Challenge of making a transition to a circular economy in the Amsterdam Metropolitan Area

The Circular Economy Programme of the Amsterdam Economic Board

July 2020

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The Amsterdam Metropolitan Area, like the rest of the world, faces the challenge of using resources much more efficiently. 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.

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. Within Europe, the Netherlands is one of the leaders in moving to a circular economy. 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.

The Amsterdam Metropolitan Area is in an outstanding position to become a leading circular resources hub in Europe. It is a comparatively densely populated region (2.33 million inhabitants) 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.
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, for example to set up cost-efficient recycling facilities and join forces in circular procurement. 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 Amsterdam Economic Board has taken the lead to coordinate and accelerate those circular activities that need to be set up at regional scale. The Board has initiated a circular economy programme in January 2015 in close cooperation with the Amsterdam Metropolitan Area governments, business, knowledge institutes and citizens. In their view this offers societal merits in all respects: People, Planet and Profit. 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 new businesses, and increase the provision of supply of key resources. The key objectives of the programme for 2025 are:

Governance: Transition management approach

Moving towards a circular economy is not business as usual but requires a fundamental shift in our economic system. To make this change we need to adopt an innovative governance approach, called transition management, which is based on the following guiding principles[1].

1. All relevant actors should be involved in the change process.

[1] Rotmans, J. et al., 2001. More Evolution than Revolution: Transition Management in Public Policy. Foresight, 3 (1), 15-31).

2. Changes should take place at micro-, meso- and macro scale.
3. 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.
4. Connections should be made between innovative practice experiments and changes at the system level.
5. 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 execution of the programme was in the hands of the challenge lead Circular Economy of the Amsterdam Economic Board, respectively Dominique van Ratingen (2015-2016) and Marjolein Brasz (2016-2019) and is orchestrated by Jacqueline Cramer, member of the Amsterdam Economic Board (2015-present).

The design of the programme

The circular economy programme of the Amsterdam Economic Board consists of four phases:

Phase 1: Drafting the circular economy programme

Phase 2: Building circular initiatives, have been concluded

Phase 3: Scaling up at regional level

Phase 4: Mainstreaming at national level

In 2015 – 2018 the programme has focused on phases 1 and 2. In 2019 phase 3 has started for those initiatives that realised new business development. Phase 4 is not yet in sight. Phase 1 evolved relatively fast due to the comparatively favourable cultural and political climate in the region. This positive climate has not only enabled the emergence of the circular economy programme of the Board, but also triggered other circular initiatives at local level and within industry. Phase 2 – building circular initiatives – is key in the implementation of the programme and can cover a variety of activities. After four years of implementation the results of the programme were monitored and evaluated. Reflecting upon these results led to the start of a next round of activities since January 2019.

To stretch the circular ambition of the programme, the aim was to set up activities that focus on the highest possible steps on the ladder of circularity[2] :

[2] J. Cramer, Moving towards a circular economy in the Netherlands: Challenges and directions, in Proceedings van The HKIE Environmental Division Annual Forum, 'The Future Directions and Breakthroughs of Hong Kong's Environmental Industry, Hong Kong, 17 April

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Levels of circularity: 10 R's

Order of priority

High

Refuse: prevent raw materials use

Reduce: decrease raw materials use

Renew: redesign product in view of circularity

Re-use: use product again (second hand)

Repair: maintain and repair product

Refurbish: revive product

Remanufacture: make new product from second hand

Re-purpose: re-use product but with other function

Recycle: salvage material streams with highest possible value

Low

Recover: incinerate waste with energy recovery

Based on the ladder of circularity the strategic choice of the programme in 2015-2018 was to focus on:

