

JUNE 2013

# DUTCH LOGISTICS 2040 DESIGNED TO LAST

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The Council for the Environment and Infrastructure (*Raad voor de Leefomgeving en Infrastructuur, Rli*) advises the Dutch government and Parliament on strategic issues that are concerned with overall living and working environment. The Council is independent, and offers solicited and unsolicited advice on long-term issues of strategic importance to the Netherlands. Through its integrated approach and strategic advice, the Council strives to provide greater depth and breadth to the political and social debate, and to quality of decision-making processes.

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DUTCH  
LOGISTICS 2040  
DESIGNED TO LAST

**The Dutch version of the advisory report contains an additional analytical section.  
A short film accompanies this advisory report and is available at [www.rli.nl](http://www.rli.nl)**

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ADVICE



# WHY THIS ADVICE ON LOGISTICS?

# 1

## 1.1 Towards logistics in a circular economy

The world is changing considerably: the global population is growing and becoming wealthier, consumption is increasing and so is the amount of waste generated. However, resources and energy are becoming scarcer. According to the sectors high-tech, chemicals and agrifood, a circular economy (appendix: Glossary) offers a potential solution to this discrepancy. An economy in which products no longer end up as waste, but are reused in the chain for as long as possible. For companies in all sectors, it is becoming more interesting to adopt business models in which they remain responsible for their products throughout their entire lifecycles. This starts with the development of the product, but also entails production techniques and the packaging and transport of goods; in short, the entire organisation of the supply chain. The spatial clustering of companies which collaborate with and complement one another is highly important in that respect as it makes the inter-connecting of links in the supply chain and the exchange of residuals between links easier. **The Council advises municipal and provincial authorities to stimulate spatial clustering within the sectors high-tech, chemicals and agrifood. This can be implemented in practice by assigning certain locations to specific clusters and/or by formulating conditions for the (re)use of energy, heat and waste in the business location policy. The State is advised to promote the reuse of waste as raw materials for new products by eliminating obstacles in the legislation pertaining to waste processing and by introducing 'raw materials passports'.**

The transition to the circular economy presents new opportunities to the logistics sector. The already considerable importance of logistics to the Dutch economy can be even further expanded. The transition to the circular economy has implications for logistics flows at global, national and local levels. At the global level, the following applies: the more control companies wish to exercise over the full lifecycle of a product, the more attractive it becomes to operate close to the customer: near-sourcing (appendix: Glossary). In addition, the fact that consumers want specific, tailor-made solutions also makes the distance to the customer a factor of importance.

Simultaneously, at the national level, the transit function of the Netherlands is changing. Through seaports in Southern Europe or over land by rail, alternatives for the transit (appendix: Glossary) of cargo to the European hinterland are emerging; consequently, the economic balance is slowly shifting to the East.

Moreover, the expected flow of biomass (appendix: Glossary) is expected to have an impact. The question is also which impact the circular economy will have on incoming cargo flows. There are opportunities to transform the Netherlands into the hub (appendix: Glossary) of Europe for the circular economy. **The Council recommends to the State: develop a programme with Rotterdam as the circular hub of Europe. Study the effects of the circular economy on the cargo types and volumes coming into and leaving Europe via the port of Rotterdam in that respect.**

At the local level, an increase in transport movements will occur. Not only is this attributable to the increase in near-sourcing and e-commerce, but also to the transition towards a circular economy, which leads to an increase in service logistics (appendix: Glossary) and reverse logistics (appendix: Glossary). Keeping cities liveable is a challenge for the logistics sector. **The Council recommends to provincial and municipal governments: use innovative tendering for city logistics and only set goal-oriented regulations aimed at the promotion of liveability in that respect. The State is advised to pursue administrative agreements with local governments about the harmonisation of these local goal-oriented regulations.**

As the transition towards a circular economy predominantly needs to be picked up by the sectors themselves, the Council has opted to also include recommendations to the business sector in this advice. From the perspective of the circular economy and logistics, it is essential for all sectors to consider the entire supply chain rather than all the separate links. One single link, company, in the supply chain is able to optimise its own production process, but all these individual link optimisations do not necessarily result in optimisation of the entire supply chain and the greatest added value for consumers and society in general. **The Council recommends to the business sector: shift from a focus on the individual link to multiple value creation in the integrated supply chains. Develop integrated supply chains for the entire lifecycle of each product (including sales and post-use phase).**

These three main advices to government bodies and the main recommendation to the business sector are further discussed in this advisory report. In addition to these three main advices and the main recommendation, the Council offers a number of advices to government bodies (Chapter 2) in this report and a number of recommendations to the business sector (Chapter 3) for the path towards logistics which are 'designed to last'.



## 1.2 How can the logistics sector remain competitive and an enabler for other top sectors?

The logistical strength of the Netherlands is affected by the aforementioned increasing scarcity of resources and energy sources, but also by climate change, shifting balances in geopolitical and economic power, demographic trends, changing consumer behaviour and the digitisation of society. The Minister of Infrastructure and the Environment (IenM in Dutch) has requested the Council for the Environment and Infrastructure to draw up an advice regarding the logistical strength of the Netherlands.

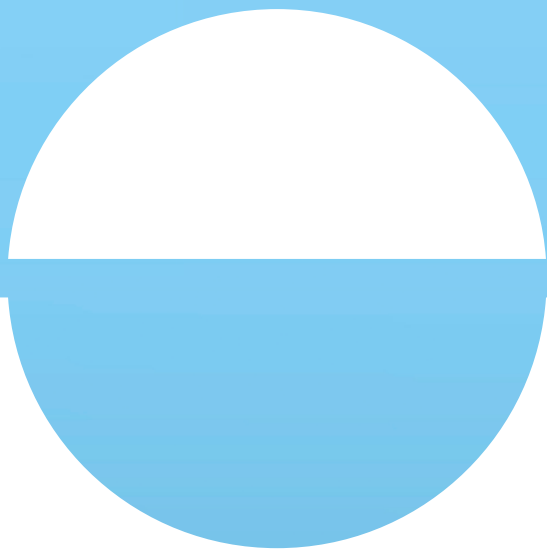
Logistics is primarily a matter of organising, planning, managing and handling cargo flows, from their development and purchasing via production and distribution to the end user, including return flows (Visser & Van Goor, 2008). The Council however defines logistics in a broader sense which also includes supply chain management (appendix: Glossary). Supply chain management comprises supply chains and networks which are internationally anchored and among other things entails the coordination of goods flows, information flows and financial flows. This advice focuses on the local, regional, national and international goods flows.

Following consultations with government bodies, the business sector and scientific sector (appendix: Formation advice), the Council has formulated the following question:

*What must the government do to ensure that the logistics sector can optimally function and act as an enabler for the top sectors high-tech, chemicals and agrifood<sup>1</sup> by 2040?*

The Council has selected these key sectors as they constitute a representative indication of the logistical challenges in the Netherlands. In addition, substantial and diverse goods flows are involved in the sectors chemicals, agrifood and horticulture: bulk, general cargo, containers, raw materials etc.

1 The Council has included both the agrifood and horticultural sectors in the advice. In many cases, agrifood and horticulture are interchangeable.



# ADVICE TO GOVERNMENT BODIES: MAKE DUTCH LOGISTICS 'DESIGNED TO LAST'

# 2

## 2.1 Challenge: Facilitating a circular economy

### "Society is ready for the circular economy

A trend is developing in society towards sharing and reusing instead of owning and disposing. Rising commodity prices are also a contributing factor in this respect. This makes the circular economy increasingly attractive for companies." (Lageweg et al., 2013)

Logistics is an enabler of other sectors such as high-tech, chemicals and agrifood. To determine the logistics concepts which will be necessary to continue fulfilling this role in the future, it is important to know how these sectors will develop. If resources become scarcer and thus more expensive, the reuse of products or the raw materials and components they contain will become more and more attractive. It is estimated that as a result, the global reductions in the use of raw materials can amount to as much as 700 billion USD annually for consumer products. Currently, 80% of consumer products are still discarded (Ellen MacArthur Foundation, 2013a). In the economy as a whole, this amount could rise to more than 2000 billion USD a year. Furthermore, it helps to achieve the climate target and the waste separation target of 65% by 2015 (Tweede Kamer, 2011a).

"As part of the Ellen MacArthur Foundation's mission to accelerate the transition to the circular economy, we have conducted analysis and published the first ever report series highlighting the economic rationale for the transition to a circular economy – an opportunity in excess of 2 trillion USD for the global economy." (Ellen MacArthur Foundation, 2013b)

### **“Reward people for their waste**

According to DHV, the average resident generated approximately 550 kilos of waste in 2009; 25% was bulky waste. Half was not separated. In this way, 4.6 million tonnes of waste, including a lot of plastics, ends up in the incinerator. Interesting detail: in municipalities that have a high degree of waste separation, the waste levies tend to be relatively low. The reason: recycling generates revenue for municipalities [...] If all household paper, glass, plastic, textiles and organic waste were to be reused, CO<sub>2</sub> emission would drop by 5.6 million tonnes; more than what is emitted by 1 million passenger cars. Or: one fifth of the remaining climate targets for 2020. According to DHV staff, recycling furthermore yields municipalities 250 million euros per year. They spend 400 million euros extra on separated collection, but save 650 million euros on processing and incineration.” (Buddingh, 2011)

### **“Waste separation saves money and benefits the environment**

Separately collected plastic, glass, paper and textiles generate money for municipalities. One tonne of plastic is worth about 475 euros. For a tonne of waste paper, between 50 to 100 euros is paid. According to DHV, a thousand kilos of glass is worth ‘a couple of tenners’ and the prices for textiles range from 100 to 300 euros per tonne. It costs a municipality 50 to 150 euros per tonne to incinerate waste.” (Warbroek, 2011)

In addition to a scarcity of resources, there is also a shortage of energy resources and an immense waste issue. The world population is expanding and welfare levels are increasing; as a result, the demand for products is continuing to rise. Finding ways to add value (multi-value creation) through the rendering of improved services surrounding products is therefore becoming increasingly more topical.

- “According to the UN, the world population will grow to twelve billion people in 2100. Over the past 100 years, the world population has quadrupled.
- The average wealth in the world will double in the next twenty years. In the 20th century, wealth levels have increased 25-fold.
- With that, consumption levels will also rise. KPMG expects that in 2030, there will be three billion more middleclass consumers than in 2010.
- The annual extraction of resources is increasing by 4% on average. For example, the demand for construction materials has increased by a factor 34 in the twentieth century.
- The annual global waste heap is unabatedly continuing to grow and amounted to 12 billion tonnes in 2011; enough to fill the Amsterdam ArenA 7000 times.

- The annual global demand for energy has doubled in 40 years. Expectations are that this demand will increase by another 50% over the next twenty years." (MVO Nederland, 2013a)

In all sectors studied, the Council observes a shift from a linear (appendix: Glossary) to a circular economy. The government also supports this observation: "The government is committed to a circular economy and wants to stimulate the (European) market for renewable raw materials and the reuse of scarce materials (Tweede Kamer, 2012b)". This view is also expressed in the motion by Marieke van der Werf (box below) and the letter 'Green Growth: for a strong, sustainable economy' (Tweede Kamer, 2013b) of the Minister of Economic Affairs and the State Secretary of Infrastructure and the Environment.

