TRANSITION AGENDA
CIRCULAR ECONOMY | 2018

PLASTICS

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PLASTIC OF VALUE

ABSTRACT

Plastic and rubber are an integral part of our society. In the past fifty years, the use of plastics has grown enormously. Partly because of their versatile properties, their worldwide application has increased twentyfold. Plastics are strong, rigid, flexible, dimensionally stable or exactly form-free and thus contribute to comfort, safety, durability, hygiene, and energy efficiency. Applications produced with plastics also contribute to the reduction of CO2 emissions compared to the use of other materials. Apart from a large number of advantages, the large-scale use of plastic also entails disadvantages. The use of (mostly) fossil raw materials and energy exerts pressure on the environment. The spread of plastic litter and microplastics on land and in the sea results in a growing pollution of ecosystems. So despite all the advantages, we see ourselves faced with a number of important challenges.

This transition agenda incorporates all these points into an action and intervention agenda for the years ahead based on the joint ambition set out in the Raw Materials Agreement to accelerate the transition to the circular (plastic) economy, where plastic is and will remain of value. Plastics have a low footprint in 2050 and are made from recycled or renewable – bio-based - plastics of guaranteed quality. There is no longer any question of incinerating plastics, and unnecessary use of materials is a thing of the past. With the circular plastics economy, the sector contributes to the energy and climate objectives. No substances of concern that could pose a danger to public health and the ecosystem are processed in plastics. By closing the plastics chain, producers, retailers, and consumers ensure that macro and microplastics no longer leak into the environment.

GOALS FOR 2030

Currently, only 250-300 kton of plastic is recycled per year in the Netherlands, while plastic producers market around 2,000 kton. Set against the amount of discarded plastic materials (1,700 kton), this means that 300 kton more will remain in use annually with a recycling percentage of 15-17% of the potential flow of plastics to be processed. More than 5 times as much is currently being sent to waste incinerators (1,313 kton). The desired situation on the part of the Transition Team with regard to plastic material flows in 2030, which is both ambitious and feasible, is outlined in the figure below.

Waste incineration will decrease by -44% in 2030, from a total of 1,313 kton (2016) to 740 kton (2030). This decrease is explained by:

More separate collection through more waste collection points with more bins for hard plastics and more and better sorting installations;

The development of better post-separation of plastics from residual waste;

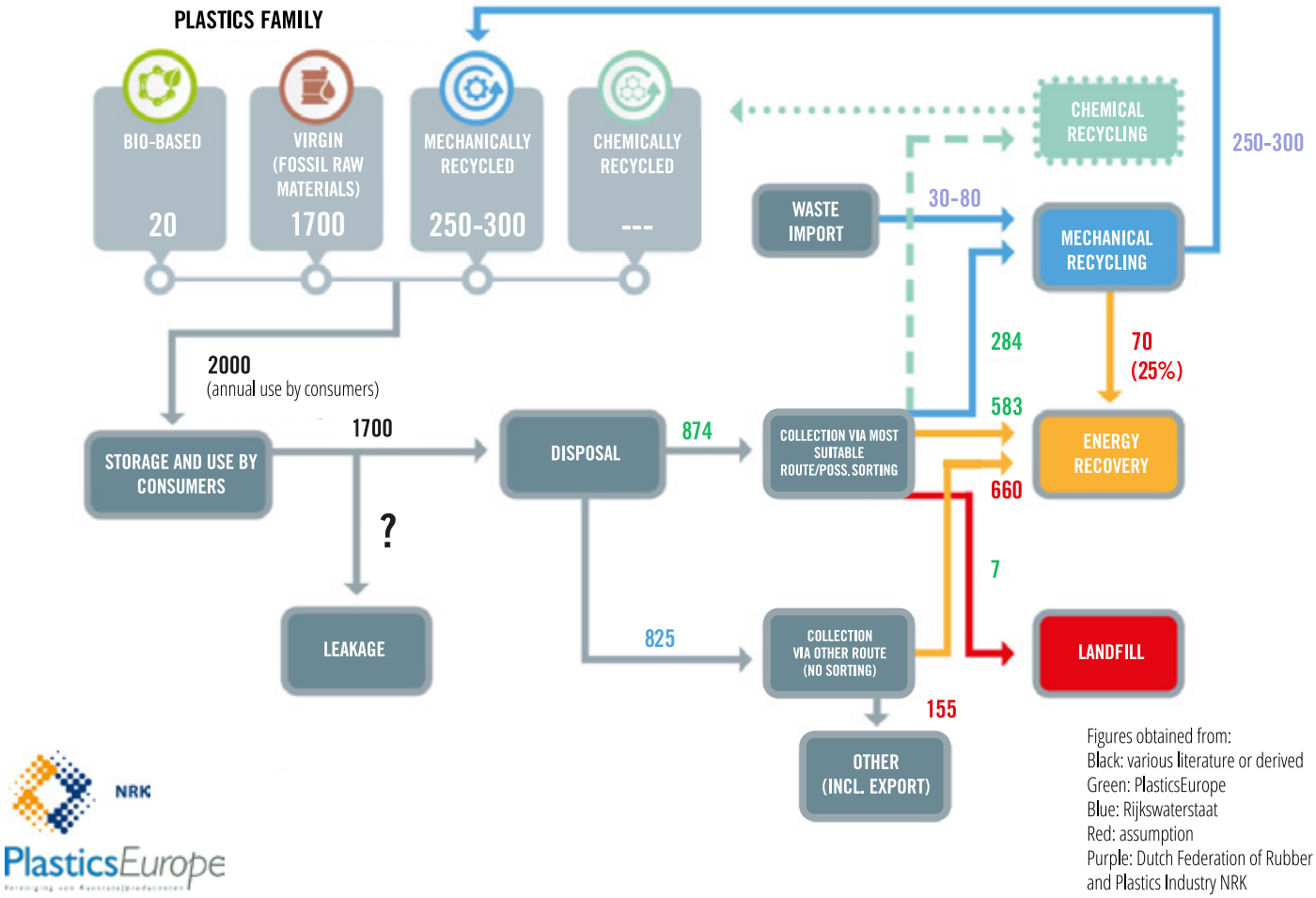
The development of “closed loop” return systems (e.g. for mattresses) as a result of EPR systems for furniture, clothing, façade construction, and the automotive industry;

A decrease in exports of unsorted plastics (mainly to China) due to stricter controls here (Human Environment and Transport Inspectorate, ILT) and import restrictions elsewhere.

With the reduced incineration of plastics, CO2 emissions in the Netherlands will be reduced by 0.97 Mton in the period 2016-2030.

[1] Het CPB hanteert een omrekenfactor van 1,7 kton CO2 voor de besparing van 1 kton reductie in de verbranding van kunststoffen.

PLASTIC FLOWS NL 2015/2016 (IN Kt, SIMPLIFIED DIAGRAM)



Thanks to heavy investment in more mechanical and chemical recycling and through investment in the production of bio-based plastics, the production and marketing of new (virgin) fossil plastics will decrease from 1,700 to 1,090 kton (= -36%). It is expected that the decrease in the incineration of recyclable plastics and the marketing of new (virgin) fossil plastics will decrease rapidly after 2030.
As it is currently not possible to estimate how much CO2 savings will be realised with the shift of the production from fossil to recycled and renewable (bio-based and CCU) plastics, it is not possible to determine an additional quantitative effect, but in the period 2016-2030, the CO2 emissions in the Netherlands will in any case decrease by more than 1 Mton.

ACTION AND INTERVENTION AGENDA

To expedite this transition, four development directions are elaborated further in actions and interventions, linked to a social agenda, a knowledge and investment agenda, and an investment agenda:

1. Prevention. More with less and the avoidance of leakage Prevention is better than cure. Six lines along which the unnecessary use of materials and "leakage" of plastics into the environment can be prevented, to attain the highest possible usage value and quality, are outlined: (1) from product to service, (2) from linear to circular design, (3) from economic to usage value, (4) from single-use to multi-use applications, (5) where possible, prevention of harmful additives and microplastics in the environment, (6) from long to short chains through 3D printing, the Internet of Things, and blockchain technology.

2. Increased supply and demand of renewable plastics
   In order to keep plastics more in circulation and to reduce the carbon footprint, the focus is on (a) reducing the incineration and export of recyclable plastics and (b) a shift from production and use of "virgin" fossil plastics to recycled and renewable - bio-based - plastics. To this end, both the demand for these recycled and renewable plastics and the production capacity must increase and become balanced to achieve the target of 100% circular by 2050:

   a. The demand for recycled and renewable plastics can be stimulated by internalising external costs in the price of virgin fossil plastics, by focusing more on circular procurement by companies and governments, and by expanding and intensifying producer responsibility (EPR). Producer responsibility can provide an incentive for producers and retailers to market only circularly designed products (without harmful substances and without the addition of microplastics), to take more responsibility for, among other things, repair in order to improve the performance of the product and extend the life span of products. To put an end to litter, there is a push towards a broadening of EPR pertaining to products that are still featured in litter, such as cigarette butts. The sectors with the largest plastic flows (packaging, construction, the automotive industry, and consumer electronics) are further challenged to come up with plans on how they will specifically substantiate these objectives in their sector for specific product-market combinations and how they will implement them.

   b. The supply of recycled and renewable plastics can receive a significant boost if it becomes more unattractive to incinerate or export end-of-life plastics, which would render investments in the upscaling of mechanical recycling and bio-based plastic production profitable. Recently, there have been interesting developments that justify the expectation of a big development for chemical recycling. Plastics cannot be recycled infinitely by mechanical recycling and mechanical recycling will not filter out (harmful) additives. In the future, the development of CO2 or methane as raw materials for the production of plastics (Carbon Capture and Utilization (CCU)) may also have a significant role.