Two major sub-programmes

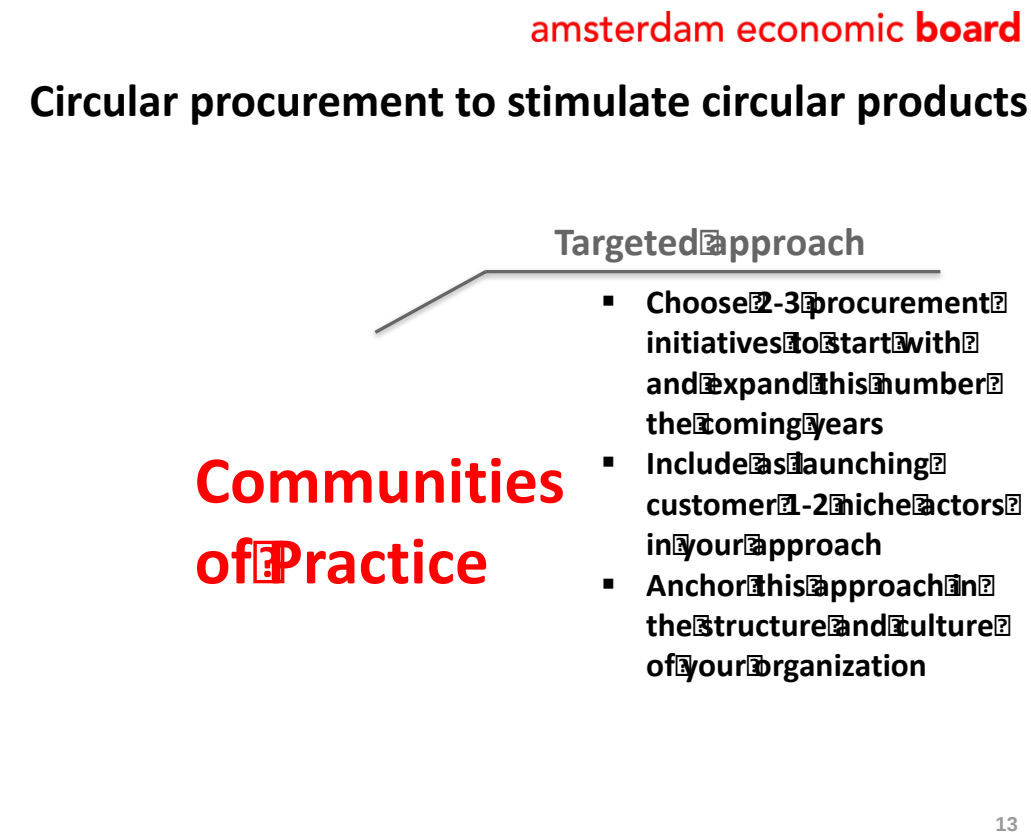
1. *Circular procurement.*

This programme aims to stimulate circular products through circular procurement executed by local governments and other contractors (for example businesses and educational and research institutions). Two communities of practice were set up successively, with in total 22 representatives of procurement or sustainability divisions. The goal was to gain knowledge about circular procurement, exchange experiences and explore potential cooperation. Each community of practice consisted of 6 sessions, in which the participants learned from each other and acquired the necessary expertise to implement circular procurement within their own organisation. The participants chose a few procurement trajectories to start with and planned to add more in the coming years. It was left to the participants themselves (often being procurement managers within their organisation) to decide which trajectories they would select. In order to be as innovative as possible, the participants were encouraged to include start-ups and

2015, pp. 1-9.

grownups as well. The investments were made particularly in the following five product groups: demolition and construction, office furniture, road signs, catering, and data servers and ICT business equipment.

Key results were: 150 million investments in circular procurement. Moreover, all 32 municipalities except one and the two provinces have signed a manifesto in which they committed to realise 10% circular procurement in 2022, 50% in 2025 and 100% as soon after as feasible.



