be assigned to store recycled materials temporarily. In order to increase the ambition level of sustainable demolition practices, local governments can formulate specific requirements in the procurement policies. These should aim to enhance high environmental, social and economic performance. Moreover, they can promote the use of recycled materials in new buildings and the design of sustainable buildings.

2. Closing the loop of plastics

Plastic recycling is a relatively new phenomenon in the Netherlands. Besides the recycling of PET bottles collected via a deposit system and company specific plastics, no attempts were made to recycle plastics of household and industry at a large scale. Since 2007, the national government introduced a recycling system for plastic. In order to finance the start of this system a packaging tax was introduced and a Plastic Hero collection system set up. This triggered municipalities to install the Plastic Hero system and consumers to take part in the

collection of plastic waste. The goal is to recycle 52% of the plastics in 2022. However, the system is so successful that this target will be reached in 2017.

As Germany was ahead of the Netherlands in recycling plastics, we first brought the collected plastic waste to this neighbouring country to be recycled. When the success of the system became evident, the first recycling factory was established in Rotterdam in 2010. At present, several regions, among which the Metropole region of Amsterdam, are in the decision-making stage of whether or not to follow the example of Rotterdam. To avoid divestments in too many plastic recycling facilities, the region aims to coordinate the locations of these facilities. Moreover, the region promotes innovations and R&D in plastic recycling aimed at enhancing the resource efficiency of all kinds of plastics even further. This activity will be part of the regional approach as well.

Not only higher volumes of plastic waste will increase the value creation of plastic recycling, but also sufficient demand for these recycled materials (Cramer, 2015). Customers should be willing to use recycled plastics in their products and guarantee a steady demand. This is the most difficult part of the overall business case. In order to realize a constant demand for recycled plastics, customers and government make the difference. Philips provides a good example as this company has implemented a circular policy to apply recycled plastic in consumer products. When more companies follow this example, the demand for recycled plastic will rapidly increase. Similarly, the government can set standards regarding the use of recycled plastics, for instance in packaging. This is already the case for PET bottles. When large volumes of packaging material at least partly consist of recycled plastic, the closing of the plastic loop will come closer.

These various efforts to promote the use of recycled plastics require the redesign of the plastic product chains themselves. Thus, recycling waste streams goes hand-in-hand with redesigning product chains.

3. Closing the loop of biomass

Biomass is a valuable waste stream consisting of many components, such as fibres, proteins, sugars, fatty acids, pigments, vitamins and minerals. Several biomass waste streams can be distinguished, such as the garden, fruit and vegetables waste, manure, food waste from industrial sites, and sludge of waste water treatment plants. At present, we do not recover many of these valuable ingredients yet. We do make compost of garden, fruit and vegetables waste and bio-energy from manure. However, in principle a radical breakthrough can be made in reclaiming ingredients from these bio waste streams. The reclaimed ingredients can in turn be used in the pharmaceutical, (fine) chemical, material, and food industry – while the remaining biomass can be used as fuel stock in the transport and energy sector. For instance, the garden, fruit and vegetables waste can serve as a fertile breeding ground for insects that produce proteins. And the waste water treatment plants can become a factory for resources. In illustration, valuable nutrients such as phosphates and nitrates can be reclaimed, but also toilet paper being an important source for cellulose.

This breakthrough can only be achieved through joint action and innovation. Collaborative programs are presently carried out, among others in the Metropole region of Amsterdam, to promote R&D, innovation and business development in this area. These efforts are part of the so-called bio-based economy, an important priority area for the Netherlands. Under this heading, initiatives are not only focusing on waste streams but also on the production of

products from grass and crops (e.g. flax, bamboo). In this context, the Metropole region of Amsterdam has carried out a large joint program called Bio-based Connections.

CONCLUSIONS

The transition towards a circular economy is promising, both in economic, social and environmental terms. Therefore, it is high on the Dutch political agenda and a buzz word in society. However, in order to grasp the expected opportunities many obstacles should be overcome. Joint efforts at local and regional level are the breeding ground for change. Here, transition management aimed at circularity, can be put in practice.

The Metropole region of Amsterdam has expressed the ambition to be a frontrunner in moving towards a circular economy. The municipalities in this region joined forces together with industry, knowledge institutions and citizens. A strategic plan for the region forms the basis for action. First, the waste streams will be selected that seem to be most promising economically to enhance circularity at regional level. Examples of priority areas are construction- and demolition-, plastic- and biomass waste. Every waste stream needs a tailor-made approach, involving the relevant actors and the right incentives. Moreover, high supply and demand of recycled material should be guaranteed. However, all cases have a number of drivers in common. First, there should be one or a limited number of initiators who act as inspiring change agents. Secondly, cooperation in the product chain (including end-users) is key, including trust and mutual respect. Thirdly, new financial and organizational arrangements are important to create convincing business cases.

The transition towards a circular economy is not only about reusing and recycling waste streams. It also includes the appropriate design of products and materials for those purposes. Hence, efforts are also made to promote circular product development, for instance via innovation programs, public procurement policies and business-to-business purchasing policies. Redesign of product chains is therefore a crucial part of the overall transition towards a circular economy.

The Metropole region of Amsterdam is on its way towards a circular economy. The region still has many hurdles to take, but the enthusiasm to catalyse a change is invigorating. Through joint initiatives, we hope to accelerate and speed up the process – and become a leading circular hub in Europe.

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