3. Better quality, more environmental efficiency
   In order to speed up the demand for and the use of recycled and renewable plastics, the industrial sectors applying this technology must have confidence in the quality of use and the environmental efficiency of these materials. The aim is to come up with a quality action plan with the industry, in which there is more focus in the chain on the quality of recycled and renewable plastics. In that action plan, attention should be paid to setting up standards for recyclates of different "grades", in order for customers to have confidence in grades being geared to the required quality and application possibilities. The action plan will also include the development of a guide for the use of "track and trace systems", such as markers and watermarks. Finally, attention can be given to the possibilities within existing EPR schemes and those still to be developed, in which an EPR fund provides a "waste management contribution" from producers and importers and a collection payment for collectors (mostly municipalities) to arrive at a differentiated rate that encourages producers and importers to market circular, high-quality, and recyclable products, and to reward collectors for offering the purest possible (mono)flows of discarded plastics.

4. Strategic (chain) cooperation
   Chain management and a joint strategy of stakeholders from industry, science, NGOs and governments is crucial for success. Due to the interdependence of companies in product chains, and of countries due to the interconnectedness of the (world) economy, everyone can only exercise limited influence. Focusing on (strategic) cooperation therefore helps to create the circular economy. Among other things, the stimulation of supply chain cooperation via a voucher scheme with which the supply chain management (director) can be funded is proposed. The focus is also on regional cooperation between various stakeholders who jointly invest in labs and hubs. At the international level, the government and Dutch companies and NGOs can work together to influence European frameworks (such as EPR and Ecodesign) and promote cooperation in existing and newly developed international networks to inspire foreign parties with our innovations, but also to provide guidance to countries with less developed waste infrastructure (as a result of which they are burdened by a substantial "plastic soup") in order to create the circular (plastic) economy jointly (in co-creation) with our innovative business community.

SOCIAL AGENDA

The social agenda provides an outline of the consequences for employment opportunities and the labour market, for the development of knowledge and skills (skills and training), and for the involvement of people in companies and other organisations. These are not yet quantitative, but simply dealing consciously with the social effects of the actions and interventions outlined above adds value for the speed of the transition and the adaptivity of the government and the business community that are needed to go along with the system change of the economy. An overview is provided of the differences in qualitative employment effects between chemicals (from fossil to recycled/renewable), the industry using it (from central, large-scale production to decentralised (3D printing), repair and refurbishment, customised products and just in time management "), and the waste and recycling sector (from waste incineration to recycling). In addition, it is emphasised that investments must be made in training and the alignment of education and practice. Inspiring examples to that effect that deserve imitation and upscaling are already visible.

INTRODUCTION

Plastic and rubber are an integral part of our society. Modern cars, computers or mobile phones: nowadays they consist for the most part of plastic parts. Drive into any new residential area and the houses are equipped with plastic frames and solar panels. Even with the weekly grocery shopping in the supermarket, people's carts are full of products in plastic packaging. And that makes sense. All these examples illustrate the high usage value of plastics[2].

In the past fifty years, the use of plastics has grown enormously. Partly because of their versatile properties, their worldwide application has increased twentyfold. Plastics are strong, rigid, flexible, dimensionally stable or exactly form-free and thus foster comfort, safety, durability, hygiene, and energy efficiency. Applications produced with plastics also contribute to the reduction of CO2 emissions compared to the use of other materials.

Apart from a large number of advantages, the large-scale use of plastic also entails disadvantages. The use of (mostly) fossil raw materials and energy exerts pressure on the environment. The spread of plastic litter and microplastics on land and in the sea results in a growing pollution of ecosystems. So despite all the advantages, we see ourselves faced with a number of important challenges:

- The macro environmental impact of plastics is high, and given its growing use it will increase further. Without specific measures, global use is expected to double over the next twenty years . We need to prevent the depletion of non-renewable natural resources, such as fossil resources. It is advisable, not only from a climate point of view, but also to limit our geopolitical dependence on oil, to be as economical as possible with these raw materials. This can be achieved by replacing them with recycled and bio-based content, obtained through mechanical and chemical recycling or via Carbon Capture and Utilization (CCU). These solutions place a substantially lower demand on our scarce mineral resources.

- Plastics are often made from fossil oil and gas products, which lead to CO2 emissions in the production chain. Greenhouse gas emissions in the Netherlands can fall sharply if plastics are recycled instead of incinerated. Although much has already been accomplished in the area of recycling, its scope and quality are still limited. More use of recycled plastics can make an important contribution to the Dutch climate challenge.

- In society, there is increasing concern about the increasing amount of "plastic soup" in rivers, seas, and oceans and the (negative) effects of microplastics and nanoplastics on the environment, the living environment, and the health of humans and animals. A prevention-oriented, ambitious, and credible approach must prevent (un)conscious leakage to reduce the impact on the environment..

Meanwhile, the Dutch market has discovered the commercial power of circularity. A "profit" can be gained in the field of sustainability. The position of the Netherlands as an innovative top country (Top Sector Chemicals) is a booster and also brings economic growth within reach. This is also emphasized in various Dutch and international reports.

Plastics can therefore be applied and used much better, viewed in the light of a sustainable, circular economy. Consumer support must be increased for those plastic applications that do deliver a social added value. The positive and negative sides of plastics have rarely been considered in their mutual interrelationship. This transition agenda takes all points into consideration. This document shows the necessary process and acts as a travel guide on the way to a circular plastic economy, where plastic is and will continue to be of value!

This transition agenda is a joint product of a Transition Team, in which experts from the business community, knowledge institutions, non-governmental organisations (NGOs) and governments were represented. Input from relevant stakeholders, collected during organised stakeholder meetings and networks, has been incorporated. This agenda contains measures that focus on the short and medium to long term. They can act as leverage to accelerate the transition to the circular plastic economy. This way, the future we outline is actually within reach. In the years ahead, the actions must be further developed and social, societal, and economic developments properly monitored. Monitoring and reviewing the actions is therefore part of the implementation.

[2] In this transition agenda, plastics also include natural and synthetic rubbers (elastomers), in addition to the groups of thermoplastics and thermosets.

[3] Source: Denkstatt study, June 2010, "The impact of plastics on life cycle energy consumption and greenhouse gas emissions in Europe"

CONTENTS

VISION: ACCELERATING THE TRANSITION TO A CIRCULAR PLASTICS CHAIN

The Netherlands in 2050: new raw materials are extracted in a fully sustainable manner. The use of secondary raw materials and biomass has become common practice. Products and materials are designed for optimum usage value and reuse, without loss of value or harmful emissions. In short, the Netherlands will work towards a circular economy in the coming decades, according to the government-wide program "The Netherlands Circular in 2050".

In concrete terms, this means that all products with plastics will be circular in just over 30 years. They have a low footprint and are made from recycled or renewable plastics of guaranteed quality. There is no longer any question of burning plastics, and unnecessary use of materials is a thing of the past. With the circular plastic economy, the sector contributes to the energy and climate objectives as well as to the food agenda. No substances of concern that could pose a danger to public health and the ecosystem are processed in plastics. By closing the plastics chain, producers, retailers and consumers ensure that macro and microplastics no longer leak into the environment.

WHAT DOES THIS MEAN?

This vision implies that our country will have to make a large-scale change in the coming years. It requires simultaneous change at many levels, within numerous market segments and in a variety of applications. Because of the multitude of products and submarkets, each with their own characteristics, the task is a complex one. With this vision, we intend to initiate a system change towards a circular economy, in which plastics have no negative effects on the environment and in which we compromise our natural capital as little as possible. In order to realise this transition, we propose four development directions. A set of actions and interventions is linked to each direction to set the acceleration towards the circular economy in motion.

1. Prevention, more with less and the avoidance of leakage
   Preventing unnecessary use of materials by consumers and producers in combination with working towards the highest possible usage value and quality of plastics.

2. More supply and demand for renewable plastics
   Mobilising the shift from the use of fossil raw materials to the use of recycled and renewable plastics. To this end, both the demand for these recycled and renewable plastics and the production capacity must increase and become balanced to achieve the target of 100% circular by 2050.

3. Better quality, more environmental efficiency
   Expediting the use of renewable plastics requires a quality improvement and standardisation of recycled and renewable plastics. The introduction of new quality systems in the chain ensures higher quality at every stage with a more demand-driven chain as a result.