2. *Closing the loop of resource streams*
   This programme started with the selection of the following nine main resource streams, consisting of many sub-streams:

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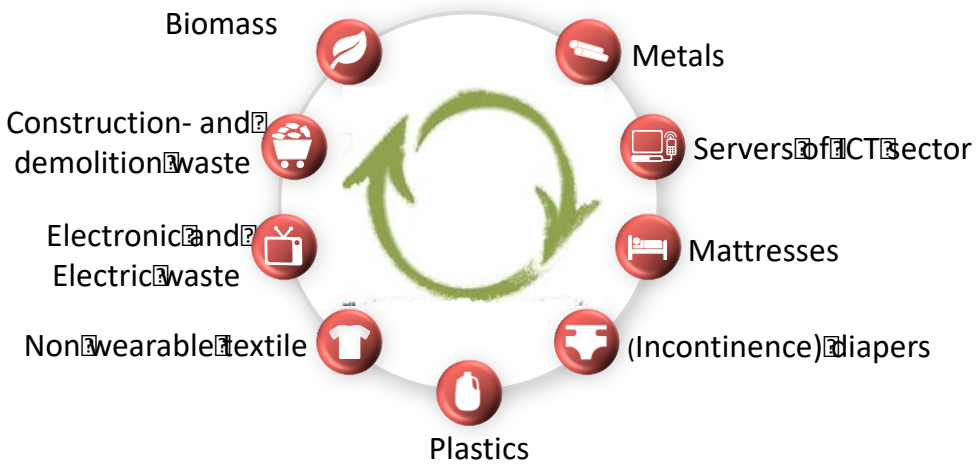
Closing the loop of resource streams (9 priority resource streams: 2015-18)



These resource streams were chosen because of their high volumes and large environmental footprint and their potential for innovative improvement in terms of recycling, product reuse and redesign. First, priority was given to household waste streams, because more public data are available about those compared to business waste streams. Some business resource streams were also included because these were prioritised by members of the Amsterdam Economic Board (viz. data servers, demolition and building, metals and the resource stream of the food industry (sub-stream of biomass). The objective was to build consortia of parties that were willing to jointly set up challenging circular initiatives.
The Board designed and adopted a generic approach to generate and select the most promising options for closing the loop of each resource stream[3]. Experiences showed, however, that this generic approach had to be applied flexibly. The overall approach was as follows:

[3] J. Cramer, Moving towards a circular economy in the Netherlands: Challenges and directions, in Proceedings van The HKIE Environmental Division Annual Forum, 'The Future Directions and Breakthroughs of Hong Kong's Environmental Industry, Hong Kong, 17 April 2015, pp. 1-9.

The approach adopted has often led to innovative steps being taken towards the circular economy. The actors involved strived for ambitious solutions, both for generating new products (flavour additives, phosphate and calcite, insulation material and regenerated clothes, diapers and mattresses) and for reuse of products (building materials and data servers).
New business models were frequently adopted, namely in about 60 percent of all cases. The model most often applied was the 'shared costs and benefits model', in which key actors jointly estimate the overall cost-result ratio in advance and make a calculation that reflects the share of each actor in a well-balanced manner. Such an honest account of the costs and benefits was often needed to build a viable consortium, which was economically attractive for all consortium partners. Other new business models being applied were: leasing, sharing and the introduction of a cooperative or voluntary producer responsibility scheme.

Results

The key results were high value recycling and product-redesign and reuse of 20 sub streams, viz.:

Biomass

a. Waste streams from the food industry consist of valuable resources which can be reused, for example to produce flavouring additives. Plans for a bio-refinery that reclaims nutrients are being developed by a start-up (a spin-off of a flavouring

additive manufacturer) in collaboration with the Green Campus of the University of Amsterdam. To obtain sufficient residual food waste streams, cooperation is needed with major food companies in the region. The Board actively supported the making of this consortium. See also: High-grade food waste processing

b. The processing of organic waste from public green space (e.g. grass and clippings) focused on recycling organic waste from public green space to produce energy and resources. The Board helped to form a consortium consisting of a recycler, three public authorities that provide the waste material and a start-up that is able to make insulation material from the reclaimed resources. See also: Roadside grass as a green raw material
c. The case of the organic liquid fraction is a joint initiative by the Board and the Green Business Club (a grown-up). With participants including major companies in Amsterdam, the Green Business Club promotes the separation of waste at source (starting with paper and plastics) instead of the current bulk collection of the mixed waste stream, which is used to produce energy bricks, but a vast amount of the remaining waste is landfilled. See also: Commercial waste (Dutch)
d. Reclaiming resources from sewage sludge was already a high priority for the Amsterdam area's main water company Waternet when the Board programme started in 2015. This public company focuses on treating wastewater, reclaiming usable materials (e.g. phosphate, calcite, cellulose and humic acid) and energy, and releasing the treated water back into the environment. The Board therefore actively supports the water company at its request.
e. The production of green gas, heat, compost, citrus fuel and water from organic waste has been set up by Meerlanden, one of the main waste incineration facilities in the region. This so-called Green Energy Factory uses vegetable, fruit and garden waste from nine municipalities and 4,000 companies in the region as input and has been built in Rijsenhout, just south of Amsterdam Airport Schiphol. The Amsterdam Economic Board helped to set these developments in motion by conducting thorough market research and bringing together the parties concerned. See also: Organic waste: the start of something beautiful