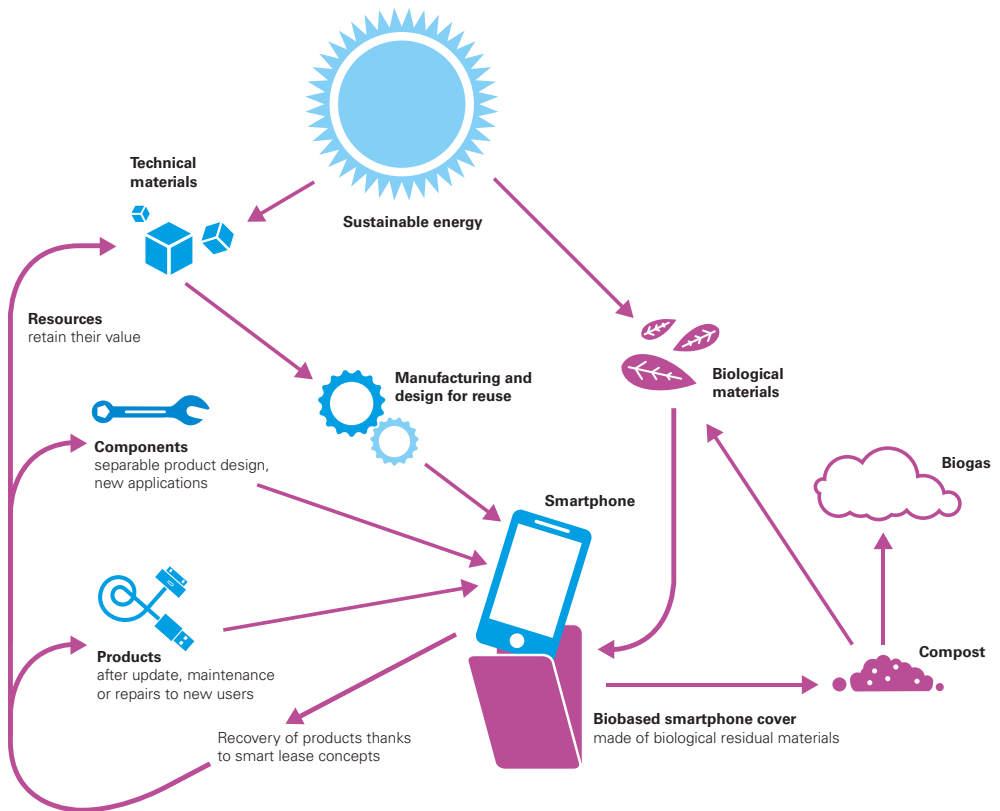
#### "Motion by MP Van der Werf

Proposed during parliamentary meeting d.d. July 2, 2012

The House of Representatives, after having considered the matter, noted that it is in the interests of both the environment and the conservation of resources to make the transition from a linear economy to a circular or recycling-based economy; calls on the Government to charter which opportunities are present for working towards a circular economy in the Netherlands, how these opportunities can be capitalised on and how obstacles can be eliminated, and proceeds to the order of the day." (Tweede Kamer, 2012a)

In a circular economy, it is less likely for a product to end up as waste (Figure 1). Companies are increasingly striving to reuse products for as long as possible: this makes them less dependent on scarce, expensive resources. This consequently makes it more attractive for companies to develop business models in which they retain ownership of products during their entire lifecycle and therefore also remain responsible for them. This allows the companies to reuse the products when they are discarded by end users. In this approach, products are no longer purchased once and consumed, but rather leased by end users during a certain period. As a result, the recovery of resources is becoming an increasingly important part of the business chain. A circular economy combines the cradle-to-cradle principle (products no longer end up as waste, appendix: Glossary) with the responsible consumption of a product by the consumer. Making this transition possible means both challenges and opportunities for the logistics sector.

Figure 1: Circular chain for smartphone with cover



Source: MVO Nederland / ShootMedia, 2013.

**“The main principles of the circular economy are:**

1. Value retention is maximised by considering product reuse first, then reuse of parts and finally reuse of raw materials.
2. Products are designed and manufactured in such a manner that they can easily be dismantled at the end of the use phase and material flows can be easily separated.
3. No harmful substances are emitted during the production, use and processing of the product.

4. The parts and raw materials of 'user products' (such as a lamp) are reused without a loss of quality (in a new lamp, for example, but possibly also in a new laptop).
5. The resources used in 'consumables' (like toothpaste) are biodegradable and (after any remaining raw materials have been recycled) are returned to nature.
6. Manufacturers retain ownership of consumer products; customers pay for their use, not for ownership of the products.
7. Because the performance of the product determines the value, providing the right quality becomes extremely important to the manufacturers.
8. One of the most important success factors is (cross-sectoral) chain cooperation focused on the creation of multiple value. In this, not only the economic value of all the companies in the chain is increased but also the ecological and social value." (MVO Nederland, 2013b)

The Council realises that the current era of finite and non-sustainable energy sources can still be extended through the use of alternatives such as shale gas and thorium (as a replacement for uranium). Nevertheless, the Council is currently already observing that more and more companies and organisations are moving towards a circular economy and based on this it expects that the characteristics of a circular economy will have become much more apparent by 2040.

This requires a perspective for action that focuses on strengthening already visible initiatives and creating new initiatives and actions. In this chapter, the Council first offers various advices to stimulate the autonomous shift towards the circular economy. Next, the significance of a circular economy for global, national and local logistics concepts is explored. This chapter concludes with some advice for government bodies to stimulate and facilitate the logistics concepts necessary for the circular economy.

### **2.1.1 Encourage the formation of spatial clusters within the sectors high-tech, chemicals and agrifood**

An important component of a circular economy is the spatial clustering of companies which cooperate with and supplement one another (for example in different types of valleys, appendix: Glossary). In a circular economy, clustering makes it easier to connect different links and exchange residual flows between these links. In the Netherlands, the FLOW2 system (appendix: Glossary) is already demonstrating how companies exchange information on unused equipment, personnel and knowledge (Ellen MacArthur Foundation, 2013c). Information on unused energy and resources can bring companies together in a similar manner.

The Council realises that the development of clusters takes time. Stimulating the formation of clusters is only possible when existing business estates are

transformed or new ones are developed. Port authorities are by the way already actively pursuing policies to this extent.

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In addition to the formation of clusters, it is important that a reliable and robust network is present between these clusters. Reliable in this context means ensuring predictable travel times so that companies can use them as a starting point for their operations. Such logistical reliability can form the basis for building a circular chain; uncertainty in this respect mainly results in the creation of buffer supplies (appendix: Glossary), higher chain costs and more environmental effects. In addition, robustness plays an important role. In its advice Permanent mobility in the Randstad (*De Randstad altijd bereikbaar*, Raad voor VenW, 2009), the Advisory Council for Transport, Public Works and Water Management therefore advised to add sufficient spare capacity to the physical network and to create detour routes. Furthermore, the different networks need to be better interconnected with one another; this makes it easier to switch to a different mode of transport (appendix: Glossary) in the case of disruptions. That requires an intensification of the approach in the network design and network management (Raad voor VenW, 2007), which means that different parties and levels of government work together to make existing networks as reliable and solid as possible.

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*The aforementioned leads to advice 1 to provincial and municipal governments:*

- Provinces: Use public law for the admission of companies to a certain cluster or specific location. Clearly assign locations to certain clusters in advance. Coordination between municipalities is crucial in that respect. The provincial coordination task of establishing planning policies which transgress municipal borders is important for that coordination.
- Provinces / municipalities: Include objectives or conditions for the (re)use of energy, heat and waste in your business location policy.

#### **“Energy Transition Park Midden-Drenthe**

The Energy Transition Park (ETP) Midden-Drenthe is a business park next to the Attero site in Wijster. The aim is to attract companies to the site which consume a lot of energy and want to do so in a sustainable manner. They can make use of the sustainable energy produced by Attero. In this way, they locally use this energy in a smart manner. The same principle also applies to the raw materials they retrieve from waste and to the process water from the waste treatment



plant: local for local. Besides Attero, the provincial government of Drenthe, municipality of Midden-Drenthe, the Reest & Wieden Water Board and Energy Valley are involved in the development of the Energy Transition Park. In addition, knowledge institutions will be offered the opportunity to develop sustainable, innovative technologies at the ETP. Noblesse Proteins is the first major energy consumer to enter into a contract with Attero for the purchase of steam and the treatment of wastewater.” (Attero, s.a.)

### **“New form of cooperation in the field of sustainability launched in Limburg as first pilot for the Netherlands**

Industrial symbiosis that leads to innovation; that is the objective of the project SILVER which was initiated on the 11th of April by the Province of Limburg, NL Agency and the Limburg Employers Association. In Dutch, the acronym SILVER stands for Accelerating and Realising Symbiosis in Limburg. The organisations which are committed to SILVER signed a cooperation agreement on the 11th of April 2013. The SILVER project connects companies from highly diverse sectors and forges partnerships; it encourages these companies to share information related to the supply and demand for respectively residuals, raw materials and energy. The programme is designed to generate opportunities for the business sector and create new innovations and employment. It also helps companies to (re)consider the energy, resources and waste and residual flows which are to be used. In short, it contributes to more innovation and economic growth whilst reducing the environmental impact. SILVER is a method focused around chain cooperation and has already proved successful in England. The pilot in Limburg is the first to be initiated in the Netherlands.” (Limburg.nl, 2013)

- Provincial governments/cooperating municipalities: Ensure a decision for a cluster is centrally controlled by the municipality. If necessary, make use of an equalisation fund so that the revenues from land issuing and the expenditures for the development of industrial sites are distributed as fairly as possible.

“In 2009, the municipalities of Bronckhorst, Doetinchem, Montferland and Oude IJsselstreek entered into a cooperation agreement with the Province of Gelderland for the industrial area West-Achterhoek. The established administrative frameworks were further fleshed out in a cooperation agreement by the municipalities in question. In that respect, such aspects as risk sharing, the allocation of responsibilities, regional land price policy and acquisition play an important role. There is administrative consensus on the cooperation, the equalisation, the fund formation, joint marketing and acquisition and many other elements.” (Gemeente Doetinchem, 2009)

### 2.1.2 Stimulate business concepts focused on the circular economy

The formation of a circular economy starts with the development of a product: can resources and components be optimally reused and how? Not only regarding the product design, but also in terms of production, packaging, transport of goods; in fact, the entire business concept affects the manner in which the circular economy is shaped. European standardisation of new products and packaging, for example, can have a stimulating effect for a company and prevent unfair competition.

Digitisation through the NLIP (Neutral Logistics Information Platform) or the use of raw materials passports (appendix: Glossary), which indicate the raw materials used in a certain product, can be important tools in this.

The design of the supply chain in which a company operates is important as well. Which activities are still carried out by the company itself? With which parties should there be cooperation, how can the strengths of various companies be geared to one another for a sustainable result?

It appears as if VAT (Value Added Tax) is a concept of the linear economy, because value is constantly added en route to the final product. In a circular economy, the process of extraction (cradle-to-cradle) from products to semi-finished products or raw materials should also be interpreted as added value. The government should differentiate (in a fiscal sense) between the use of primary resources and resources which are generated through recycling. After all, this will make it more attractive for companies to recover resources from the waste flows of discarded products through recycling (Wijffels, 2012).

#### **Presentation Feike Sijbesma (CEO DSM):**

In the TV programme *Buitenhof*, Sijbesma talks about his presentation to the World Economic Forum. The primary goals are to add value to this planet, add value for the people and make a profit, he says. All three objectives are relevant, not just making a profit. He believes that taxation offers concrete opportunities to achieve this. Shareholders will consequently be able to address companies listed on the exchange as regards the aims in relation to the three P's (VPRO, *Buitenhof*, 2012).

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*The aforementioned leads to advice 2 to the State:*

- Stimulate the development of circular business concepts. The business sector benefits from clarity and transparency about the end goals, the desired performance of products for a circular economy. Therefore, use goal-oriented regulations (appendix: Glossary) to encourage this development (for example: the burning and export of valuable residuals, requirements as regards the reuse percentage of components and raw materials in new products, lease constructions of products, return services and deposits).
- Investigate whether an expansion of the NLIP with information from raw materials passports can help to promote clustering and cooperation.
- Continue facilitating Green Deals (Appendix: Glossary), but use the facilitation of a circular economy as the selection criterion. Green Deals were launched by the government to help citizens, companies, organisations or other government bodies to realise sustainable initiatives that would otherwise be difficult to initiate. For example, projects for energy insulation or the more sustainable use of water. The cabinet Rutte II wants to give priority to energy conservation by expanding the number of Green Deals. The Council recommends that projects related to waste processing also be included in these Green Deals.
- Analyse relevant taxes and adjust them in such a manner that they stimulate the circular economy. As a starting point, use a tax which comprises all steps in the product process: a tax on extracted value. Charter the obstacles which hinder this form of taxation and find ways of eliminating them (Wijffels, 2012).

“[...]Another aspect of fiscal legislation which needs to be revised is the energy tax. In the current set-up, taxes become lower as consumption increases[...]To stimulate the transition to a circular economy, change-oriented fiscal legislation can help promote the cyclical reuse of resources and the application of new, sustainable technologies.” (Wijffels, 2012)

- Use the circular economy as a starting point in calls to tender: whereas currently the lowest price is determining as regards, for example, installation, construction and design, the starting point needs to be the costs for the entire life cycle of an initiative, so including maintenance and management, reverse logistics and the processing of residuals. Or, in other words: the total costs of ownership (appendix: Glossary), including transportation and processing. This will allow service providers who cover all these aspects to fairly compete with companies that solely focus on installation, design or construction. The design may initially be more expensive, but the management, maintenance and processing of waste products often yields profits compared to the situation in which installation, construction, design, maintenance and management, reverse logistics and residual processing are tendered separately.

### **Pilot circular purchasing at the Ministry of Infrastructure and the Environment**

The Ministry of Infrastructure and the Environment, in cooperation with the Ministry of the Interior and Kingdom Relations, is studying whether the furniture and carpeting of a number of meeting spaces can be purchased in a circular fashion. Together with market parties, the ministries are experimenting to determine how circular purchasing can best be shaped. The intention is for the products to be actually returned to the chain again after use and not be disposed of as waste. Source: Prummel, Ministry of the Interior and Kingdom Relations.