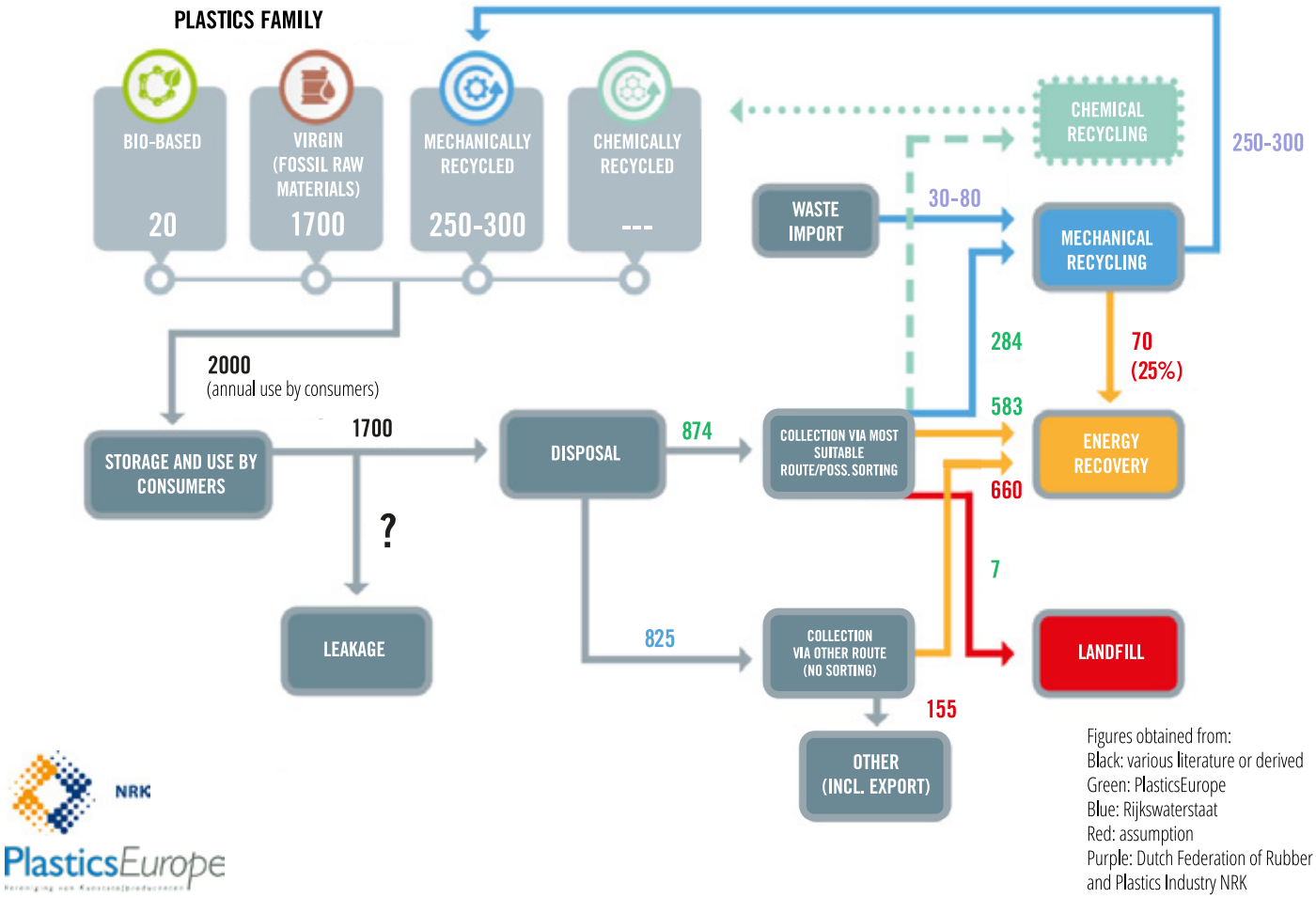
4. Strategic (chain) cooperation
   Chain management and a joint strategy of stakeholders from industry, science, NGOs, and governments is crucial for success. Due to the interdependence of companies in product chains, and of countries due to the interconnectedness of the (world) economy, everyone can only exercise limited influence. Together we are strong!

GOALS

The transition to a fully circular plastic economy in 2050 involves a challenge in terms of both quantity and quality. In terms of quantity, this involves reversing the incineration, landfill and export (from low-value) plastic streams to bring them back into the cycle. The qualitative challenge is focused on the high usage value and low(er) external costs of these materials in the chain. Both elements flow back into the elaboration of the four development directions. Incidentally, the quantitative reversal outlined here cannot succeed without the quality improvement of plastic flows.

At the macro level, we have mapped out the current quantitative plastic flows in the Netherlands. This forms the basis for properly interpreting the current situation and for formulating quantitative goals. This is the ultimate image of where we could stand in 2030. Current data (2016) has been used wherever possible. In the absence of complete data, an estimate of certain flows has been made in some cases.

PLASTIC FLOWS NL 2015/2016 (IN Kt, SIMPLIFIED DIAGRAM)



Source: Plastics Europe

On the basis of the current picture, only 250-300 kton of plastic is recycled per year at present, while plastic producers market around 2,000 kton. Set against the amount of discarded plastic materials (1,700 kton), this means that 300 kton more will remain in use annually with a recycling percentage of 15-17% of the potential flow of plastics to be processed. More than twice as much plastic is currently sent to waste incinerators. More than 5 times as much is currently being sent to waste incinerators (1,313 kton). Mechanical and chemical recycling and production expansion of bio-based plastics offers great potential for reducing the use of new fossil plastics by 50% by 2030.

Subsequently, an assessment was made of relevant parameters. We examined which goals are ambitious and at the same time feasible, in view of the actions and interventions described in the following chapters.[4]

GOALS AND PARAMETERS			
	2017 (%)	**2030 (%)**	**Underpinning of change**
Annual growth of plastic consumption	--	1,5*	Annual reduction in the growth of plastic (1)
Annual increase in discarded plastics	--	1,0*	Less disposal due to increase in products with a long(er) lifespan (1)
Discarded plastics via route without sorting	48,5	10	Unsorted waste streams will be significantly reduced (1)
Discarded plastics via route without sorting which are incinerated (%)	80	80	No change in %.
Discarded plastics via route without sorting which are exported	9	2	Thanks to high usage value, effective return systems, litter control, enforcement (2)
Sorted plastics as input for mechanical recycling	32%	50%	Increased quality of sorted plastics leads to more recycling and less incineration (3)
Efficiency of mechanical recycling	75%	85%	Increased quality of sorted plastics (3)
Chemically-recycled plastics	0	10	Growth in chemical recycling (2)
Efficiency of chemical recycling	0	60	Expert estimate of the efficiency of chemical recycling
Produced bioplastics	1,5	15	Growth in (sustainably) produced bioplastics (2)

Based on these parameters and objectives, the Netherlands will reflect the following picture in 2030 if the described actions and interventions have been addressed and carried out.

[5] *These numbers represent the development lines that assure this development:(1) preventie,*

(1) prevention,

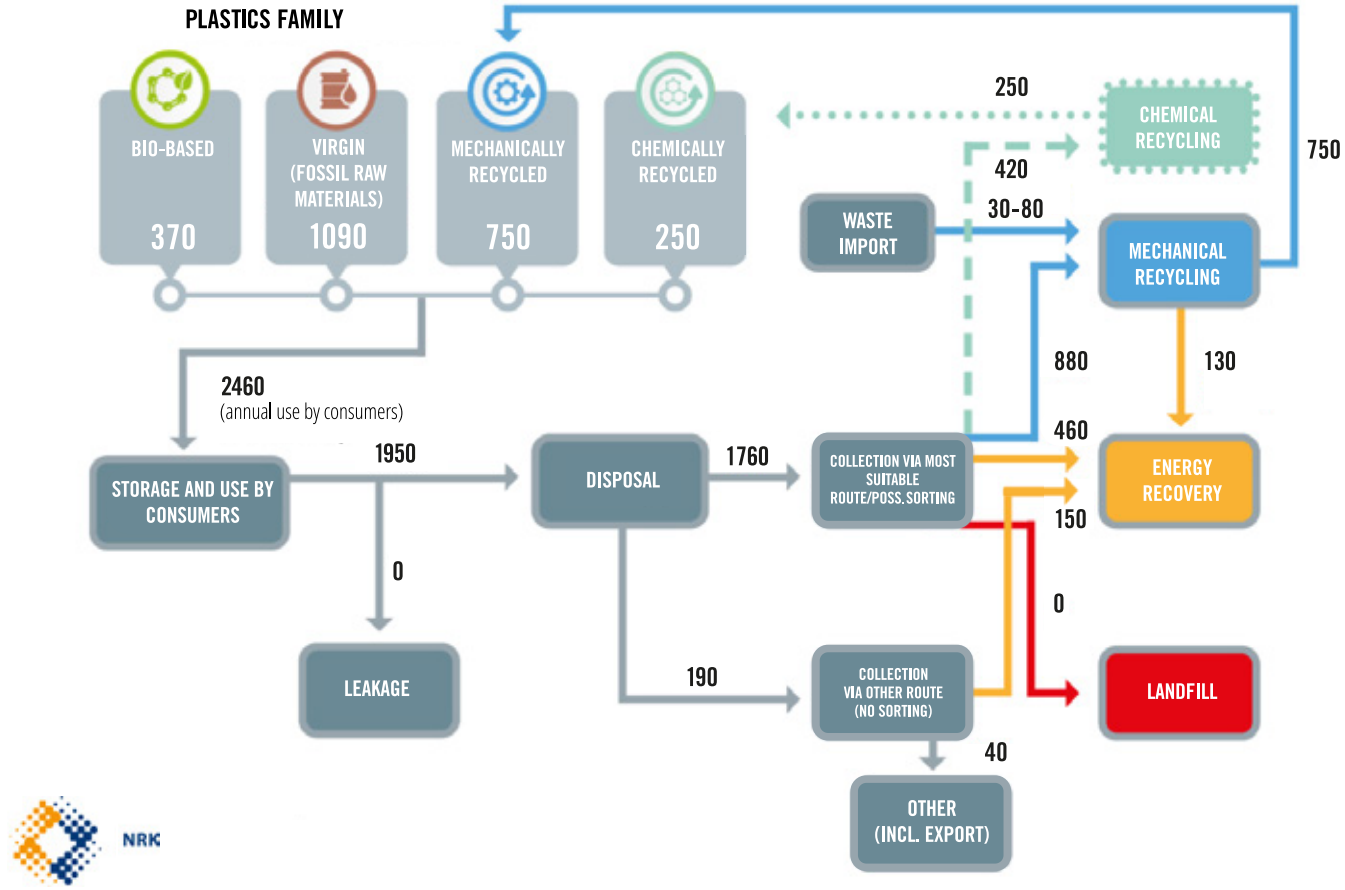
(2) More supply and demand,

(3) Better quality, more environmental efficiency,

(4) More strategic cooperation.