Circular demolition and construction

a. Circular demolition is the basis for being able to reuse and recycle building materials in the construction sector. Recently, various companies - mainly newcomers in the market - specialised in this area, relying upon the so-called 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 region of Amsterdam has been inspired by this Circle City example and started to formulate specific requirements in its procurement policies. The Board actively supported this development.
b. Circular building and construction got a boost in 2017 through the initiation of a platform for circular building and construction co-financed by the local governments of the Amsterdam Metropolitan Area. This platform, called C-creators, is an independent foundation that aims to accelerate circular construction and building through learning by doing and experimenting. The Board has supported the establishment of this platform.

Electronic/electric waste

a. Sorting of materials is the first step in closing the loop of discarded products. The Board has encouraged the two main waste incineration facilities to expand the facilities for dismantling the electronic and electric equipment in special service centres. This activity is an obvious extension of their portfolio and could start without much innovation.
b. The next step of reclaiming the materials, however, is not considered as the core business of the two main incineration facilities and therefore left to others. The reclamation of two resource flows – plastics and cables – is already a viable business. The other main resource is printed circuit boards, which are presently being reclaimed abroad. As new techniques have emerged that can achieve higher value recycling, the Board acts as matchmaker between niche company and the Port of Amsterdam to set up an innovative recycling plant for printed circuit boards.
   See also: Major steps in e-waste: recycling electronic equipment

Non-wearable textiles

a. Sorting is the first step in closing the loop of the resource stream of non-wearable textiles. The Board has actively supported a grown-up that anticipates market opportunities in sorting these textiles using innovative technology.
b. This sorting company has initiated the next step 'generating fibres' by building a consortium with a commissioning partner (a municipality), a textile collector and a niche company that can produce new clothes from the fibres. To complete the consortium, the partners are still looking for a company interested in mechanical defibrating. Although the consortium can start with one municipality as commissioning partner, the business case will clearly improve when more municipalities join the initiative and supply non-wearable textiles. Efforts are therefore being made by the Board and the governing board of the 32 municipalities to interest municipalities in harmonising their procurement policies with this initiative.
   See also: From discarded textile to new thread

Plastics

a. Sorting is the first step in reclaiming the different plastics for reuse. The Board asked the Port of Amsterdam (as landowner) to approach a niche company identified by the Board as an expert in innovative plastic sorting techniques. This has resulted in the development of a new initiative which will shortly lead to an up-to-date facility for sorting plastics. The largest waste incineration facility in the region will become the main supplier of the resource stream of plastics.
b. Through mechanical recycling new products can be made from these recycled plastics, such as packaging material and 3D printing products. To stimulate this business the Board helps with matchmaking.
c. Chemical or feedstock recycling is another innovative technological trajectory to reuse the resource stream of plastics. It aims to convert post-consumer plastic waste into valuable chemicals, to be used as fuel or raw materials by the chemical industry. This technology is currently being developed by innovative niche companies together with large established companies at national scale.