### **“RAU and Philips launch ‘Pay per lux’**

In the new service concept ‘Pay per lux’, the user pays only for the actual quantity of light consumed. Philips is the main contractor in this concept, which means that both the installation of the lighting and the energy bill are paid by Philips. The manufacturer retains ownership of the products. [...] At the end of the contract period, Philips returns the lighting products to the production process and reuses the raw materials. This reduces unnecessary waste and optimises recycling, according to the parties involved. [...] The amount of light is geared to the work activities in a particular area. Smart energy meters of Philips register energy consumption and offer insight into the consumption per room. As a result, it becomes possible to consume energy more efficiently.” (Architectenweb.nl, 2011)

- Strengthen the knowledge infrastructure regarding the circular economy, both through the training of future knowledge workers and a knowledge centre of international esteem.
-

### **“The Community of Practice Circular Economy**

Since the autumn of 2012, MVO Nederland has set up a Community of Practice Circular Economy in conjunction with a number of partners. In this community, professionals from the business sector work together to explore this partially new field and assess the opportunities it presents as well as ways to capitalise on these opportunities. A network to structurally and thoroughly achieve the shift to a circular manner of thinking and working. Each group (fifteen to twenty participants) brings together participants from different industries and sectors, of different sizes and with different market focuses. Insights are enriched through other sectors and positions in the value chain: designers engage with waste processors, business developers with financiers and buyers with MVO managers. Through co-creation, added value is generated for all parties involved. This also offers opportunities for (cross-sectoral) partnerships. In a series of six meetings, the participants explore the opportunities to make processes, services and/or products within their organisation circular. They are looking into the possibilities of launching a pilot and further expanding this. During each meeting, they have the option of bringing along a colleague, customer or supplier to generate both sufficient support and input.” (MVO Nederland, 2013c)

## **2.2 Challenge: logistics as an enabler of the circular economy**

At various levels, the circular economy brings with it numerous changes which impact on logistics concepts.

### *Global: shift to near-sourcing*

A number of factors are in play as regards the trend towards near-sourcing. One of these is the fact that both companies (business-to-business, appendix: Glossary) and consumers - especially in the high-tech sector – are increasingly becoming consumers of services rather than buyers of products. Resources are becoming scarce and manufacturers would like to retain control of these commodities.

“In 2007, leasing constructions accounted for 2% of solar panel sales in California. In 2011, this percentage rose to 33%. The company owns, insures and maintains the solar panels and the homeowner pays a monthly fee over a twenty-year period (Korosec, 2012). In Europe, this doubly sustainable concept of solar panel leasing has not really caught on yet, but could be on the verge of gaining wide acceptance.” (Merkies, 2012)

If manufacturers become service providers, control over and management of the supply chain are highly relevant. During the lifetime of the product, users pay for the performance of the product. Service logistics is of great importance in that respect. Ultimately, the product is returned to the manufacturer to be reused. In the past, labour costs resulted in a shift in production to low-wage countries, but nowadays the entire chain costs are becoming more and more important: the second cause of near-sourcing. Factors of relevance in this respect are energy costs, transport costs, necessary technical skills, delivery times and environmental impact (Manyika et al., 2012). In the United States, this trend has already become clearly noticeable: in the past two years, various production facilities have already returned to the country.

Thirdly, there are the global shifts in geopolitical and economic power, as a result of which regions want to become increasingly self-sufficient.

A final factor is the demand of consumers for products which are more and more customer-specific. This makes it more attractive for manufacturers to organise their production and assembly activities regionally: close to the market. Rising transportation costs and levelling production costs, among other things through ongoing mechanisation and a levelling in labour costs, contribute to this. Less and less products for Europe are produced in Asia, and more and more are assembled or customised in Central or Eastern Europe (Broek et al., 2010). The Council expects that near-sourcing will increase all over the world. Depending on the sector, a company no longer manufactures products for the European market in China, but in Europe. Or no longer in the Netherlands, but elsewhere in Europe. The production location is determined by the cost-benefit analysis of the entire supply chain. Depending on the product and the total supply chain costs, supply chains emerge at the global, regional, national or local level (Manyika et al., 2012). This could for example mean that the primary production of smartphones may initially occur in China, but that those upgraded versions for the European market are produced within Europe.

#### **“Restore the Made in America label**

Yes, in an ideal world we manufacture in the region where we sell. Doing so does not only eliminate the costs involved in offshoring, but also allows one to benefit from the proximity of the consumer: it is easier to gear one's production to their needs.” (Van Grunsven, 2012)

#### **“Welcome home**

“Ideally”, said Jack Welch in 1998, when he was chief executive of General Electric, “you'd have every plant you own on a barge to move with currencies and changes in the economy.” Reality followed vision for Mr Welch, who was a pioneer of offshoring, setting up one of the first offshore service centres in Gurgaon on the outskirts of Delhi. GE's line has now reversed. Jeff Immelt, Mr Welch's successor, calls outsourcing “yesterday's model”.

He has returned production of fridges, washing machines and heaters from China back to Kentucky. Having shipped much of its IT work outside America, the conglomerate is now shifting it back and taking on hundreds of IT engineers at a new centre in Michigan. [...] In a survey of big American manufacturers by the Boston Consulting Group last spring, nearly two-fifths of firms said they were either planning to move or thinking about moving production facilities from China back home. Next month America will start making mass-market personal computers again when Lenovo, a Chinese giant, relaunches production of IBM ThinkPad notebooks and desktop PCs in North Carolina. Foxconn, a Taiwanese firm which makes a large share of the world's electronic gadgets, now says it will expand in America. General Motors plans to shift almost all its IT (much of which had also gone to India) back home to Detroit. These days the main reason why companies want to expand their presence overseas is to be close to consumers in fast-growing new markets, not to exploit low wages as part of an offshoring strategy." (The Economist, 2013)

The emergence of a circular economy means that the market for products also becomes the main source of raw materials and components for new products. Whether the intercontinental flows will partially need to be replaced by regional flows, such as short-sea flows (appendix: Glossary), needs to be studied in more detail. It is expected that some primary commodities will more frequently undergo some form of initial processing in the country of origin. Think of the refinery of oil in Saudi Arabia, for example, or a bio refinery plant for palm oil in Malaysia.

#### *National: transit function changes*

Currently, many products from abroad are moved to the European hinterland or elsewhere in the world through the Netherlands and vice versa. About 15% of incoming volumes, approximately 93 million tonnes of cargo, are transported onward by air, sea or land without further treatment (Savelberg et al., 2012). For the logistics activities in the Netherlands and for the connectivity of international shippers established in the Netherlands, this transit function is of interest (Kuipers et al., 2003), although this is changing. The European Commission for example wants biofuels (appendix: Glossary) to account for 10% of the total consumption of petrol and diesel by 2020 (Europese Unie, 2009). It is highly probable that this percentage can only be achieved by producing biofuels in countries in Central and Eastern Europe. These areas still have plenty of room to accommodate agricultural activities, average to high crop yields and the costs of land and labour are relatively low (Dornburg, 2004). Such a development could have major implications for cargo flows within Europe. But the circular economy too can have an impact on the volumes of transit cargo. Through near-sourcing, reuse and recycling, volumes and/or cargo types will change. Ports in southern Europe are developing as well and transport by sea from

Shanghai to Vladivostok and then by rail on the Trans-Siberian railway to Russia is also emerging as an option. This route is 11,100 kilometres long. It takes only fifteen days, currently still with the inevitable technical and administrative obstacles; over time, these however are expected to disappear. By sea, it takes a container 35 days to bridge the 19,000-kilometre distance between Shanghai and Rotterdam. From there, another 2,500 kilometres still need to be covered by land to Moscow (Lofvers, 2012). The Netherlands will remain a major logistics player, but foreign competitors are also evolving and are trying to equal or even surpass Dutch logistics. Currently, the Dutch logistics hubs distinguish themselves through, among other things, their situation on water which can accommodate deep draughts, good hinterland connections, quality and efficiency. Whether these factors will suffice to retain the current lead in the future remains to be seen.

*Local: increase in traffic movements*

The number of regional and local movements does not only increase due to near-sourcing, but also because of the growth of e-commerce, reverse logistics, service logistics and home care logistics (appendix: Glossary). More and more consumers are shopping online and want to have their order delivered at home or pick it up at a pre-designated collection point. This may mean that the one shopping trip per week will be replaced by deliveries by individual suppliers. However, more is involved than just customer-retail movements. The development towards a circular economy also means a growing demand for reverse logistics and service logistics. Will every consumer or company autonomously arrange reverse logistics or are partnerships possible? The same question applies to service logistics. The growing need for care (for the elderly) brings with it its own logistics as well: home care logistics. The government wants elderly and sick people to increasingly live at home for longer periods of time. As a result, care is not dispensed at one central location but at many different locations instead. Therefore, the number of traffic movements increases.

Not only will the amount of traffic movements change, but also the function of stores. Shops in inner city areas are functioning less and less as locations where products are waiting to be purchased by consumers. Instead, they are becoming locations where consumers can 'experience' the products. The products which are bought or leased are increasingly either home delivered or picked up from collection centres.



Near-sourcing and potential changes in the transit function make it necessary to re-evaluate the competitive position of the Netherlands in terms of logistics. The sharp increase in regional and local streams anticipated by the Council will result in more congestion and emissions. The challenge for the logistics sector here is to minimise the negative impact this has on liveability or even to prevent traffic movements. Given the limited space and relatively high costs involved, major infrastructural changes cannot be expected. Therefore, things must be done more effectively and efficiently: better use must be made of already existing possibilities, realising innovations in supply chains and network logistics and making use of digital possibilities. Towards a circular economy, the Council proposes instruments to make Dutch logistics 'designed to last'. These are addressed in the five following sub-paragraphs.

### **2.2.1 Devise a programme with Rotterdam as the circular hub of Europe**

As mentioned earlier, the transit function of the Netherlands is increasingly facing competition and will be affected by the circular economy. The societal significance of mainports (appendix: Glossary) such as Rotterdam and the different types of 'valleys' (maintenance valley, food valley, horticultural valley, health valley) comes down to the ability to retain logistics functions in this competitive struggle. The circular economy offers opportunities for this, for example in the form of return flows, recycling, service flows, production and the use of new, biodegradable raw materials and the supply of raw materials for spare parts for 3D printing (appendix: Glossary). Existing or new logistics centres can capitalise on these opportunities, but mainports can also fulfil these new functions. Rotterdam can play an important role in this (Havenbedrijf Rotterdam & Rabobank, 2012), but locations for such activities can also be selected elsewhere in the country. The Dutch government must play an active role in the development of these functions to stimulate the circular economy in the Netherlands.

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*The aforementioned leads to advice 3 to the State:*

- Together with the stakeholders, study the impact of the circular economy on the type and quantity of goods entering and leaving Europe via the port of Rotterdam.
  - Develop a programme with all stakeholders which explores and further develops the possibilities of Rotterdam as the circular hub of Europe.
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### 2.2.2 Use innovative tendering for city logistics

Service logistics and reverse logistics will play a major role in the circular economy. Problems are arising in the cities due to the increase in logistics movements. At present, numerous delivery services which are often poorly loaded already drive through residential areas to deliver products which were ordered online. In addition, they often come in vain as the recipient turns out to not be at home. This flow to residential areas is increasing, also due to products which are returned or need to be repaired or the supply of raw materials for 3D printers of consumers. The distribution in the urban areas is complex. In addition to consumer-bound flows, there are also flows aimed at supplying shops and other locations such as building sites, healthcare facilities, educational institutions, offices and businesses. The result is a large number of different, potentially difficult-to-combine and inefficient flows.

“E-commerce has a substantial impact on municipalities. Peter Colon, managing partner at BCI, [...] “We have calculated that a city of 100,000 inhabitants will be processing an additional 1,500 to 2,000 vehicles per day in the coming years. The increase in delivery vans is already clearly noticeable right now. This could especially become an issue in city centres.” (Buck Consultants International, 2013)

The current solutions which should streamline these flows are very diverse: business-to-business concepts (such as Green City Distribution, Binnenstadservice, Cargohopper), business-to-consumer (such as PostNL, DHL, appendix: Glossary) and service logistics. Each city develops its own concept, which leads to confusion among shippers and transporters. The current last mile concepts (appendix: Glossary) are often linear and in the opinion of the Council city logistics need to be designed in a manner that allows for more sustainable management.