** Average per year over the entire 2017-2030 period.*

OBJECTIVE PLASTIC FLOWS NL 2030 (IN Kt, SIMPLIFIED DIAGRAM)



Source: Plastics Europe

Due to the continuing growth of plastics applications, the total volume of plastics put on the market will increase to 2,460 ktons (= average growth of 1.5% per year). Relatively speaking, the volume that will subsequently be discarded by consumers due to more preventive measures (development line 1, including longer product life) will increase less rapidly (the annual accumulation will then be 510 kton instead of 300 kton in 2017). The leaks at the bottom of the diagram are decreasing as a result of more efficient separate collection and sorting of plastics, an effective approach to litter, and discouraging of the export of low-grade plastic waste. We assume that imported plastic waste that is offered to recyclers is high-quality waste, which is easy to recycle. For the time being we have assumed that this volume will remain constant, given that no ambition has been expressed in the transition agenda to increase the import of plastic waste for recycling.
Waste incineration will decrease from a total of 1,313 kton (2016) to 740 kton (2030). That means a decrease of -44%. The decrease is explained by:

- More separate collection through more waste collection points with more bins for hard plastics and more and better-quality sorting capacity;
- The development of better post-separation of plastics from residual waste;
- The development of "closed loop" return systems (e.g. for mattresses) ensuing from EPR systems for furniture, clothing, façade construction, and the automotive industry;
- A decrease in exports of unsorted plastics (mainly to China) due to stricter controls here (Human Environment and Transport Inspectorate, ILT) and import restrictions elsewhere.

With the reduced incineration of plastics, CO2 emissions in the Netherlands will be reduced by 0.97 Mton in the period 2016-2030.

Thanks to heavy investment in more mechanical and chemical recycling and through investment in the production of bio-based plastics, the production and marketing of new (virgin) fossil plastics will decrease from 1,700 to 1,090 kton (= -36%). It is expected that the incineration of recyclable plastics and the marketing of new (virgin) fossil plastics will decrease rapidly after 2030.

Currently, it is not possible to estimate how much CO2 savings will be realised with the shift of the production from fossil to recycled and renewable (bio-based and CCU) plastics. Consequently, a quantitative effect cannot be determined either. Nevertheless, precisely because of a lower carbon footprint, many producers will choose to invest in mechanical and chemical recycling and in the production of bio-based plastics. This is expected to reduce emissions of CO2 in the Netherlands by more than 1 Mton in the period 2016-2030.

[6] *The Netherlands Bureau for Economic Policy Analysis CPB uses a conversion factor of 1.7 kton CO2 for 1 kton reduction in the incineration of plastics.*

ASSUMPTIONS

The transition to a circular plastic economy involves many challenges and requires perseverance. The total process can only be planned to a limited extent; it requires flexible attitudes and behaviour from all stakeholders. It also means adapting thoughts and actions on a cultural and social level. It is not just about the development of a circular market. At the same time, it requires a switch in the orientation of traditional companies, which have based their business models on the linear principle of production, use, and disposal. This transition forces all parties - producers and consumers - to make the switch to circular operations sooner or later.

Consciously reflecting on this social task, actively shaping the process together will benefit acceleration in the transition to a circular economy. In the elaboration of the actions in this agenda, it is advisable to consider this explicitly.

IN THIS AGENDA WE ADDRESS THREE ASSUMPTIONS:

1. The circular plastic economy is not an end in itself. It is a means to develop a more sustainable society, in which the worth of people and the environment is central and as high as possible. This must also be reflected in the economic actions of producers, retailers, and consumers. A focus on optimisation of the entire product life cycle is important for this assumption. The economic actions also look at the effects on energy and water use and the effects on other vital systems, such as those for food and biodiversity.

2. The transition to the circular plastic economy calls for technical, social, and system innovations to get off the ground. This is only possible if the interventions are focused not only on the economical and careful use of raw materials, but also on the interests of the individual entrepreneurs. They will also have to adapt to the social circumstances; however, they will only invest in innovations if they offer added value for the long(er) term. In fact, this also applies to the collective Dutch business sector, which wants to maintain a level (European) playing field and a healthy competitive and financial market in Europe and the rest of the world. The transition offers opportunity for growth, but it must be permanently anchored in the economic system.

3. The transition to the circular plastic economy is a worldwide task. The interweaving of the world economy and the globally visible environmental effects require actions and interventions at the national, European, and global levels. The transition agenda contains actions from the national perspective. In addition, actions for triggering the transition to the circular plastics economy at the European and global levels have been included.

THE FOLLOWING ADDITIONAL ASSUMPTIONS ALSO APPLY:

1. Definitions: to avoid discussion about definitions of the circular economy, we have adopted the definitions used by the Ellen MacArthur Foundation[7].

2. Scope: this action agenda does not contain specific activities aimed at clearing litter in public space, along rivers, on beaches, in seas and oceans. Much is being done in this area by parties here in the Netherlands within the framework of the National Approach to Litter (LAZ), the Green Deals, the RWS Mackathon Challenge and by initiators. Clearance actions do not bring the transition to another, circular economic system closer, but they do contribute to raising awareness among the population. Working on this awareness is and remains necessary and should therefore be scaled up to other European member states. This is possible with a number of Green Deals, which also address prevention measures in addition to tidying, and the processing of collected plastics into new products. The OSPAR Convention and the Maritime Strategy Framework Directive also contain objectives and source-oriented measures to monitor the implementation of clean-up actions. Approximately 55% of the leakage in the oceans "leaks" from five countries in Southeast Asia. An active investigation is being conducted into how Dutch knowledge and expertise can contribute to stopping this plastic leakage at an international level. Export of plastic material to countries outside the EU is monitored and prohibited where it leads to leakage.

3. Lock-in: this transition agenda describes the measures for initiating the intended acceleration, which are appropriate to the aforementioned assumptions. Given the complexity of the plastic chain, there is unfortunately no single button that we can press. The chain needs to be controlled with several buttons at the same time, since each step has an immediate effect on every connecting link in the chain. Short and long-term actions have been formulated, which must be in line with each other and in which the creation of new "lock-ins" that stand in the way of new innovations must be prevented.

4. Opportunity perspective: the transition agendas for the different themes do not stand alone. The realisation of a circular economy is a systematic transition, with a central focus on operations within the system boundaries of this planet. At the same time, this transition cannot be successfully realised if social system boundaries are also not respected. The opportunities offered by the creation of a circular economy offers are not just in the area of job creation. By drawing on an inviting perspective, we work on realising a future-proof economy and society in the Netherlands, strengthen our position as a knowledge country, and at the same time contribute to creating a more beautiful and better world for everyone.

[7]Source: "Glossary" The New Plastics Economy: Rethinking the future of plastics (p102), by the Ellen MacArthur Foundation (EMF).

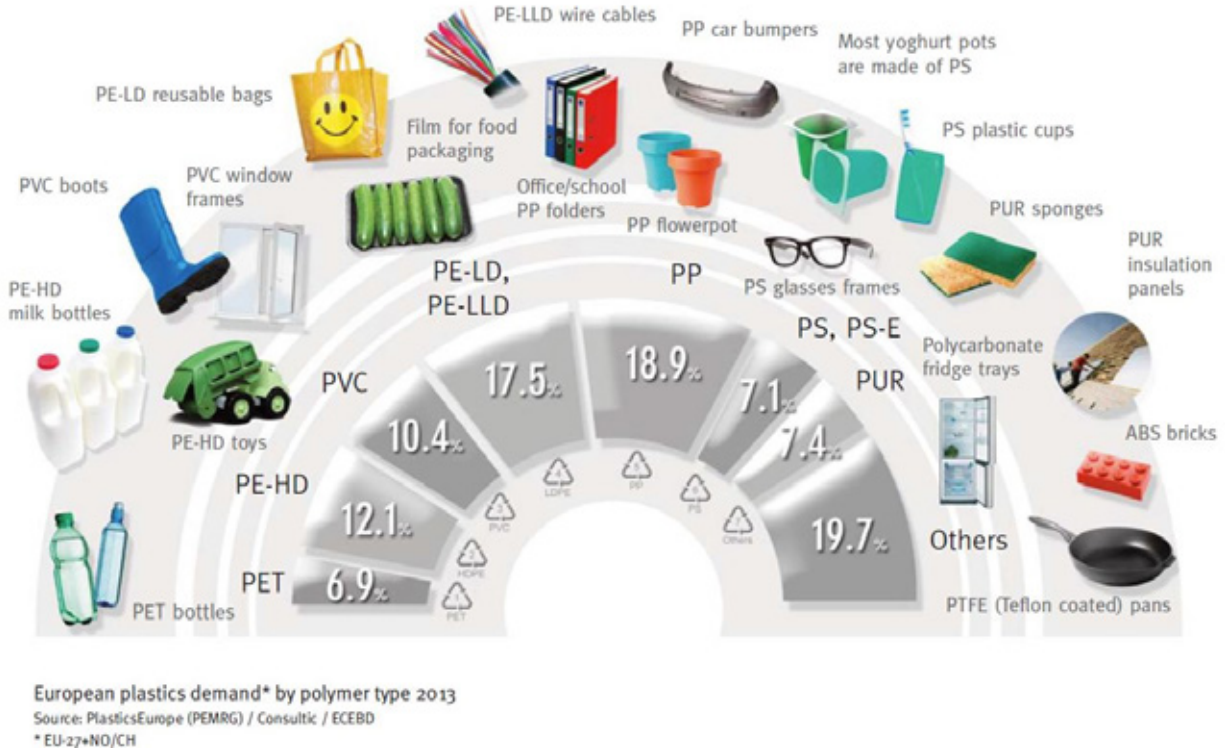
[8]They block innovations because in the past substantial investments have been made in other innovations that stand in the way of the new innovations.