Diapers

a. in the case of high-value diaper recycling, the action was initiated by a call from the Board for the reclamation of resources from recycled diapers in order to produce R-plastic, sterilized cellulose and sterilized super absorbing polymers for new applications. Having investigated the most promising options available in the market, the Board approached the waste incineration company in Amsterdam to determine its interest. As diaper recycling was appropriate to the diversification of its portfolio, the company was willing to co-invest in demonstration and commercial scale facilities. The next step was to select the most appropriate candidate, which happened to be a grown-up – a spin-off of a diaper manufacturer. Together with this company, the Board and the waste incineration company built a consortium with a customer and various municipalities to organise the collection of diapers. The initiative could then be launched.
   See also: Pilot launched to recycle millions of nappies

Mattresses

a. In the case of mattresses recycling, the incentive for action is the increasing pressure on manufacturers to improve the redesign and recycling of mattresses. This is primarily caused by the technical problems that waste incineration facilities encounter in storing and processing mattresses. The existing alternative pathway – mattress recycling – is very expensive, which implies that it is barely possible for the two Dutch grown-up mattress recyclers to survive. To solve this stalemate, the Board has initiated a national initiative to set up a voluntary producer responsibility scheme. This includes a fee for each mattress sold in order to finance collection and recycling and to promote through innovation the redesign of mattresses for reuse and recycling. The latter activities involve both regime actors and grown-ups focusing on redesign and recycling. Mattress manufacturers are now taking the lead in decision-making on this plan.
b. In anticipation of the introduction of this initiative, an innovative manufacturer has already managed to redesign and sell a 'circular' mattress that sets an example to the entire sector.

Data servers

a. The case of data servers has been initiated by the Board in view of the rapid expansion of the data centre sector in the Amsterdam Metropolitan Region. The Board has approached key actors in the data centre business environment to help increase the circularity of data servers. A consortium consisting of a manufacturer, two industry associations and a data centre was formed. The first problem was a lack of knowledge about what happens to data servers once they are discarded. As there is no overarching administrative system, equipment is entirely untraceable, which hampers high value recycling. A Board partner adopting block-chain initiatives helped to address this problem.
b. Knowing what happens to data servers after use also increases the interest in reuse (including the refurbishment of data servers in whole or in part). Consequently, SMEs and niche companies that can provide these services have become more involved. The data servers themselves are produced on the world

market, which makes it hard for regional bidders to exert a radical influence on the product design.
See also : Half a million data servers a year discarded in the Netherlands

Metals recycling

a. The Board has promoted reuse and high-value recycling of ferro and non-ferro metals. The first, relatively easy step was the recycling of cans by connecting the waste incineration company to the major steel company in the region.
b. More radical, innovative steps, however, are harder to make. More than 50 per cent of all (mostly polluted and/or mixed) ferro and non-ferro metal scrap is exported and the rest is recycled in the Netherlands. In order to create new business through innovative processes and reduce the export volumes, the Board has searched for interesting candidates. New promising options have been put forward, which are currently being prepared. They include reuse activities, particularly in the building sector, and new steps in recycling techniques in ferro and non-ferro metals .

Next steps
In the coming four years (2019-2023) the circular economy programme of the Amsterdam Economic Board will focus on:

a. Scaling up the circular initiatives that have been successful to a regional scale
b. Enlarging and strengthening the circular procurement community in the region
c. Initiating a next round of initiatives to close the loop of resource streams, particularly focussed on industrial resource streams

The objective for 2019-2023 is to scale up at least 15 initiatives to a regional scale, increase the total investments in circular procurement to 10% (including the redesign of 17 material - and product chains) and build at least 15 circular consortia of industrial resource streams.

Drivers of success
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. One of these incentives is circular procurement [4] .

[4] J. Cramer, Key Drivers for High-Grade Recycling under constrained Conditions, Recycling, 3,16, 2018, pp. 1-15.

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Towards a circular economy
Conditions for success:

Join in!
A combined effort on the part of innovative companies and forward-thinking universities, plus a government to stimulate, facilitate and connect them, is a prerequisite for success. Together we know more, and we can achieve more. So we invite all municipalities, companies, startups, universities and research institutes to join the programme. Tell us about your plans, initiatives and innovative product or service, or let us know where you need help. We can then combine our diversity and activities and accelerate the transition to a circular economy, with the aim of putting the Amsterdam Metropolitan Area on the map as the prime circular hotspot in the Netherlands and Europe.

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