#### **“53 Flemish cities and municipalities and 5 department store chains are working together with the Flemish Minister Crevits on quiet and sustainable urban distribution**

53 cities and municipalities in Flanders are participating in a project aimed at urban distribution by the Flemish Minister for Mobility and Public Works Hilde Crevits. The project focuses on the quiet and sustainable unloading and loading of cargo in cities and municipalities early in the morning and late in the evening. Attention is also paid to improved cooperation and dialogue as regards global issues relating to cargo transport in cities and municipalities. Five distribution companies are also participating: in addition to Colruyt and Delhaize, these are Albert Heijn, Carrefour and Lidl.

Together, they represent almost 80% of the food market. According to an initial pilot project in nine Flemish cities and municipalities, local residents, municipalities and distribution companies are positive about silent deliveries.” (Flanders Logistics, 2013a)

### Projects at Dinalog

“In the project 4C4D: City distribution, retailers and transporters are developing smart concepts which they can use to consolidate and manage the supply of various shops, cargo flows and frequencies.” (Dinalog, 2010)

“Cargo hitching: Combining people and freight flows creates attractive business opportunities because the same transportation needs can be met with fewer vehicles and drivers. This can make socially desirable transport options economically viable in rural areas where the population is declining. In urban areas it reduces congestion and air pollution and facilitates the introduction of electric vehicles. This project will design integrated people and freight synchromodal transportation networks and the related coordination (4C), planning and scheduling policies to enable efficient and reliable delivery of both persons and small- to medium-sized freight volumes.” (Dinalog, 2012)

*The aforementioned leads to advice 4 to the State, provinces and municipalities:*

- Municipalities: Invite shippers to develop concepts for city logistics through innovative tendering (appendix: Glossary) and supply chain-transcending cooperation. Make sure the policy for city logistics is goal-oriented: the sustainable management of goods flows. Formulate clear end goals for a number of effects (including noise and air emissions, maximum number of transport movements, load factor for both inbound and outbound flows, service logistics, involvement of all stakeholders). Those formulating the policy must be able to demonstrate that these concepts meet the end objectives. Consider how digital tools can be helpful in this respect.

### “Smartest city’ in the world is in struggling Spain

Santander in Northern Spain is the world’s first ‘smart city’. Twelve thousand fixed sensors (plus an unknown number of mobile ones) measure everything there is to measure and directly relay this data to a central location. The city has been fully digitised and according to Mayor Iñigo de la Serna this is “not an option but a pre-requisite for all other major cities in the future.” [...] Muñoz had ten thousand sensors installed in the centre of Santander (but also in taxis, buses and police cars) and offers all residents of the city the opportunity to become ‘human sensors’ through the use of a smartphone application. Anything and everything is measured, including light, air pressure,

temperature, humidity levels and the continuous flow of cars and people. Every few minutes, the sensors send their data to the headquarters at the university, where it is analysed and prepared for interpretation. This enables the city to access real-time information about the city. Any information is available, from environmental issues to traffic jams, crowded parking lots, defective lights and water shortages in the park.” (Express.be, 2013)

- Provinces / State: Ensure consistency between municipalities. State: make administrative agreements with local governments on the harmonisation of the local goal-oriented regulations.
- Municipalities: Incorporate logistical challenges such as urban distribution in local spatial plans. This will make visible specific loading and unloading areas, signage for sustainable urban transport and urban Intelligent Transport systems (ITS, appendix: Glossary).

### 2.2.3 Use regional agendas to take stock of logistical challenges

To allow parties to make use of one another’s residual flows and the clustering of flows within the circular economy, insight into the logistics flows is important. Often, the logistics challenges in an area are still unclear, as are the size and nature of the cargo flows in an area.

#### “Business sector Overijssel asks province for vision logistics

Logistics warrants a more prominent position on the provincial agenda. Freight transport is one of the cornerstones of the entire regional economy and therefore of paramount importance to the growth and development of the economy of Overijssel. Currently there is no univocal vision as to which (longer term) vision the provincial government aims to pursue in this field. Correlation is hardly present between regional logistics visions, between provincial policy focal points and between (cargo transport/infrastructure) projects.” (SER Overijssel, 2013)

A regional agenda specifies the challenges formulated by the national and regional government as regards such aspects as infrastructure, the construction of housing and nature. The Council advises that the regional agenda also be used to offer insight into the logistics challenges in an area.

It is the task of the national government to designate logistics hubs and corridors. The core network<sup>2</sup> (appendix: Glossary) can play an important role in that respect. Striking about the roads in the core network is that the underlying road network (provincial and municipal) is seen as an important production factor by many companies.

The regional agenda encourages various parties to consider possibilities for collectively addressing logistics challenges in the area. The State is working on making its own goods logistics more sustainable. This does not only relate to sustainable transport, but also to closing the supply chains. To this extent, the Directorate-General for Organisation and Management of the Central Government (Directoraat-Generaal Organisatie en Bedrijfsvoering Rijk, DGOBR) is preparing an advice by order of the Interdepartmental Committee on Facilities and Housing (Interdepartementale Commissie Faciliteiten en Huisvesting, ICFH) which contains a number of concrete recommendations. In that context, the State in its capacity as a 'major client' can stimulate the joint transport of goods by drawing up service level agreements (SLAs, appendix: Glossary).

The Directorate-General for Public Works and Water Management (Rijkswaterstaat, RWS) is a major client in the construction sector; by focusing on sustainability when putting projects out to tender, it can challenge the market to make construction logistics more sustainable. For its own projects, RWS has drafted a first version of a so-called EMVI criterion (Economically Most Advantageous Tender) 'construction logistics', which can be used in tendering procedures. Such an approach is only effective if several clients in a region adopt the same approach and if the market experiences the right incentives through this EMVI. Rijkswaterstaat wants to bring parties together to jointly work on the tendering criteria and to explore the shape a common region-oriented approach with other clients (such as ProRail, Schiphol, NS and local governments) might take. In the market (also including the construction sector), there is more and more interest in improving supply chains. With the help of Bouwend Nederland, a group of companies has emerged which lead the way in terms of more sustainable and efficient supply chains. RWS are examining how they can support this. Source: Versteeg, Rijkswaterstaat.

2 The core network as determined by the various stakeholders which contains all modes of transport is a network of physical infrastructure comprising high-quality connections and hubs with a distinction between the importance to international flows and the importance to national flows. The core network is leading in terms of investments by national and regional government bodies in infrastructure and in hubs, as for example is the case with the reprioritisation of the MIRT (Multi-Year Plan for Infrastructure, Spatial Planning and Transport) (Topteam Logistiek, 2011).

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*The aforementioned leads to advice 5 to government bodies:*

- State/provinces: Use the regional agenda for offering insight into and achieving as much cooperation as possible on the logistics challenges in an area, in addition to the spatial, environmental and infrastructural challenges.
  - State/provinces/municipalities: Recognise and reinforce the importance of the secondary road network as a production factor. In this respect, think of such aspects as safety, reliability, connectivity, traffic flow and interaction with the primary road network.
  - State/provinces/municipalities: Stimulate the collective transport of cargo by using an SLA as a framework for agreements aimed at stimulating higher loading rates (appendix: Glossary) through joint transport if this can minimise the number of transport movements.
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#### **2.2.4 Eliminate barriers and organise a level playing field**

Within the concept of a circular economy, the logistics activities themselves need to be carried out as sustainably as possible. Due to the environmental impact, unnecessary and inefficient transport of goods has to be prevented wherever possible. Economic market rules, spatial rules for the use of infrastructure, environmental performance regulations and labour rules can conflict with one another and result in the unnecessary transport of goods. This for example is the case for the often divergent rules between municipalities as regards time slots (appendix: Glossary), weights and measures; as a result, logistics service providers (appendix: Glossary) are forced to supply cities during certain hours. This consequently limits their flexibility to compile optimum routes. Furthermore, the various different requirements make it impossible for them to optimise their fleets. At the local level, there are also differences in the way regulations pertaining to external safety are interpreted, especially in relation to the duty of accountability for societal risks. This causes confusion about which activities (transport of hazardous materials, production and storage) that require specific external security can be performed where (Van der Vlies, 2011).

Other examples are the international differences in tolls and kilometre-based levies, which sometimes cause companies to take detours to avoid extra costs. A lack of coordination between municipalities, but also within Europe, leads to inefficiencies, for example as regards long and heavy truck combinations (LZVs, appendix: Glossary); these for example are prohibited from driving in Germany. Different rail track standards within Europe lead to delays of trains on the borders with Russia and Spain. Varying standards of training for train drivers means they do not have the required qualifications to operate a train everywhere.

The current legislation is strongly prohibition-oriented. Effect-based control however is preferable and furthermore stimulates innovation. It is good to establish the function of a certain area (mainports, residential area, agro park,

industrial park, recreation, etc.) and the accompanying end goals in national policy to prevent each area or municipality from formulating separate maximum limits. Also set clear end dates, for example in terms of becoming CO<sub>2</sub> neutral. The EU has indicated that by 2030, CO<sub>2</sub> neutral logistics must be used within major cities. In this proposal, this means that logistics service providers decide for themselves how they plan to comply with these maximum limits. For example, a quiet, emission-friendly vehicle may enter the city at all times or also make use of bus lanes, even at night, provided the logistics follow-up activities such as loading and unloading are also carried out quietly.

#### **“Utrecht opens up bus lanes to clean trucks**

In conjunction with the business sector, the municipality of Utrecht has embarked on a pilot in which clean trucks are allowed to make use of bus lanes. The pilot will run for one year and is aimed at making the supplying of companies more efficient. By opening up the bus lanes, Utrecht furthermore aims to stimulate the use of environment-friendly freight transport by the business sector.” (Dijkhuizen, 2013)

The Council recommends making use of supervisory permits (box below, appendix: Glossary) at locations where companies are grouped together, the so-called spatial clusters or industrial parks. Here, the rule also applies that clear end goals stimulate innovation.

“The supervisory permit allocates the scarce environmental boundaries for an entire industrial estate. Consequently, it is possible to exercise control based on the full environmental impact. The current licensing system is based on individual licenses per installation, using reasonably available technology as the starting points. It sets no absolute maximums as regards emissions. Combined, the environmental impact for all installations in an area quickly exceeds the available environmental boundaries, especially when the traffic movements are taken into consideration as well. By determining the available environmental boundaries beforehand through a supervisory permit and next smartly filling this in, more industrial activity is possible.” (Van der Schot, 2011)

#### **“Schultz supports supervisory permit port**

Minister Schultz of Infrastructure welcomes a proposal of the Port of Rotterdam Authority to by means of trial issue a supervisory permit for the entire port or parts thereof. This according to CEO Hans Smits on Thursday during the Port congress. According to Smits, such a supervisory permit for ‘environmental use’ in the port area can save companies in the area tens of millions of euros a year. The idea is to assess whether the nuisance (noise, emissions) generated

by a company wishing to set up in the port stays within the limits of the supervisory permit. If so, then there is no need for individual companies to go through the entire licensing procedure again.” (Nieuwsblad Transport, 2013)

Furthermore, it is imperative that a level playing field (appendix: Glossary) is created, nationally but also within Europe. Not only in terms of emissions and the use of physical infrastructure, but also as regards legislation for the entire logistics chain (for example for imports and exports and safety policy during transport).

*The aforementioned leads to advice 6 to government bodies:*

- State / provinces / municipalities: Eliminate obstacles. Set phased general end goals for areas with a particular function regarding such aspects as air emissions, noise and maximum number of transport movements (for example through a minimum load factor). Ensure uniform legislation is in place between areas with the same function. Determine whether Regional Operational Services (Regionale uitvoeringsdiensten, RUD) or the implementation of the new Environment and Planning Act through an Order in Council with environmental quality standards can help in this. For logistics service providers who meet these end goals, no obstacles are in place such as time slots and environmental zoning. Make use of already existing knowledge on the privilege approach (see box below, Privilege Approach, CROW in samenwerking met Ambassadeur Stedelijke Distributie, 2011; Flanders Logistics, 2013b).