5. Global goals: the UN global goals - the Sustainable Development Goals (SDGs) - have been established worldwide and offer a framework and perspective for action. By contributing in partnership to the transition to the circular economy, the Netherlands can contribute to various global goals. An integral, holistic approach is indispensable here: solutions must not cause new, unforeseen ecological and social problems. The European Commission has formulated climate targets for 2030. To achieve the climate goals, a global effort is needed from all countries. The Netherlands also wants to limit the emission of CO2 even further. Every sector must contribute to this. With the proposed development directions and associated actions, an important contribution can be made to the Dutch climate challenge.

FOCUS AND APPROACH

The plastic and rubber market is extensive and has a variety of applications and materials with a wide variety of material properties. In addition, there are various submarkets that each have their own sources of origin, sorting and recycling techniques, and sales channels. These markets use different logistical systems and financial arrangements. The division of roles between government and the waste processing industry also differs.

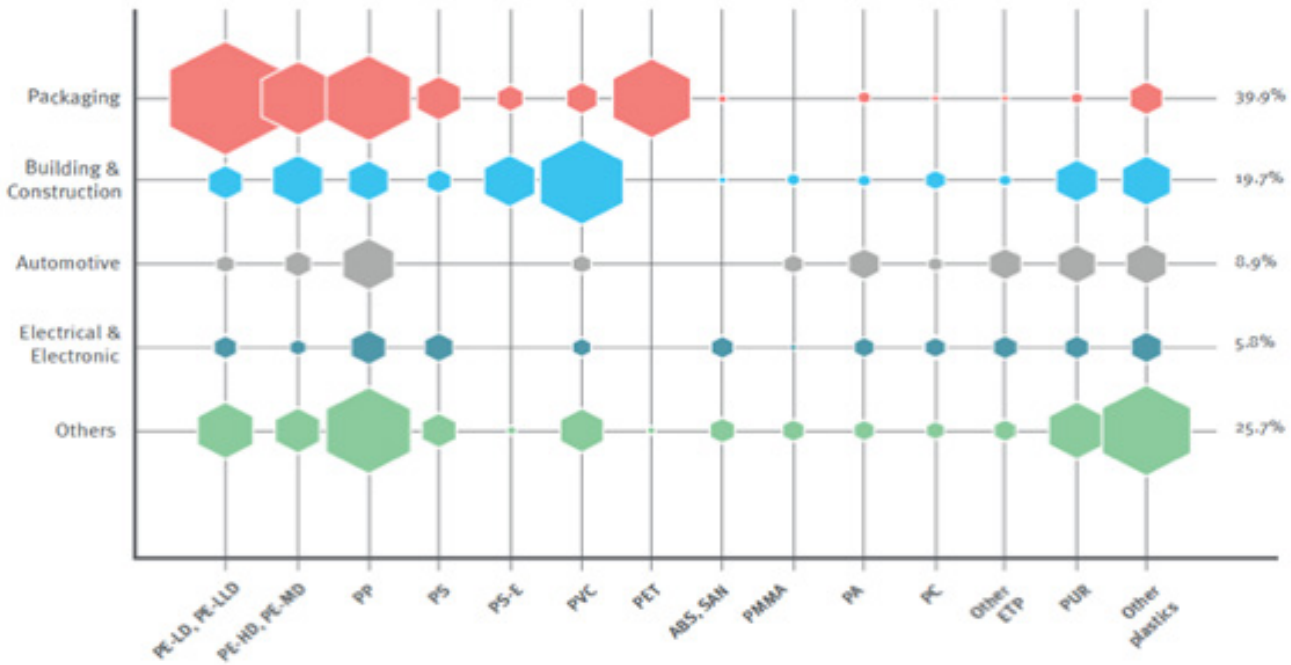
In the Netherlands, approximately 2000 kton of plastic is marketed every year. Plastics are used in Europe as packaging (40%), as building material (20%), in the automotive industry (9%), the electrical engineering industry (6%), and other applications (25%).



Source: Plastics Europe

To make the task of this transition agenda manageable, we have focused on the applications and sectors where the impact could be the greatest. For the time being, these are the four largest applications on the European market, namely plastic packaging, construction, the automotive industry, and consumer electronics. This is also reflected in the actions and interventions.

[9] *This does not include the production and use of rubber. 160 kilotons of rubber are put on the market each year (50/50% natural / synthetic) and used in car tires (70-80%), construction (15%), and in the electrical industry (5-15%).*



Source: PlasticsEurope 2017.

ACTION AND INTERVENTION AGENDA

This agenda acts as a travel guide for the plastics transition to the circular economy. The aforementioned four development directions have been drawn up on the basis of the challenges that arise from the complexity of the market. This transition agenda builds on the insights and results of previous initiatives, partnerships, and other plans. To accelerate the transition, the development directions have been elaborated into several themes (operational goals), which have subsequently been divided into activities. The Human Environment and Transport Inspectorate (ILT) is involved in the start-up, development, and implementation of the actions on account of its supervisory and enforcement role. Every action has been concretised as much as possible. Parties that want to contribute to the development of the actions can join in at any time. In the action and intervention agenda, the relationship with the other transition agendas is discussed a number of times, and this can be expanded.

DEVELOPMENT DIRECTION 1:

PREVENTION. MORE WITH LESS AND THE AVOIDANCE OF LEAKAGE

The use of plastic is growing. This is not just due to applications that have a high social added value. Due to the negative effects of excessive production and consumption, leaks and the effect this has on our environment and our raw materials, preventive measures need to be taken.

This first development direction is aimed at the more efficient use of and unnecessary leaking of plastics in the production and consumption phase .
In this development direction, six levers have been defined for this:

1. From product to service
2. From linear to circular design
3. From economic to usage value
4. From one-off to multiple-use
5. From harmful to natural additives
6. From long to short chains

With regard to these aspects, the sectors of the packaging industry, construction, the automotive industry, and consumer electronics are challenged and supported by partners of the Raw Materials Agreement to present sector plans. These issues are discussed and objectives are formulated for specific product-market combinations.

1. FROM PRODUCT TO SERVICE

You can produce less and more efficiently by looking at products differently. Using new business models and taking a new look at products and processes can help here. If a producer puts his product on the market as a service, he gets much more feedback about the quality and use of the product. The development of "product-to-service", such as lease constructions, can therefore play an important role in achieving more efficient (re) use of raw materials. At the same time, the performance of the leased product increases and better matches the needs of the customer. Between 2018-2022, companies work together with other stakeholders on concrete projects around suitable product-market combinations within the packaging, construction, automotive, and consumer electronics sectors.

Agreements between parties in the chain about what happens to a product after use are also required. Subsequently, these concrete initiatives and processes can be scaled up within the EU and put on the agenda internationally as "best practices". This action is closely linked to and strengthens the following actions with regard to the sector plans to be drawn up. It is useful to analyse more big data in order to gain insight into where and why we use which raw materials for which application. This can also help us to adjust in the implementation of the strategy in the coming years.

[10] *Several actions in the following development directions (2, 3 and 4) also contribute to the avoidance of leakage, e.g. EPRs on litter and international actions.*

Source: www.kunststofkringloop.nl

HANDHOLDS FOR CIRCULAR DESIGN

Elaboration can take place via regional hotspots, in consultation with the Top Sector High-tech Systems and Materials (HTSM, Top Consortium for Knowledge and Innovation on Smart Industries). For a broad approach of "product to service", we refer to the relevant passages in the Transition Agenda for Consumer Goods.

1	Intended result	Inventory of promising options from products to services, including the associated implementation strategy
	Action holders	Business community / sectors, national government
	Budget required	€ 50,000 per annum. Co-financing by companies.
	Timeline	2018-2022

2. FROM LINEAR TO CIRCULAR DESIGN

A different approach to and design of plastic products to be marketed can foster the optimisation of their usage value, the extension of useful lives, and the facilitation of repair, disassembly or recycling. For example, it will prevent situations in which consumers need to replace plastic products solely because one (small) part is broken. However, it will also obviate the drawback of recyclers being unable to recycle a product's component materials on account of the glue or coating used. By 2030, the measures below should ensure that only products designed in a circular fashion are marketed.

SECTOR PLANS

Since products are highly diverse, a "one size fits all" approach is not appropriate. The proposal is for the packaging, construction, automotive, and consumer electronics sectors to draw up their own ambitious plans for the years ahead. In these plans, they are challenged to formulate concrete ambitions with respect to their plastic products. They must make agreements with other stakeholders regarding the implementation of "circular design" as a point of departure in the development of products. The sector plans must reflect the objectives, approach, time frame, and essential requirements.