“In the framework of the Environment and Planning Act, the concrete norms shift as much as possible to the AMvB level (Order in Council). The Ministry of Infrastructure and the Environment (IenM) and VNG both consider it important to make the formulation of Orders in Council with environmental quality standards a priority and feel that these should come into effect in synch with the first module of the Environment and Planning Act as much as possible. IenM is willing to accelerate matters compared to its earlier resolutions. If possible, a basic protection standard is formulated per desired environment quality at the AMvB level; this also includes the presence of a range within which deviation will be possible. Per set of standards, it will be studied how these deviation possibilities will be further shaped. For example the possibilities of additional standards in the area plan and a deviation option for the competent authorities to grant an environmental permit.” (VNG & Ministerie van IenM, 2013)



### Privilege approach

In 2009, the Minister of Transport and Water Management appointed an Ambassador Urban Distribution to among other things make an inventory of problems surrounding urban distribution. One of the conclusions was that in addition to other measures, a national, uniform privilege approach is desirable for sustainable urban transport. Companies experience the differences between cities as a major bottleneck, while if anything they should be rewarded for being in the vanguard in terms of sustainable transport. Rewards can for example consist of granting access to bus lanes and better unloading areas, an extension of time slots or more flexibility for off-peak distribution. A pre-requisite for this is that clear requirements must be defined as to the allocation of privileges and the monitoring thereof. Having a short running time makes it possible to adjust policy based on impact assessments and the monitoring of technological progress, so that the privilege approach retains its stimulating effect. (CROW in samenwerking met Ambassadeur Stedelijke Distributie, 2011; Flanders Logistics, 2013b)

- Provinces / RUD: Use a supervisory permit for cluster areas, mainports or industrial estates.
- State: Arrange a level playing field at the national and European level for supply chains (take the initiative for this) and do so in consultation with the stakeholders. Points of consideration in this respect are:
  - access to the profession (professional competence, financial strength)
  - access to the market
  - social regulations (minimum age, driving and rest periods)
  - technical regulations (dimensions, maximum permissible masses, environmental standards, safety, certificates)
  - price policy
  - enforcement
  - support and fair competition policy
  - regulation and standardisation of, for example, new products and packaging.

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### 2.2.5 Stimulate technological innovations aimed at achieving environmental benefits

The aim of a circular economy is to minimise the emission of harmful substances as much as possible. One of the instruments to this extent is the internalisation (appendix: Glossary) of external costs: the party responsible pays the costs. External costs (appendix: Glossary) are costs relating to the entire supply chain which have a negative impact on others besides those directly involved in an economic activity. Examples include environmental costs (negative impact on climate, health, use of space) and social costs (negative impact related to child

labour, poor working conditions). By order of the Council, TNO (2012) has carried out a study on the effects of internalisation of external costs on goods flows. In that study, the Transport White Paper (Europese Commissie, 2011), which uses internalisation of external costs of road transport as a starting point, was used as the basis. In the alternatives which were developed, the main focus is on the external costs from other parts of the supply chain, such as production. The alternatives: internalisation at global, European or national level (the Netherlands as the first to internalise or the Netherlands as the only one to not internalise) appear to have little to no impact on the volume of trade flows of chemicals, high-tech and agrifood. In all four of the alternatives studied, the position of the port of Rotterdam is maintained. The internalisation of external costs has only a slightly negative effect on the added value of the Dutch economy, even though differences between the sectors are present. The decrease in emissions compensates for the decrease in added value. The decrease in emissions is mainly attributable to the use of a different (cleaner) energy mix and lower consumption of fossil fuels. Furthermore, the quantity of respiratory substances (appendix: Glossary) is reduced. When these effects are weighed against each other, there is a slight positive effect on welfare in the Netherlands. Only in the scenario in which the Netherlands is the only party to not participate is there a slight negative effect. The results of the TNO study assume a fixed scenario. To consolidate the results, it is important that several scenarios are further fleshed out.

The study also shows that in the case of global internalisation of external costs, the CO<sub>2</sub> target - aimed at reducing CO<sub>2</sub> emissions by 30% by 2020 - is not achieved through the sole use of internalisation. In the basic alternative, the emissions are even 50% higher in 2040 than in 2012. In the global internalisation alternative, this increase remains limited to 10%, but that still means an increase rather than a decrease. Internalisation of external costs thus significantly contributes to reducing CO<sub>2</sub> emissions, but more instruments are required in order to achieve the CO<sub>2</sub> target.

In addition to the CO<sub>2</sub> target, other targets aimed at noise, air quality and safety are relevant as well. A set of instruments is needed to meet the environmental targets. Most environmental gains can be achieved through technological innovations. Of the energy gains of 38% which are to be achieved in the global supply chain, more than half is attributable to technological innovations (Alicke & Meyer, 2011). Other instruments such as increasing the density value (appendix: Glossary) by no longer transporting air and water, shortening transport distances or making optimum use of the different modes of transport yield fewer environmental benefits (under 5%) than technological innovations. Important technological innovations include making engines more economical and/or improving aerodynamics. The automotive sector in the Netherlands can play a pioneering role in this respect.

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*The aforementioned leads to advice 7 to the State:*

- Expand the study into the internalisation of external costs (for example to other sectors, sensitivity analysis for CO<sub>2</sub> prices and the discount rate, other scenarios). Promote the conduct of analyses into the internalisation of external costs within an EU context. Use these results to discuss the use of internalisation of external costs as one of the instruments to achieve environmental goals.
  - Stimulate the implementation and acceptance of new technologies through tax measures which reward ‘good behaviour’ by consumers (e.g. driving style) and companies (think of the blind spot mirror on trucks).<sup>3</sup>
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#### **“China and the Netherlands to study alternatives for road pricing**

Utrecht University and the University of Beijing together will study whether a system of ‘Tradable driving rights’ may constitute a viable alternative to road pricing. It is one of the projects which will be carried out as part of a NWO research programme in the field of traffic and transport.

The system of ‘Tradable driving rights’ means that a limited number of car kilometres are available in a region. In such regions, it is not permitted to drive more kilometres. The rights to the kilometres are tradable; as a result, the price for the motorist varies according to demand. The system was already mentioned in 1997 by Eric Verhoef of the VU Amsterdam, but was never actually implemented in practice anywhere.

In total, seven projects relating to Operations Research in Urban Transport were honoured within the China-Netherlands programme in question of the Dutch National Science Foundation. In the Netherlands, the universities of Utrecht, Eindhoven, Amsterdam and Delft are involved. Other topics include traffic control in networks and network management in the cases of incidents.” (Verkeersnet.nl, 2013)

<sup>3</sup> Also see the advice of the Council for the Environment and Infrastructure regarding sustainable behavioural patterns which is expected at the end of 2013.



# RECOMMENDATIONS TO THE BUSINESS SECTOR: MOVE FROM 'DESIGNED FOR DUMP' TO 'DESIGNED TO LAST'

# 3

## **3.1 Recommendation to all sectors: Move from link to integrated chains**

The Council for the Environment and Infrastructure is an independent advisory body to the government and parliament. This advice on logistics was drawn up at the request of the Minister of Infrastructure and the Environment.

Given the fact that the realisation of the circular economy will mainly need to be initiated by the sectors themselves, the Council has decided to also include various recommendations to the business sector in addition to the advice to the government bodies.

Companies are increasingly moving towards a circular economy. Not only the fact that natural resources are becoming more scarce and expensive makes it important to close the supply chains. More and more, consumers are also requesting sustainable products. Waste is no longer waste, but a source of useful materials. The development of circular economy-oriented production and service concepts is increasingly becoming the strategy for companies to survive in highly competitive markets.

**“Hardly any copper particle is lost anymore**

Prognoses suggest that copper stocks will be depleted within 25 years. However, Sjoerd Helmer of Elemetal cannot imagine a world without copper. At the Innovation Relay (Innovatie-estafette) Helmer won the powerpitch and was awarded a baton. His innovation enables the separation of copper from domestic waste. Our waste is incinerated in waste energy plants. The ashes which remain contain copper residues. The coarse fraction is separated mechanically into, among other things, a non-ferrous metal mix. The innovation of Elemetal removes copper from the remaining fraction ashes and returns the copper again to the commodities cycle in its pure form. As a result, hardly any copper is lost.” (Helmer, 2011)

**“Ruud Sondag (former CEO Van Gansewinkel): “The circular economy is coming!”**

That is why the aim of Van Gansewinkel is to close supply chains. We supply plastics to Philips for the Senseo coffee machine. Not virgin material, but raw materials that we retrieve from old Philips products. For Auping, we collect old mattresses, recycle them and return the resources to Auping again. We have a similar system in place for Luxaflex.” (Sondag, 2013)

For all sectors, it is essential that the entire chain be considered rather than all the separate links. One single link, company, in the supply chain can optimise its own production process, but all these individual link optimisations do not necessarily result in optimisation of the entire supply chain, and the greatest added value for consumers and society. In the context of the circular economy, it is important to look at all the resources that go into the supply chain and the emissions this generates. One example is the idea to already remove the water from milk at the dairy farm, which results in less traffic movements from the farm. During processing in the chain, water however is needed again (the same by the way applies to fruit juices and beets, where the pulp and water are separated). In these cases, it is important to assess whether a reduction in the number of transport movements from the farm outweighs the energy it takes to add the water again. After all, what matters is the overall balance of incoming and outgoing resources.

Another factor of relevance is the functional lifespan of a product. The intention is to use, reuse and recycle products as long as possible. Systematically tracking whether the product needs innovative adjustments regarding sustainability (for example classic cars which are not sustainable in terms of emissions) is relevant as well. From the point of view of reuse, products must be standardised as much as possible. After all, this makes reusing, exchanging or combining with other products far easier. Consequently, the options for continuous development towards products which can be used with the greatest possible degree of flexibility are increased. The development of raw materials passports also helps in the reuse and exchange of residuals.

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*The aforementioned leads to recommendation 1 to the business sector:*

- Develop integrated supply chains for the complete lifecycle of each product, so also after a product has been sold or a service has been provided to a customer and also for the phase after the customer disposes of the product again. Start with the product design. Position components in such a manner that makes it easy to carry out repairs and reuse materials. Companies that have control over the full lifecycle and for example also retain ownership of the product during its entire lifecycle can help shape the circular economy. Focus on maximum durability, minimal maintenance, maximum recyclability, as much continuous development of products as possible, for example through standardisation, and a positive environmental balance i.e. a very small footprint (appendix: Glossary). Develop a marketing method that stimulates behavioural changes among consumers: product, service, usage and return must be in line with one another.

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What can the logistics sector do itself to make this development towards a circular economy possible? It can focus on further expanding return and service logistics. Furthermore, it is important that the logistics sector itself also commits to sustainability (people, planet, profit) as much as possible. Some ways to achieve this are:

- minimising the number of kilometres
- consolidating goods flows as much as possible
- using environmentally friendly modes of transport (including loading and unloading).

The strength of logistics lies not in optimising the quantity of transported tonnes per kilometre, but in the value (people, planet, profit) that is added per kilometre of transported goods. The need for return and service logistics is only increasing.

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*The aforementioned leads to recommendation 2 to the business sector:*

- Shorten (international) supply chains as much as possible through:
    - exchange of semi-products and residuals to minimise transport
    - maximum clustering of related production facilities
    - use of specific connections between production facilities, especially for hazardous and environmentally sensitive products through pipelines, inland shipping, shortsea, rail and road
    - optimal utilisation of digital opportunities
    - optimal collective utilisation of available infrastructure such as (tank) storage, quays, jetties, distribution centres and storage and transshipment terminals.
  - Consolidate flows as much as possible through system solutions and also consider new organisational structures in that respect:
    - organisations that facilitate horizontal cooperation
    - partnerships between retailers on the same street
    - cooperation between downtown retailers by sector or product
    - cooperation between transport companies.
  - Explore and further develop the initiatives in this field in conjunction with all the stakeholders. Fair redistribution of profits and losses among the various participating parties is a major focal point. Trust is also an important factor (Ruijgrok, 2012). Digitisation is one of the tools available to shape partnerships. The NLIP (Neutral Logistics Information Platform) can play an important role in this.
  - Combine as many flows as possible (think of supply, distribution, return and service).
- 

#### **“Four FMCG<sup>4</sup> -manufacturers consolidate cargo flows**

HJ Heinz, FrieslandCampina, SCA Hygiene Products and Hero Benelux will from now on collectively have their goods flows to retailers and the ‘food service channel’ transported by logistics service provider Nabuurs. The supply chain concept that underlies this was jointly developed by the parties.” (Van Roosmalen, 2012)

#### **Greenport Logistics (GPL)**

De Winter Logistics (DWL), Van Es Logistics, Van der Helm Logistics, Mercuur Smart Logistics, Schiffer GmbH and Greenport Logistics GmbH are cooperating in Greenport Logistics. As leader of this initiative, DWL together with the partners in GPL built up a nationwide logistics network around the Greenport a number of years ago. Greenport Logistics among other things focuses on

4 As a classification, Fast Moving Consumer Goods (FMCG) relates to a wide range of frequently sold consumer goods such as food, toiletries, soap, cosmetics, dental care products, shaving materials, detergents and other non-durable goods such as glassware, bulbs, batteries and disposable plastic products for everyday use. Given the length of the term, the abbreviation FMCG is commonly used (Wikipedia, 2013a).



increased cooperation in transport based on divisibility, need and trust. By sharing the common physical transport capacity used for the connections between the various Greenports, the logistical range can be increased and the transport of empty space can be minimised; this also corresponds with the ultimate goal of the consolidation hubs as envisaged by the Commissie van Laarhoven. Factually, Greenport Logistics is establishing a scheduled service between the hubs. The participating companies have set up the virtual network in such a manner that other logistics companies with hubs that are interesting from a market-technical perspective are also able to participate later on. After all, this ultimately strengthens the competitiveness of Greenports and with that also the position of the participants in 'Greenport Logistics'. The network creates collection and distribution facilities in the Netherlands, Germany and Belgium that would not be feasible on an individual basis for the participants. A compulsory requirement is that all information must be shared between participating parties via a digital platform. Through supply chain management, it is possible to optimally bring together demand for transport, transport companies and modes of transport. The result is fuller trucks and the consolidation of smaller goods flows. More transport with fewer people and less equipment. With Greenport Logistics, they have a nationwide network at their disposal. Source: De Winter, De Winter Logistics.

### Reverse logistics Japan

Combining the reverse logistics of several companies can be quite profitable. In Japan, for example, the reverse logistics of all printers, cartridges and parts has been centrally organised; the manufacturers themselves can carry out recycling or remanufacturing again. Source: Smit, Océ-Technologies BV.

All kinds of barriers are present on the path towards a circular economy. Legislation aimed at combating irregularities can sometimes prevent innovation. Examples are the safety requirements for the local processing of biogas and the transport of hazardous substances, legislation making it difficult to reuse products (how to define waste, crossing barriers as to what is currently considered waste), but also the Consumer & Market Authority (formerly Dutch Competition Authority) which sometimes erects barriers for the cooperation between companies from a free market perspective.

Besides legal obstacles, there are also so-called perverse incentives. One example of this is the overcapacity of one million tonnes per year at incinerators (Verbeek, 2012), which often makes it cheaper to incinerate waste rather than incorporate it in the supply chains again. Another example is the energy levy which decreases as more energy is consumed. (Wijffels, 2012). Or the inability to process waste from the restaurant and catering sector into animal feed, which makes it necessary to import substantial flows of soy. But agricultural subsidies, which sometimes result in food surpluses, can also be considered perverse incentives.

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*The aforementioned leads to recommendation 3 to the business sector:*

- Point out obstacles and ambiguities in legislation to the government as well as perverse incentives that hinder the closing of supply chains. In close consultation, determine the possibilities and innovations for removing these barriers and improving the incentives. Assess whether it is necessary to combine the various existing hotlines in this field so that it becomes easier to substantiate removal of barriers with the government.
- 

### 3.2 Recommendations to the high-tech sector: Move from product to service

The high-tech sector uses substantial quantities of scarce resources. Think of indium, which is used in touch screens, LCD displays and solar panels, for example. There are new sectors of industry that cater to the recycling of these scarce resources:

Urban mining (appendix: Glossary), the city as a mining area, is a collective term for all forms of recovery of valuable resources from domestic waste and sewage. This industry, mainly instigated by the waste processing industry, aims to anticipate the recovery of scarce resources. The concept could generate significant revenues if it is further expanded. Again, waste legislation and price setting should not constitute obstacles for this (Wijffels, 2012). The consumer too sees the importance of retaining products in the supply chain for longer by repairing them; the throw-away mentality is disappearing. In many locations, citizens' initiatives such as the Repair Cafés are emerging. A Repair Café is a free gathering where residents take their broken goods to repair them with the assistance of experts which are present. But also the emergence of thrift stores, eBay, Markplaats and LETS serve as confirmation of the changing mindset among citizens.

#### **"Repairs through Internet services**

Lenovo offers a tool for searching for spare parts on the Internet and provides manuals for repairs. Logitech has an online parts store. Another initiative is Fixya.com, an online community that provides people with tips and instructions to solve problems themselves. According to De Leeuw, there are three reasons why consumers are willing to repair products themselves: it is faster (no need to wait two weeks before a laptop is returned), it is cheaper and they feel confident they can perform the repairs themselves. According to De Leeuw, ordinary web shops cannot meet the need for DIY repairs; the flow of spare parts is too thin for that. He sees opportunities for parties willing to organise this, including the supply of spare parts." (De Leeuw, 2012)

### “LETS circles

LETS circles consist of people who trade and exchange services with each other. LETS (Local Exchange Trading System or Local Economic Trading System) are local, non-profit swap networks where goods and services can be exchanged without the need for money. LETS circles use tax-free, local forms of credit, so people do not have to trade there directly. A member of a LETS circle can for example earn credit looking after the child of one member and later spend it on a carpentry service performed by another member in the same LETS circle. The local LETS circle centrally registers credit earned and spent and this credit is visible to all members of the LETS circle. The members also determine the amount of credit necessary for specific goods and services.” (LETS, 2011 and Wikipedia, 2013b)

The high-tech industry itself also sees the value of using products for longer periods and is anticipating this by having consumers pay for the performance of the product and not for the product itself. In other words: they no longer offer a product but provide a service. Take the manufacturers of photocopiers for example. Their customers no longer buy machines, but pay a fee for each copy they make. The machine remains the property of the manufacturer.

High-tech manufacturers that provide services rather than products benefit from a circular economy. It allows them to reduce their costs by for example repairing broken parts and reusing them instead of throwing them away. This is because they are often able to revise and reuse ‘written-off’ products as usually only a couple of parts have reached the end of their lifecycle. If the service is terminated by the customer before the product has reached the end of its lifecycle, it can also be used elsewhere again. The principle of service provision also stimulates the manufacturer to focus on designing products with a long lifespan that require minimal maintenance and contain as many recyclable components as possible. The interaction with the customer becomes more important: the manufacturer wants to retain a lease contract for as long as possible. Service logistics becomes more important.

### “KPN introduces new subscription with PhoneLease

Telecom provider KPN has introduced a new subscription that is completely customisable. As is the case with mobile telephony providers Hi and Telfort, you will start leasing your telephone in this new subscription. KPN will launch the new KPN Mobile subscription on the 30th of July 2012. You can fully customise your subscription and determine how many call minutes, SMS messages and MB you wish to consume each month. You will also pay a fixed monthly fee for your telephone through PhoneLease, something which KPN daughters Hi and Telfort have already been doing for longer.” (Haenen, 2012)

### Lemnis Lighting

Lemnis Lighting develops and manufactures LED lamps for use on a large scale. One characteristic of LED bulbs is their long lifespan of thirty to forty years; longer than most people or companies stay in their respective houses or offices. Lemnis is therefore considering a model in which customers do not pay for the physical product ‘lamp’ but for the service ‘lighting’, for example through the electric utility. Concretely, this may mean that lamps remain in a building after a tenant moves out for the next inhabitants or that the service provider uses them elsewhere (VPRO, Tegenlicht, 2012).

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*The aforementioned leads to recommendation 4 to the high-tech sector:*

- Stimulate the return of products and the development of reverse logistics, among other things through centres where products are returned and reconditioned, repaired or recycled.
  - Stimulate resource pools for rare, recycled materials so that suppliers of these resources are rewarded for their efforts in the field of recycling.
  - Invest in 3D printing as a key technology and in Value Added Services (appendix: Glossary) in addition to service logistics in order to make parts available in the future without the need to have them in stock. Develop a business model to determine which components (e.g. rare, expensive, specific) are particularly suitable for 3D printing.
  - Invest in Research and Development (R&D), since the success of a circular economy starts with a product design that is fully geared to this (overhaul, repair, recycle).
  - Make smart use of innovative niche players to outsource or facilitate links in the supply chain, such as the urban mining industry, Repair Cafés and the ‘Maker Movement’ (see box on the next page).
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“What exactly does the Maker Movement entail? It is a broad term that covers a wide range of activities from traditional craftsmanship to high-tech electronics, which have often been around for many years. But the Makers are doing something new. Firstly, they use digital tools, design on the PC and are increasingly having their designs made by digital production equipment. Secondly, they are the Internet generation, so they obviously share their creations online. By transferring the Internet’s culture of cooperation to the process of making, they are building something together that is unprecedented in the world of DIY (Do-It-Yourself).

In short, the Maker Movement is characterised by three characteristics:

1. The use of digital tools to design new products and produce prototypes.
2. The standard to share those designs with one another and work together with others in online communities.
3. The use of standardised files, making it just as easy for everyone to have their designs manufactured by a commercial production company in the desired amount as locally on a 3D printer or other digital device.

This shortens the path from idea to entrepreneurship, similar to the role of the Internet as regards the dissemination of software, information and content.” (Anderson, 2012)

#### “Patents taboo for high-tech from the Betuwe

At Ultimaker, everyone is welcome – even encouraged – at the R&D department. All software codes and building plans are available online. Whoever feels like it is welcome to think along and make improvements. This manner of innovation is known as open source. [...] According to Ultimaker, open source fits in perfectly with a sound business plan because this method of innovating yields products which perfectly meet the needs of users.” (De Jong, 2013)

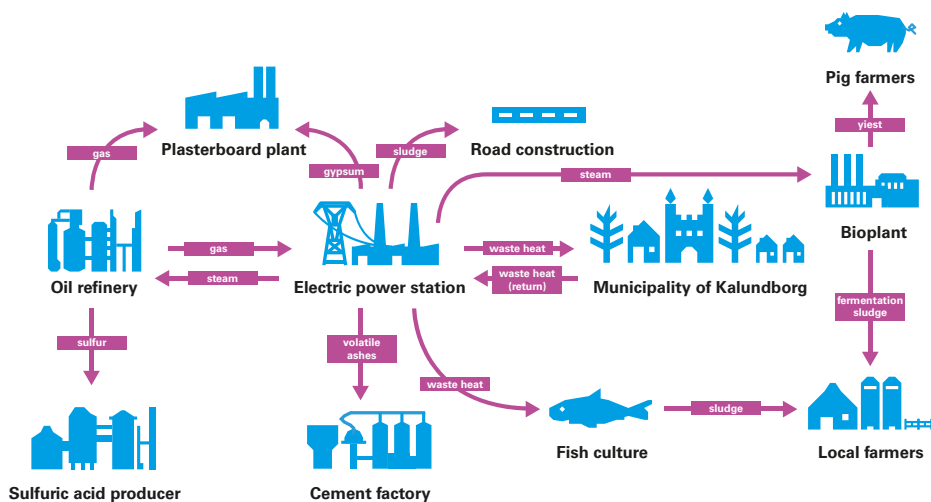
### 3.3 Recommendations to the chemical industry: Move from stand-alone to networks

For the chemical industry, the circular economy constitutes a means to reduce the use of raw materials in order to facilitate the transition to incorporating a larger share of raw materials which are more environment-friendly and minimise the negative effects of chemicals on the environment.

The chemical sector consists of several sub-sectors: fine chemistry (appendix: Glossary) comprises high-quality products which are customer-specific and made in small quantities. In bulk chemicals (appendix: Glossary), large quantities are produced and the specifications have a greater bandwidth.

At present, closing the supply chains for bulk chemicals mainly focuses on the exchange of residual flows. One party's waste may be another party's raw materials. Just as in nature, the waste from one organism is food for the other. The chemical industry needs to seek out more companies which together can form an 'industrial ecosystem'. A good example of this is Kalundborg in Denmark (Figure 2). At Kalundborg, steam, various raw materials (e.g. sulphur), fly ash and sludge are exchanged between companies. In the system, an oil refinery, a company producing plaster, a pharmaceutical company, a fish farm, a coal-fired power plant and the municipality are working together.

Figure 2: Industrial Ecosystem at Kalundborg, Denmark



Source: Peck, 1996.

### Example of exchanging residual flows: Huntsman in the Botlek area

At Huntsman in the Botlek area, polyurethane is produced using steam and electricity. The water which is released in the process is directed to Lucite for the production of acrylic fibres. This in turn generates steam that is fed back to Huntsman. Huntsman also supplies water, steam and electricity to Invista for the production of polymers. In total, 25 companies are part of the cluster surrounding Huntsman (VNCI-Deloitte, 2012).

A problem in terms of bulk chemicals is that this subsector is vulnerable to economic balances of power. The current practice is that bilateral trade agreements are made, especially by China, that globally hinder transparency and the open market economy (HCSS & TNO, 2011). The market is consequently not transparent and as a result it is often only known shortly in advance whether an order will actually be placed with all the consequences for logistics this entails.

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*The aforementioned leads to recommendation 5 to the chemical industry:*

- As the chemical sector, actively seek out companies that together can form an industrial ecosystem. Except in physical networks in production, in which a lot of exchange is already taking place (for example raw materials and steam, cooperation in the supply chain (appendix: Glossary) can still yield substantial benefits. Try to make the supply chain as transparent as possible, as this will allow the supply chain to be organised more efficiently. Make the government aware of the obstacles for a free trade environment that stand in the way of transparency in the supply chain.

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Production facilities for fine chemicals are increasingly operating according to the chemical leasing business (appendix: Glossary) model. In chemical leasing, the focus is not on selling as much volume as possible, but on ensuring the product is optimally efficient and effective. The manufacturer does not only supply chemical products to the customer, but also expertise for optimum use of the product. The manufacturer also processes the waste or residue. Rather than the quantity of active ingredients, the required quality or performance determines payment.