2	Intended result	Drawing up four sector plans, including implementation and monitoring plans
	Action holders	Sectors, business community, Confederation of Netherlands Industry and Employers VNO-NCW, national government (incl. Human Environment and Transport Inspectorate, ILT)
	Budget required	€ 250,000 (one-off)
	Timeline	2018-2019

CIRCO-TRACKS

The CIRCO circular design programme, featuring the so-called CIRCO tracks, is a way to help market parties to design circularly and to look differently at the product-market combinations. In the coming years, this programme will be strengthened and also scaled up at the international level. CIRCO has a facilitating function, which is comparable with the Long-Term Approach to Energy Efficiency (MJA). In the period 2018-2022, five to ten CIRCO tracks will be financed annually, but only if the companies in question provide co-financing, and guarantee that the findings will be implemented in the organisation and that the acquired knowledge and experience will be shared widely.

The intention is that at least half of CIRCO tracks will have an international character so they can be scaled up globally. This method is also part of the international covenants to be concluded, such as the intended results with an International Green Deal with Indonesia[11].

[11] Part of the Memorandum of Understanding on Waste Management and the Circular Economy between the then Dutch Minister for the Environment Sharon Dijksma and the Indonesian Minister for the Environment and Forestry, Siti Nurbaya, dated 23 November 2016.

3	Intended result	Chain parties (around 200) use circular designs in combination with a different business model
	Action holders	Central government, Unilever, Philips, branches of brand owners, and via CIRCO (Reversed concept Delft University of Technology, Partners for Innovation)
	Budget required	€ 200,000 per year. Co-financing by participating companies
	Timeline	2018-2022

CIRCULAR DESIGN CURRICULA FOR EDUCATION

Start at the origin. Product developers must first learn how to design products circularly. It is therefore essential for the secondary vocational education sector as well as the professional and academic higher education sectors to include circular design directly in their curricula for future designers. In addition to Delft University of Technology, which already has a training programme in the field of Circular Design, the Netherlands Institute for Sustainable Packaging (KIDV) is currently developing an academic education programme for the circular design of packaging. In the KIDV's academic research programme, fundamental research is carried out by companies. This programme line can be extended in line with the experience gained with CIRCO, the existing "Guidelines for Designing with Recycled Plastics" and the KIDV recycling website . The Research and Education Platform RKI is responsible for the coordination of the packaging research programme and for the roll-out of the research and education programs for secondary vocational schools, universities of applied sciences, and research universities. Meanwhile, many research institutions have already reported ongoing research and submitted proposals for projects. E.g., the Centre for Sustainability (CfS) can link these programmes to direct practice, such as experimenting in "Hotspots" (field labs, testing grounds, living labs, innovation hubs etc.). CIRCO now has a project-based character. This can be converted into a more structural form, aimed at knowledge sharing and cross-sectoral chain collaboration.

4	Intended result	Realisation of a development guideline for circular design (three-year programme)
	Action holders	Dutch Federation of Rubber and Plastics Industry NRK, Centre for Sustainability, Netherlands Institute for Sustainable Packaging (KIDV), CIRCO, Central Government (including Ministry of Education, Culture and Science)
	Budget required	€ 500.000
	Timeline	2019

3. FROM ECONOMIC VALUE TO USAGE VALUE

In the traditional assessment of products, four stages are considered for the determination of the value: production, use, collection, and reprocessing. The added value of the product in the usage phase is only known intuitively. That is why a method that helps to determine this usage value, without detracting from the ambitions of a climate-neutral and circular economy, must be developed. This method prevents the marketing of unnecessary plastic products and can help in the rational selection of the material that can be used. A study could show whether it is possible to calculate the costs (in euros) in case the product does not exist or should be made with other materials. There are various possibilities for substantiating the sustainability of plastic applications. The most sustainable solution can only be determined by intercomparing the options on the basis of an independent LCA. Sustainability claims must always be scientifically substantiated in the future. The usage value highlights the benefits of the product. These are then compared against the ecological footprint. Knowledge of the usage value is an additional factor in the business case for entrepreneurs. The knowledge of the usage value is then also deployed in the development line of circular design and other programmes in the field of circular design.

[12]*Source: http://www.partnersforinnovation.com/media/Guidelines-designing-with-recycled-plastics.pdf*

[13]*Source: https://recyclability.kidv.nl/*

5	Intended result	(Calculation) method that contributes to the determination of the usage value
	Action holders	Dutch Federation of Rubber and Plastics Industry NRK, branches, TNO, national government (Ministry of Economic Affairs)
	Budget required	€ 460,000 (one-off)
	Timeline	2018-2019

4. FROM ONE-OFF TO MULTIPLE-USE

Many products which are only used once are still being marketed. In doing so, alternatives that can be used more than once are often not considered. It is advisable to carry out an inventory in 2018 for products that currently only have a one-off use and have a significant environmental impact. An adaptation of the system and the design will enable the multiple use of these products. An example of this: flower auctions exploring the possibility of replacing one-time applied floricultural trays with reusable trays. In 2019 the possibilities for system adaptation to multiple use will be scaled up (internationally). This is also the time to assess whether market incentives or other incentives are needed for certain applications, in order to minimise the one-off use of such products. "From one-off to multiple-use" is not possible or sensible in all cases. It is always necessary to place the environmental costs of the product or the packaging in perspective with the usage value and other important characteristics, such as the prevention of food waste, food safety, and public health. In the elaboration of this action, a link is made with the possibilities of the sharing economy, which touches on these kinds of product-service combinations. The sharing economy is discussed in more detail in the Transition Agenda for Consumer Goods.

6	Intended result	Overview of suitable products to transform from one-time to multiple-use
	Action holders	Ministry of Infrastructure and Water Management, business, flower auctions
	Budget required	€ 50,000 (one-off)
	Timeline	2018/2019

5. FROM HARMFUL TO NATURAL ADDITIVES

A. MICROPLASTICS BY CONSCIOUS ADDITION

Producers sometimes add microplastics to their products because of their functional properties. This is the case, for example, with cosmetics (scrubs) and in abrasive cleaning agents. After use of the product, purification plants can ultimately filter the microplastics out of the water. Manufacturers consciously opt for microplastics, but there are natural alternatives on the market that entail less risk of damage to ecosystems (such as silicon). The European Commission and some Member States are calling for microplastics to be phased out of cosmetics. We are in favour of this and will support this from the Netherlands.

7	Intended result	Affiliation to the European Commission's plea to phase out microplastics in Cosmetics (a ban)
	Action holders	Ministry of Infrastructure and Water Management
	Budget required	-
	Timeline	2018-2019

Source: State-wide Circular Economy image bank [Rijksbreed Circulaire Economie beeldbank]

RECYCLATE, INTENDED FOR NEW PRODUCTS

B. MICROPLASTICS DUE TO WEAR

Microplastics are also caused by wear and tear of plastic products. Cases in point are car tyres on the road or washing clothes. The recommendation is to use innovations that prevent wear and tear for these products, in the first instance for car tyres, washing machines, clothing, and paints and lacquers. The proposal is to develop a (research) programme together with sectors such as the automotive industry (tyres), chemicals (paints and lacquers), and clothing and textiles, as a first stage in the context of (extended) producer responsibility[14].

8	Intended result	Innovations for the prevention of wear and tear of the most important microplastics-producing plastic products
	Action holders	Dutch Federation of Rubber and Plastics Industry NVR, VACO [tyre and wheel sector organisation], Association of the Dutch Chemical Industry (VNCI), Clothing & Textile industry, Ministry of Infrastructure and Water Management, RIVM
	Budget required	€ 60,000 (one-off)
	Timeline	2018-2019

C. ADDITIVES

Producers add additives to plastics to improve quality, safety and/or ease of use. Some additives have been classified as "substances of very high concern" (SVHC), for instance brominated flame retardants. If these products end up in the waste streams, it must be assessed to what extent recycling and reuse are justified from an environmental point of view. Careful recycling, with the use of recyclate in a defined number of product groups in which the risk of human and environmental exposure to SVHC is negligible, is possibly a better solution in terms of environmental footprint than landfill or incineration. We need a clear assessment framework, so that it is always apparent to product developers and recyclers how to deal with which additives in plastics. The Netherlands must work within Europe to create a balanced assessment framework that makes plastic recycling possible. At the same time, there must be investment in research into alternative natural materials as a replacement for existing additives with substances of very high concern.

9	Intended result	Consideration framework of how to deal with SVHC
	Action holders	Ministry of Infrastructure and Water Management, RIVM, Dutch Federation of Rubber and Plastics Industry NRK, PlasticsEurope, Natuur en Milieu
	Budget required	€ 100,000 (one-off)
	Timeline	2018-2020

D. NATURAL ALTERNATIVES

BIOMIMICRY

Although nature-based alternatives are available, these alternatives are still not used much in the plastics market. However, these alternatives are of great importance in replacing harmful additives and pigments. From 2018, additional attention must be focused on strengthening the development of such nature-based alternatives. Learning from nature, the basic idea behind the circular economy, is crucial here. The model for this is called "biomimicry". It is not only a source of inspiration and a guideline for holistic solutions, but can also be used as a touchstone. At the product, process, and system levels, learning from nature offers the opportunity to create a circular economy.

[14] For the automotive industry and its supply industry (including tyre manufacturers), there is currently only an EPR for end-of-life vehicles, which can be expanded for all parts, from circular design and repair to disposal and recycling.

10	Intended result	Biomimicry programme
	Action holders	Interface, Dutch Federation of Rubber and Plastics Industry NRK, PlasticsEurope, Stichting Biomimicry, Ministry of Economic Affairs and Climate Policy, Ministry of Infrastructure and Water Management
	Budget required	€ 70,000 (one-off)
	Timeline	2019-2020

RUBBER FROM DANDELIONS

Rubber can also be extracted from dandelions. Enschede University of Technology, Wageningen University and Research Centre, and several companies have been conducting research into their employability for several years now. It is an important development that makes rubber more bio-based and reduces dependence on natural rubber plantations. Dandelions are an interesting option for the crop exchange in agriculture. For this, cooperation must be established between industry and the agricultural sector.

11	Intended result	New renewable raw material for rubber
	Action holders	Dutch Federation of Rubber and Plastics Industry NRK, Twente University of Technology, Wageningen University and Research Centre, Ministry of Agriculture, Nature and Food Quality
	Budget required	€ 50,000 (one-off)
	Timeline	2018-2019

6. FROM LONG TO SHORT CHAIN

Chain shortening is another way to make the production of plastic products more efficient and effective. By working more according to the "customised demand" principle, producers can shorten the chain, simplify the logistics process, and thus save costs. The possibilities of "3D printing", "just in time management" with fewer or no stocks, and the use of other digitisation methods, such as blockchain, are most promising.

The stability of production chains has so far mostly depended on intermediate stocks. New internet technology and decentralised production mean that this inventory, and therefore wasted raw materials and a substantial cost for companies, is no longer necessary.

In the period 2018-2022, the current "hot spots", which are already being experimented with and invested in, will be reinforced from the perspective that by 2030, chain shortening will be the standard. The reinforcement of the hot spots takes place in collaboration with companies, regional and local governments, and other partners supplying renewable plastic materials. The "smart industry" is challenged to come up with new applications via chain reduction. Hot spots serve as a liaison with regional knowledge institutes and foster the incorporation of the innovations and solutions into an active long-term innovation policy for SMEs.

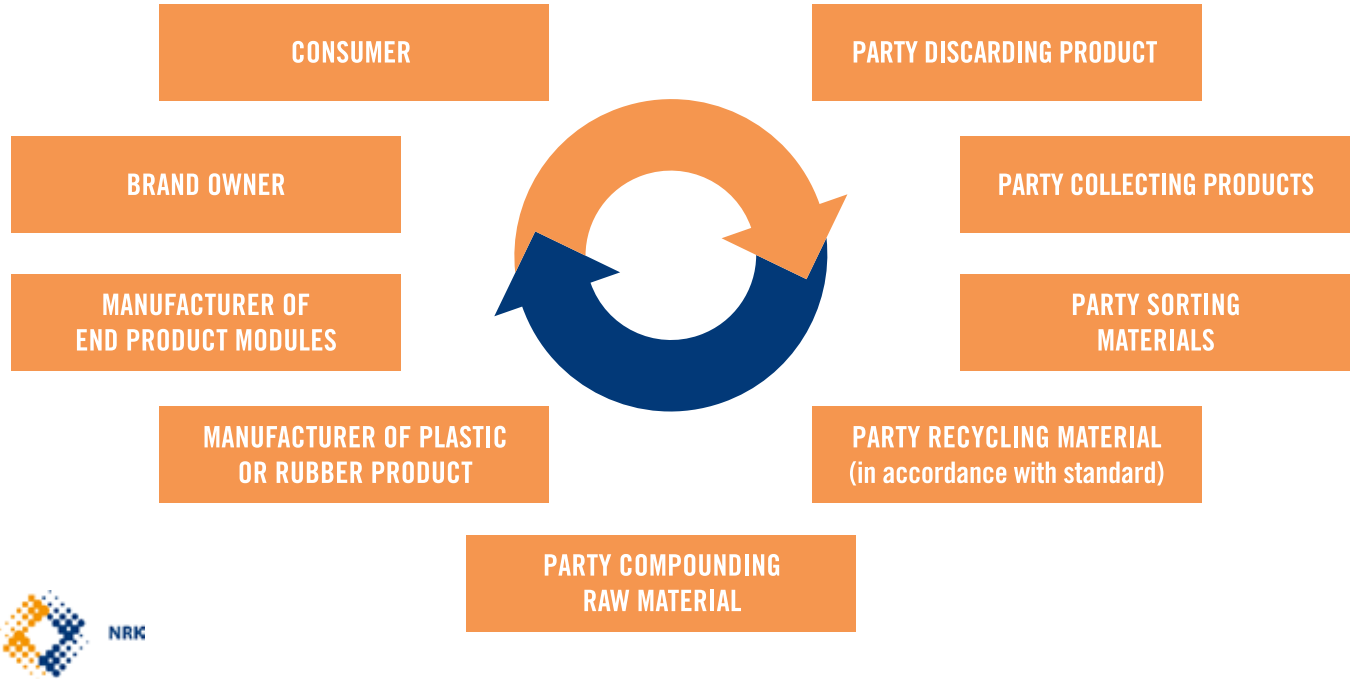
Financiers are invited to further support these parties from the perspective that long-term investments will be profitable. Recycling can thus gain more recognition at the urban or regional level. Clarification on what products can be made from waste from local environmental waste, bulky waste, and the packaging bin will increase the involvement of companies and consumers. Local producers can respond to this by making products from local raw materials. In particular, larger municipalities can make a quick start here with respect to permits and tenders. This is further elaborated in development direction 2, pertaining to circular purchasing. These new concepts must be further investigated and can provide input for the aforementioned sector plans. Elaboration will be tackled in consultation with the Transition Agenda for the Manufacturing Industry and the Top Consortium for Knowledge and Innovation on Smart Industries.

12	Intended result	Chain reduction includes the sector plans and is part of various hotspots
	Action holders	Ministry of Economic Affairs & Climate Policy, RVO.nl, HUBS and LABS, Centre for Sustainability, PSP Zwolle, Knowledge and Innovation Agenda, Transition Agendas
	Budget required	€ 50,000 (one-off); co-funding by the business community
	Timeline	2018-2022

DEVELOPMENT DIRECTION 2: INCREASED SUPPLY OF AND DEMAND FOR RENEWABLE PLASTICS

This development direction contains measures to scale up the demand for and use of renewable plastics. These recycled and renewable plastics can replace traditional primary, fossil plastics. In order to boost the market demand for renewable plastics, the companies involved and other principals must take more responsibility. Central government can facilitate this with government measures if necessary. In parallel, it is important for the supply of renewable plastics to grow along with the demand.

CIRCULAR PLASTIC & RUBBER CHAIN



Source: Dutch Federation of Rubber and Plastics Industry NRK

A. MORE DEMAND

In order to reduce CO2 emissions and keep more plastics in circulation, the demand from the implementing industry for recycled and renewable plastics must increase. To achieve this, the interconnectivity of four levers is crucial:

1. Price
2. From ownership to right of use
3. Circular purchasing
4. Extended producer responsibility (EPR)

1. PRICE

The price of oil and gas, and thus of most fossil plastics, has been so low in recent times that industry has not yet opted for the use of recycled or renewable plastics in their products. In order to increase the demand for renewable plastics, the price of using fossil raw materials (including the social costs of CO2 emissions) will have to go up. At the same time, positive incentives can foster the marketing of circularly designed products . It is important in the years ahead to find and implement financial incentives to get the market penetration of recycled and renewable plastics off the ground. According to a recent study conducted by the Netherlands Environmental Assessment Agency (PBL), "Fiscal greening: tax shift from labour to resources, materials, and waste", a tax on the production of plastics, among other things, is more effective in putting a price tag on environmental damage than taxation downstream in the chain (consumption), as is a good pricing of incineration and export of plastic waste. The starting point is that there is reason to tax, if there are negative social effects that are not incorporated into the price of the product. In addition, the Social and Economic Council of the Netherlands (SER) is currently conducting an exploratory study into financial and fiscal incentives to strengthen the circular economy. The above-mentioned aspect is being examined further specifically for the plastic sector. If possible, an ex-ante evaluation of the below-mentioned pricing will be carried out, which will include the effect of the levies on national production, including the associated environmental damage (leakage to foreign countries) and the starting point of a level playing field.

Excise duties on mineral oils (and natural gas)

An input tax on mineral oils and natural gas in non-energetic use, the so-called feedstock levy, makes the production of fossil plastics more expensive compared to recycled and renewable plastics. The aforementioned PBL report (table 4.6) indicates that this involves more environmental damage than CO2 and that (part of) the potential environmental damage does not occur during manufacture but only during the waste phase. In this case, environmental damage occurs "downstream" in the chain, but it is there nonetheless.

Taxing energy use

If reuse and recycling of materials costs less energy than newly produced (virgin) plastics, a higher energy tax (for large consumers) will make the former cheaper compared to the latter. Whether this entails a net reduction in CO2 emissions on Dutch territory depends on the place of primary production.

13	Intended result	Research into the introduction or reinforcement of financial and/or fiscal incentives aimed at reducing energy consumption and stimulating demand in the Netherlands for renewable raw materials
	Action holders	Ministry of Infrastructure and Water Management, Ministry of Economic Affairs and Climate Policy, Ministry of Finance
	Budget required	€ 80,000 (one-off)
	Timeline	2018-2020

2. FROM OWNERSHIP TO RIGHT OF USE

The introduction of new systems into the economy makes sense at a time at which the price of plastics seems to be rising structurally as a result of government intervention or market developments. Assuming that the price of "first generation" plastics will indeed rise, it may be interesting for investors to "go long in plastics", such as for example in futures markets. They invest in obtaining ownership of plastic materials. These subsequently come onto the market as a "right of use" for a period of an X number of years. The price of the right of use can be differentiated and, for example, can be lower if the implementing industry is structurally more economical with these plastics due to attractive propositions. The choice, for example, of circular design or a cost-efficient return and processing system provides both investors and the industry with an economic advantage. The term of the right of use depends on the normal (economic) lifespan of the product portfolio.