### “Chemical leasing

Cleansing objects before they are painted is important in the sector as it makes painting more effective and efficient. The use of solvents which are necessary for the cleansing still yields environmental pollution. Moreover, these substances are usually explosive, flammable and harmful to health. In Austria, a trial was initiated with chemical leasing (Chl) at a company that cleans materials which are to be painted in the car assembly sector. The solvent in question was a mixture of toluene, butane and ethanol and also contained trace amounts of water and heavy residues. The painting of cars caused emissions of volatile organic compounds and solvent waste. In the Chl project, the supplier of the solvent monitored the use of the chemical substance and the cleaning process. In addition, the supplier offered recommendations to optimise the process and use of the equipment. Afterwards, the supplier took back the solvent for reuse. More concretely, the supplier provided the technical information as regards the solvent and its application and the Material Safety Certificate, instructed the car assembly company (even better) in the use of the solvent, arranged the reuse and also supplied the solvent.

The economic benefits were a reduction in costs of 15% on raw materials used, a reduction of one-third in the amount of solvent used per car and no costs anymore for the removal of hazardous waste. The liability and benefits were shared by the supplier and the user.” (Scheppers, 2011)

The customers of chemical leasing are often small and medium-sized enterprises (SME). For them, the service provided is not the core business and is therefore often not organised in the most effective and efficient manner possible. In many cases, the activity has furthermore not been standardised and no criteria have been established for the process (Scheppers, 2011).

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*The aforementioned leads to recommendation 6 to the chemical industry:*

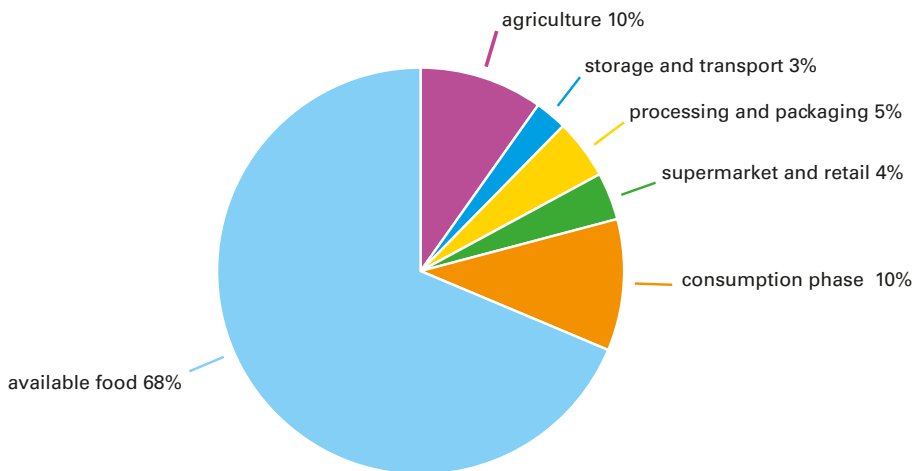
- Help SMEs to industrialise their non-core activities as much as possible: make the approach uniform, and the rules clear and consistent; standardise the desired result. In other words: define the desired performance. As a result, it will become even better possible to exercise control over the chain.
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### 3.4 Recommendations to the agrifood sector: Move from retail to consumers as pivot in the chain

The growth of the world population combined with the increase in wealth creates a growing demand for food. Globally, 1.3 billion tonnes of food is lost each year, more than a third of the total food production. In Europe too, a third of the total quantity of food produced, is involved. Figure 3 illustrates the percentage of waste in the different links of the food supply chain in Europe.

**Figure 3: Food waste in European countries throughout the entire supply chain**



Source: Gustavsson et al., 2011.

Waste occurs throughout all links in the supply chain and includes crop losses, losses during processing and transport, unsold products in supermarkets and the food and beverage industry and food discarded by consumers. On average, a Dutch person throws away 48 kilos of food a year. Reducing food wasted by consumers is high on the agenda of the government, industry and scientific sector (Westerhoven & Steenhuisen, 2012). The Ministry of Economic Affairs (EZ) wants to see a 20% reduction in food waste in the chain by 2015 (Tweede Kamer, 2011b).

But more is involved than just food waste: all residual flows are important in the circular economy. Thus, residual plant material can often still be processed into high-quality products. Fibres from tomato stems for example are suitable for use in the paper and cardboard industry, paprika residues can be used for animal feed and fruit and vegetable waste can be reused for pasta (Kenniscentrum Plantenstoffen, 2013).

The circular economy also offers advantages in this respect. Some examples (Ellen MacArthur Foundation, 2012):

- If the food thrown away by households in the UK were to be collected separately and reused for biogas plants or as nutrients for agricultural land, this would yield a new resource flow with a value of 1.5 billion USD.
- The reuse of grain residues from beer breweries yields these companies an additional revenue of 1.90 USD to 2.00 USD per hectolitre of beer.

Grain waste can be used as food for fish farmers or livestock companies.

To actualise the potential of the circular economy as regards consumer products, we need more efficient collection systems and better combinations of food and packaging; we also need to put a lot more emphasis on reuse (Ellen MacArthur Foundation, 2012).

### **“The Plant**

‘The Plant’ in Chicago is a good example where the discarded materials from one business are used as a resource for another — industrial symbiosis. This vertical farm and food incubator plans to house artisan food businesses, including a beer brewery, bakery, kombucha (fermented tea) brewery, mushroom farm, and a shared kitchen. The spent grains from the brewery are fed to tilapia fish, while solids from the tilapia waste are fed to the mushrooms.” (Ellen MacArthur Foundation, 2013a)

Furthermore, much food is lost due to inefficiencies in the food supply chain and in the relationship between the different links. In addition to optimising the own link, the links themselves can also be better geared to one another. The effectiveness and efficiency of the food supply chain leaves a lot to be desired, including optimally adding value to secondary goods flows. Some important aspects in this respect are cost-margin distribution issues, the right incentives, transparency of the supply chain and control.

Technology can play a major role in this by allowing for even better insight into, for example, the origins and perishability of the product. This allows the links in the supply chain, but also the consumer, to make better use of the product. An example is the GS1 DataBar (barcode which must be visible at checkout, appendix: Glossary), which now also offers information as to the shelf life of a product (Timmermans, 2009).

### **“Pasteur: Combined RFID and sensor technology**

Pasteur is a project within the framework of the European cooperation platforms Catrena and PointOne. The objective is the development of an RFID-based sensor technology platform (radio frequency identification tag). The project consortium among others comprises NXP, Philips, IMEC and DSM. The application domain for the project is the food supply chain. Sensors that monitor the environmental conditions of perishable products in the supply chain between production and consumer will be built into the packaging. The Pasteur project thus responds to the need to improve the online knowledge and traceability of individual products as well as the ability to take better supply chain decisions based on this knowledge.” (Timmermans, 2009)

In addition to shifting the emphasis on the entire product life cycle instead of one single link in the supply chain, it is becoming increasingly important to know the requirements of the consumer. After all, the most inefficient link in the supply chain is the consumer. Retail organisations are already investing substantially in consumer relations, but they are continuously seeking possibilities for even better controlling the last part of the supply chain, from retail to consumer. Logistics service providers may be helpful in that respect. This is because it is expected that more and more agrifood products will also be delivered at home. Instruments such as direct sourcing (appendix: Glossary) and an extended supply chain (appendix: Glossary) can help in this. If the retailer is able to more accurately assess the needs of consumers, he is also able to better plan the products that need to be available on the shelves. This reduces wastage.

### **“Direct sourcing fruit**

The concept of direct sourcing is based on the principle that there is a direct connection between the consumer (via the retailer/outlet point) and the manufacturer of the product. The entire supply chain and services are geared to ensuring that products of the right quality which have been properly handled and sustainably produced are delivered to the outlet point as quickly as possible and with the right degree of ripeness. This demonstrably leads to significantly lower waste levels due to quality loss in the supply chain and on the shelves. The supply chain is fully transparent and information about such aspects as origin and race as well as growing, distribution and labour quality conditions are known. Communication and interaction with consumers about the values of the food are part of the direct sourcing concept.” (Timmermans, 2009)

### “Extended supply chain

The challenge for the industry is to offer consumers improved service levels by for example engaging in two-way dialogues with them. One way to achieve this is linking the home situation with the supply chain, for example through communication technology. Many logistics processes currently end at the cash register. From the point of view of the consumer, this is unjustified. The process steps that consumers go through before they actually consume the food are: planning, shopping, cooking and eating. These process steps can be seen as the extended supply chain. As soon as the traditional supply chain links up smoothly with the extended supply chain, it becomes mutually possible to strengthen insights; as a result of this, it for example becomes easier to prevent food waste. Food waste in the supply chain can be reduced because the wishes of consumers can be determined more easily. The concept of home resource planning (appendix: Glossary) is of relevance here to the same degree as ERP (enterprise resource planning) in the business sector. Once in contact with the consumer, attention can of course also be paid to wishes in terms of daily food. Eating, cooking, shopping. Information on health and ingredients are increasingly gaining in importance. This information could therefore be exchanged via the extended supply chain, but what this information should actually entail still warrants further study.” (Timmermans, 2009)

Consumers themselves can also do a lot about inefficiency by optimising their own behavioural patterns. For this, the Council refers to the advice on making behaviour more sustainable which is expected at the end of 2013.

“The report of the WUR on the relationship between expiration dates and waste concludes that most expiration date-related food waste occurs with fresh products (ten percent) and less with long-life products (five percent). The report indicates that in addition to the expiration date as a source of waste, bad purchase planning among consumers [...] can for example also result in food waste. [...] The consumer is an important source of waste. One reason is the confusion about the concept of two different expiration dates, namely ‘Best before’ (BB) and ‘Use by’ (UB).” (Tweede Kamer, 2013a)

Some retailers are working on minimising their ecological footprint. Tesco is one of the retailers which uses a plan of action to define the instruments needed by the company to reduce its footprint. For some products, they for example list the required CO<sub>2</sub> emission. Ahold is engaged in smart waste management and has thus managed to save a hundred million euros over the last three years (Stad, 2013).

“As one of the world’s leading retailers, we have a clear responsibility – and a significant opportunity – to protect our environment. Our aim is to create more sustainable ways of doing business. We are reducing our impact on the environment, including energy use and waste. We are working with our suppliers to manage resources more carefully in our supply chains: for example, reducing water usage or tackling deforestation. We are empowering our customers who, together, can have a positive impact on the environment that far outweighs our own, to create a mass movement in green consumption.” (Tesco, 2011)

*The aforementioned leads to recommendation 7 to the agrifood sector:*

- Logistics service providers: invest in tools to optimise the information link between retailer and consumer.

#### **“Bpost delivers groceries at home**

The postal service is trying to expand its activities. A pilot project is underway in Sint-Niklaas in which the mailman delivers your groceries to your home. The project is called “Bpost by appointment”. The service is not free, but is a welcome luxury for many families with a busy schedule.” (Nieuwsblad.be, 2012)

- Supplier and retailer: assume mandatory take-backs if a product remains unsold (think of magazine returns or, as mentioned in the box below, bread).
- Retailer: work towards optimum coordination of production and sales through technological innovations and a good exchange of sales data from the retailer with manufacturers.
- Entire sector: make clever use of innovative niche players (box below re: NCDO Award) to outsource or facilitate parts of the chain.

### **“Solution for food waste in supermarkets wins NCDO Award**

On the 1<sup>st</sup> of March, ‘Too Good to Waste’ won The Battle of the Cheetahs, a competition for creative solutions to global food issues. The winning initiative by eleven ‘young professionals’ combats the waste of food in supermarkets by processing fruit and vegetables which are close to their expiry date into juice and soup instead of throwing them away. Annually, Dutch supermarkets throw away 600 million euros worth of turnover in the form of non-sold food which has passed the date of expiry but is still fit for consumption. The idea to have this food collected just before the sell-by-date as a cheap source material by a food processing company instead of a waste disposal company won both the audience award and the jury award: a starting capital of 25,000 euros. The PLUS supermarket chain will be the first to test the concept in the form of a pilot.” (Uiennieuws.nl, 2012)

### **“FOOD Battle: You don’t throw out food**

The FOOD Battle, started in Lochem on the 8th of September 2012, is a collaboration between several supermarkets with the aim of reducing food waste. Wageningen UR Food & Biobased Research and waste management companies Circulus and Berkel Milieu with this are studying the effectiveness of the FOOD Battle programme. This programme is aimed at raising awareness as regards the extent of food waste and furthermore aims to provide consumers with tips to help them reduce food waste at home. Consumers can participate in three ways: by joining the FOOD Battle Game, keeping a food diary or by (collectively) organising an activity.” (Wageningen UR, 2012)

### **“In Australia the bread is taken back**

Unlike Europe, Australian bread manufacturers must take back any unsold bread from the supermarkets. This also applies to Goodman Fielder, one of the two large bread manufacturers in Australia. The challenge faced by logistics manager Greg Metcalfe is finding the right balance between empty shelves and large percentages of waste. At present, average bread returns amount to 18% with peaks of 0 and 40%. According to Metcalfe, it should be possible to reduce this to 10 or 12%. “Ideally, we would like one loaf of every kind of bread to be left over in every shop. This way, we know for sure there was no shortage.” (Te Lindert, 2004)



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# APPENDIX





# GLOSSARY

**3D printing** The manufacturing of products or parts which are built up layer by layer, mostly using a fine powder; layers of this powder are piled on top of each other so that a solid object emerges.

**Biofuel** A collective term for different types of fuels made from biomass, with the exception of fossil fuels which biofuels aim to replace.

**Biomass** The dry weight of organisms or parts thereof; this includes both plant and animal material. Think of products extracted from vegetable and animal raw (waste) materials, such as sugar cane, corn, rapeseed oil, palm oil and animal fats.

**Buffer stock** Additional stock kept to ensure continuity in delivery should demand increase or supply be hampered.

**Bulk chemistry** Mass production of chemicals such as plastics, solvents or fertilisers.

**Business-to-business** Transaction from company to company, for example involving a product or service.

**Business-to-consumer** Transaction from company to consumer, for example involving a product or service.

**Chemical leasing** Business model whereby a producer of chemicals leases products to a company. After use, the remaining material is taken back by the manufacturer and is reprocessed into usable substances again as much as possible.

**Circular economy** The circular economy is an economic system aimed at optimising the reusability of products, components and raw materials and minimising value destruction. The circulatory system consists of two cycles of materials: a biological cycle in which residual materials safely flow back into nature after a cascade of uses and a technical cycle in which product (parts) are designed and marketed in such a manner that they can be reused again at a qualitatively high level. As a result, the economic value is retained as much as possible. This means the system is technologically and economically 'restorative'.

**Core network** The core network, as determined by the various stakeholders and comprising all modes of transport, is a network with a physical infrastructure of

high-quality connections and hubs; a distinction is made between the importance of international flows and national flows in this respect. The core network is a determining factor in relation to investments by national and regional government bodies in infrastructure and hubs, such as the reprioritisation of the MIRT (Multi-Year Plan for Infrastructure, Spatial Planning and Transport) (Topsteam Logistiek, 2011).

**Cradle-to-cradle** Sustainability concept in which waste is no longer treated as waste but as a resource for new products. The phrase was first further developed in 2002 in the book 'Cradle to Cradle: Remaking the Way We Make Things' by William McDonough and Michael Braungart.

**DataBar** The DataBar is the new, standard barcode for points of sale which must be scannable at all cash registers in the food sector. This barcode, managed by branch organization GS1, is smaller and can hold more information such as an expiry date or a serial number.

**Density Value** Economic value of goods per volume unit.

**Direct sourcing** The purchase of products or raw materials without the intervention of wholesale or retail.

**Extended supply chain** The extended logistics chain. This term is used to indicate that organisations have extended their scope in the chain with one or more links. For example, think of retailers who no longer consider shops the last link in their supply chain but consumers.

**External costs** The costs which arise when one's individual actions influence the well-being of another actor in a manner that does not require payment in conformity with the existing definitions of ownership in society.

**Fine Chemicals** High-quality chemicals or 'bio-specialties'. Among other things used to manufacture medicines. The opposite of bulk products.

**FLOW2** Business-to-business marketplace where companies and organisations can let or rent equipment, but also knowledge and skills of employees, to and from one another. The goal is to make more efficient use of already available resources. This can be achieved through the sharing, borrowing and swapping of goods and services. A lot of production capacity remains unutilised, for example in sectors such as construction, health care, transport and logistics and services. FLOW2 makes this hidden wealth visible and tradable.

**Footprint Ecological footprint** A figure which indicates how much biologically productive land and water area has been consumed by a certain segment of

the population in order to maintain their consumption level and process the waste generated by this group.

**Goal-oriented regulation** Regulation establishing a certain goal. To the extent not defined, all means are allowed for this.

**Green deal** Cooperation between the national government and initiators to help launch sustainable initiatives. The government can offer support by relaxing legal requirements, using its network and purchasing power or by sharing knowledge. The initiating party is responsible for the implementation and profitability and fast results are pre-requisites.

**Greenport** Dutch name for a large horticultural cluster where plants, trees, bulbs, flowers and vegetables are produced and traded.

**GS1** International organisation striving for global standards and solutions to benefit the efficiency and traceability of supply chains, global and cross-sectoral. Also see DataBar.

**Home care logistics** The logistics process of delivering health care to patients in their homes.

**Home resource planning** Planning concept to determine the need of consumers for food, similar to enterprise resource planning which was developed to charter the need of companies for materials, people and resources.

**Hub** Transition point or node in a network, such as an (air)port, a distribution centre or a container terminal.

**Innovative tendering** Tendering with flexibility and incentives to achieve the proposed final result using innovative solutions through private parties or partnerships (for example with a consortium of private parties).

**Intelligent transport systems** Concept which represents the development and application of information and communication technologies (ICT) in the transport sector. Examples of ICT applications for road traffic are (traffic) management systems in cities and on the motorways, electronic toll collection and route navigation systems.

**Internalisation of external costs** The incorporation in the cost price of external costs which arise when actions necessary for the production and supply of products influence the well-being of third parties in a manner which does not require payment in conformity with the existing definitions of ownership in society.

**Last mile** Term used in logistics to refer to the transport of people and goods across the last metres to the final destination.

**Level playing field** Legal area in which economic actors are treated uniformly; they have equal access to markets and must comply with the same rules.

**LHV** Longer and Heavier Vehicle, also referred to as *Ecocombi* or *LZV* in Dutch; a truck capable of and permitted to carry more freight than a conventional truck combination. An LZV has a maximum length of 25.25 metres and a weight of 60 tonnes, whereas the maximum length of a conventional truck is 18.75 metres and the maximum weight (in the Netherlands) 50 tonnes. As fuel consumption hardly increases, the transport of cargo by LZV yields a fuel reduction of between 4 to 30 percent.

**Linear economy** An economic system in which raw materials are converted into products that are destroyed after use.

**Logistics corridor** Physical structure which facilitates and/or consolidates the movement of logistics flows. Examples are dedicated lanes, the dedicated Betuweroute freight railway line and the Nieuwe Waterweg canal.

**Logistics service provider** Entrepreneur who arranges part or all of the logistics activities of the customer for payment. More and more companies are outsourcing transport and logistics to logistics service providers.

**Load factor** Percentage of the available loading capacity (in kilos) or loading volume (in cubic meters) that is utilised.

**Mainport** A major logistics hub such as a seaport or airport. Mainport is a Dutch policy term and is mainly used to emphasise the relative importance of the ports of Antwerp and Rotterdam and Amsterdam Airport Schiphol and Brussels Airport. The term is not used as such in English.

**Modality** See mode of transport.

**Mode of transport** Private transport, collective transport, public transport, by car, rail, barge, and so on.

**Near-sourcing** A company's strategic positioning of business activities near the location where the final products are sold.

**Raw Materials Passport** Label indicating which raw materials are present in a product as well as their quantities and composition. Information as to which raw materials a product contains makes it easier to reclaim those substances.

**Respiratory substances** Substances or particles which can be inhaled through breathing.

**Return logistics** Return logistics or reverse logistics is the recalling of products and/or packaging in order to partially or fully reuse them. Entire products can be marketed completely new (think of returns of web shops or other retailers), but it is also possible that only components or raw materials are reused in other products. In the case of the latter, return logistics comprises the entire process of repair, overhaul, recycling and destruction of products, including the associated administrative and financial processes. In the case of packaging, reusable cargo carriers such as pallets, roll cages and crates are often involved.

**Reverse logistics** See return logistics.

**Service level agreement** Agreement with stipulations between the provider and consumer of a service or product.

**Service logistics** The management of after-sales service from product delivery to the end of the product's lifecycle.

**Short-sea** The transport by water of goods or passengers on a route on which at least parts of a sea or ocean are navigated but in which these bodies of water are not crossed.

**Supervisory permit** Permit issued to a group of companies in which the stake of each actor in the permit may be divided or traded within the group, for example a group of companies which combined are allowed to emit a certain maximum amount of CO<sub>2</sub>.

**Supply chain** A chain of activities aimed at providing a product or service from provider to consumer. These activities include the transformation of raw materials and components - possibly via intermediate steps - into a final product that is supplied to the end user. In practice, a supply chain consists of a number of companies which supply one another and ultimately the consumer.

**Supply chain management** The management of a network of affiliated companies engaged in providing products and services to end-users in a supply chain.

**Time slot** Established by the municipality during which shops in a certain area may be supplied by trucks.

**Total cost of ownership** Total cost for owning a product. This among other things comprises purchase costs, implementation costs, maintenance costs, repair costs, removal costs and processing costs.

**Transit** The flow of cargo which is transported across Dutch territory en route from one country to another but remains in foreign ownership. Contrary to re-export, transit is not a part of the imports and exports.

**Urban mining** The recovery of raw materials from products, buildings and waste.

**Valley** A geographically defined area with a specific concentration of economic activities such as 'maintenance valley' or 'food alley'.

**Value added services (VAS)** Value-adding services such as arranging return logistics or technical support during delivery (unpacking, installing).

# RESPONSIBILITY AND ACKNOWLEDGEMENT

On the 9<sup>th</sup> of November 2010, a meeting was staged with Minister Schultz van Haegen-Maas Geesteranus on the work programme of the Council for the Environment and Infrastructure. During this consultation, she requested that the Council draw up an advice on logistics.

In June 2011, the then Director-General of Civil Aviation and Maritime Affairs Mark Dierikx asked the Council to offer their input on the reaction of the minister to the advice of Topteam Logistiek 'Partituur naar de top'. This took place during a brainstorm session with a number of council members.

In September 2011, a committee was formed which formulated this advice in response to the minister's request. The committee met eighteen times in the period from September 2011 to April 2013. Two studies were conducted, three essays were written and two films were produced. Seven expert meetings were staged, various articles were written and several interviews were given.

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### Research

Logistieke Kracht van Nederland: analyse van tien jaar aanbevelingen voor overheidsbeleid in de logistieke sector uitgevoerd door Buck Consultants International, 2012.

Internaliseren van externe kosten in het goederenvervoer by TNO, 2012.

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Integrale visie op transport en logistiek in 2040 door *jhr.* Dr W. Ploos van Amstel, 2012.

Innovatie en duurzaamheid in de logistiek door Prof. C.J. Ruijgrok, 2012.

Toekomstverkenning transitie tot 2040 voor de topsectoren AgroFood en Tuinbouw vanuit logistiek perspectief door Prof. Dr J.A.G.J. van der Vorst, 2011.

### Films

Interview with A.H. Lundqvist, head spearteam hightech by M.E. van Lier Lels by Studio Hoogeveen & Van Tilburg, 2012.

Dutch logistics 2040: designed to last by CCCP, 2013.

### Presentations

29 November 2012. Vervoers Logistieke Werkdagen

9 January 2013. Strategisch Platform Logistiek

7 February 2013. Dutch Water Sector Intelligence

5 March 2013. EVO Raad voor Logistieke Kennis

28 May 2013. Nationale Distributiedag

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Lindert, M. te (2012). *Anticiperen op de onbekende toekomst*. Supply Chain Magazine, nr. 8 december 2012, p. 32-40.

Korevaar, G. (2013). *Uitdagingen voor de logistiek*. EVO Logistiek, maart 2013, p. 10-11.

Jong, M. de (2013). *De meerwaarde van logistiek*. ROMagazine, maart 2013, p. 14-17.

Stad, H. (2013). *Logistiek moet leren kijken naar innovaties elders*. Logistiek Magazine, april 2013, p. 54-56.

Waltmans, J. (2013). *Doen we niks, dan missen we de boot*. Algemeen Dagblad Wereldhaven, 6 april 2013, p. 10-11.

Lier Lels, M. van (2013). *Opportunities Towards a circular economy*.  
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# OVERVIEW OF PUBLICATIONS

## 2013

Room for Sustainable Agriculture [*Ruimte voor duurzame landbouw*].  
March 2013 (Rli 2013/01)

Nature's Imperative, towards a Robust Nature Policy [*Onbeperkt houdbaar, naar een robuust natuurbeleid*]. May 2013 (Rli 2013/02)

## 2012

Keep Moving, Towards Sustainable Mobility. Edited by Bert van Wee.  
October 2012 (Rli/EEAC)

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