[15] *Calculation of the interventions on the plastic packaging chain from the plastic chain project, work package financial-economic model, Netherlands Institute for Sustainable Packaging (KIDV) 2017*

The costs for obtaining the right of use consist of two components. First of all, the "carrying cost" of plastic, for a period of X years. In addition, the necessary costs to get plastic ready for use for another cycle. Producers have a direct influence on the reduction of the second component by making contractual agreements with users and designing products that are easier to reuse. Blockchain may possibly facilitate this in order to keep a grip on the materials. The result is a potential cost saving of dozens of percent on raw materials for new products. In addition, there is an economically interesting market for the existing waste stream of (suitable) plastics, because it is open to direct investments.

As an initiator, the banking sector can play an important role in organising and facilitating this new form of dealing with materials. They can act as a connecting party between companies and institutional investors and possibly also act as liquidity providers. The implementation of this idea is complex and requires perseverance. This can be explored further, to encourage relevant parties to set up one or more pilots. If they are successful, they can be scaled up to a fully-fledged system in which large institutional investors will invest. Some first steps have already been taken. The Amsterdam Metropolitan Area has launched an Excess Materials Exchange pilot, which has embarked on the valuation of residual flows.

14	Intended result	Exploration (2018-2019) and if positive then a pilot (2022) and scaling up (2025)
	Action holders	3 major banks, PGGM, insurers, Ministry of Economic Affairs and Climate Policy, Ministry of Finance
	Budget required	€ 60,000 (one-off)
	Timeline	2018-2019

3. CIRCULAR PURCHASING

It is the task of government and industry to purchase products and services in a more socially responsible way. A conscious choice for sustainable and circular options reinforces the demand for recycled and renewable plastics. However, this does not happen automatically. Circular procurement is already part of the Government-wide Approach to Socially Responsible Procurement (SRI). A number of aspects are important when it comes to socially responsible procurement . More than one hundred authorities are involved in this manifesto, and they have an exemplary function here. Nevertheless, circular purchasing deserves even more attention.

ECO labels and Green Deal Green certificates

First of all, it involves encouraging the use of recycled and renewable content in ECO labels and certificates. In the near future, purchases based on renewable materials will be prescribed in ECO labels. In addition, recycled content is included in the current Green Deal Green Certificates, where only bio-based content is currently being encouraged. In both cases it makes sense to add well-founded sustainability claims. In ECO labels and the Green Deal Green Certificates, it is worthwhile to include an incentive measure regarding "award points" for circularity, so that companies will score as high as possible.

15	Intended result	More purchasing of recycled and renewable content
	Action holders	Central government, Netherlands Enterprise Agency RVO, Dutch Federation of Rubber and Plastics Industry NRK, Association of the Dutch Chemical Industry (VNCI), PlasticsEurope
	Budget required	-
	Timeline	2018

[16] *See Action Plan 2015-2020 and Manifesto MVI 2016 to 2020.*

Green Deal on circular purchasing

Organisations can join the Circular Purchasing Green Deal II, which fosters innovations in the use of renewable plastics and scales up procurement pilots. In this Green Deal, producers work together with public and private purchasing organisations to scale up. A great purchasing potential is available here, given the fact that municipalities and (lower) authorities are also involved. Promising leverage projects are being set up to encourage both the direct purchase of renewable plastics by producers and the indirect purchasing by users. Companies can distinguish themselves in the market through circularity or use of materials. Clients can include circularity more manifestly in their award criteria and also include quality aspects in the assessment of registrations. The Procurement Act offers various instruments to challenge market parties to seek out the boundaries and innovate. Central government will work on upscaling two plastic-oriented procurement pilots for the construction sector (plastic reuse in the civil engineering sector) and the furniture and/or packaging industry.

16	Intended result	Scaling up of purchasing pilots
	Action holders	Central government, MVO Nederland, NEVI [purchasing and supply management network], PIANOO [public procurement expertise centre], local and regional authorities, municipalities
	Budget required	-
	Timeline	2018-2020

Circular purchasing within the EU

Through circular procurement, Dutch companies are also placing the applications of recycled and renewable plastics on the European and international agenda. To maintain a level playing field, the whole of Europe needs to work with circular procurement. In the coming years, the government will continue to promote the importance of "Green Public Procurement" (GPP) in the EU. In addition, governments set the example by including recycled and renewable plastics at the European level in public tenders. GPP can be raised nationally via large cities. It is also useful to build on ongoing initiatives for knowledge sharing at European level, for example SPP Next: a leader group of implementers from a number of European member states. It is also important to continue the discussion at policy level between departments of "like-minded member states" for uniform criteria for circular procurement. Subsequently, this can be raised together with the European Commission in order to further standardise Green Public Procurement at European level through the EU. The action is further concretised in the international agenda under development direction 4.

4. PRODUCER RESPONSIBILITY (EPR)

The demand for recycled and renewable plastics can increase when the industry and importers take more responsibility for their products. Given the necessary transition to a circular plastic economy, this should go beyond just the responsibility for the (cost of) recycling of plastic materials. EPR may be able to focus even more on quality and value in the chain. After all, the goal is to bring plastic products back as high as possible on the Ladder of Circularity in the cycle through reuse, repair and disassembly.

More focus on quality

By shifting the focus on circular design to the front end of the production process, plastic manufacturers and importers can promote the use of recycled and renewable plastics and minimise social costs in the chain. Another design, the use of alternatives, and new high-grade applications of residual or renewable materials can contribute to creating added value for producers and consumers. This means that the designer will play a role in technical development, in creating acceptance among users, and in co-developing systems that close material loops. For example, producers and partners in the product chain can find a way to use and apply recycled and renewable products and materials in a high-grade manner.

Research into the intensification of existing EPRs.

The current EPR systems must be evaluated, shortcomings must be analysed, and possibilities for intensification in the four priority sectors must be explored, so that the so-called "white spots" can be mapped out. This should be followed by an examination of the possibilities for tackling these white spots (intensification) and the profit that can be achieved both in terms of raw materials and financially in further chain closures. The aforementioned sector plans can serve as input here, as can the possibilities that are researched and elaborated under development direction 1. This will provide a picture of the benefit to be obtained in the future. With regard to construction, the first priority is to examine the synergy with the proposals arising from the Transition Agenda for the Construction Industry. For example, an EPR for façade construction, which also focuses on the return logistics and recycling of plastic frames and insulation materials. Producer responsibility with regard to the automotive industry could be extended with the promotion of circular design. The automotive industry can also initiate research and measures based on this producer responsibility to reduce microplastics in the environment as a result of wear and tear on car tyres.

This research can use the lessons learned from the evaluation of the Framework Agreement on Packaging II (ROV II) and the experiences with other EPR schemes within the EU, such as EPRO and EXPRA, where knowledge is available in the area of producer responsibility for packaging. The initiatives the European Commission is taking in the context of the EU Circular Economy Package and the "Strategy on Plastics" are also examined. In addition, it is important to explore how the adapted EPRs can be laid down in legislation and regulations, at both the national and European levels.

17	Intended result	A plan with concrete proposals for intensifying existing EPR schemes
	Action holders	Central government (incl. Human Environment and Transport Inspectorate, ILT), sectors / business community, and possibly other countries
	Budget required	€ 80,000 (one-off)
	Timeline	2018-2020

Expansion to new sectors

Social burdens resulting from littering end up partly being absorbed by the taxpayer or are not resolved. This means there is only limited incentive to come up with innovations and instruments that prevent, reduce or clean up litter. However, the expansion of EPR to disposable products that cause plastic litter reinforces this incentive. The most common disposables found in litter are, in addition to packaging, especially cigarette filters (cigarette butts), chewing gum, and balloons.

The proposal is that cigarette butts be dealt with first. Attempts have been made in the past to address the litter from cigarette butts together with the tobacco industry . The voluntary contribution of a tobacco manufacturer then collapsed due to the Dutch interpretation of the international WHO Framework Convention on Tobacco Control. Regardless of this international treaty, it is inconceivable that tobacco producers are not taking responsibility for the collection and processing of cigarette butts, which consist mostly of plastics and break down badly and slowly in the environment. That is why it is desirable to investigate possibilities for expanding producer responsibility in the area of plastic litter. Following the study of cigarette butts, chewing gum is the next issue that needs to be dealt with.

18	Intended result	Study of EPR introduction for cigarette butts
	Action holders	Ministry of Infrastructure and Water Management, Ministry of Health, Welfare and Sports, companies/sector, National Litter Strategy
	Budget required	€ 50,000 (one-off)
	Timeline	2018-2019

B. MORE SUPPLY

If only the demand for renewable plastics increases, the result is scarcity and uncertainty among producers about the security of supply and the continuity of their raw materials. The supply of recycled and renewable plastics must therefore grow simultaneously and proportionately with the demand development rate. There are six "buttons" that can be pressed to realise this:

1. Incineration and export of recyclable plastics
2. Recycled / renewable content
3. Mechanical recycling
4. Chemical recycling
5. Bio-based plastics
6. Carbon Capture and Utilisation (CCU)

[17] *Green Deal Clean Beaches*

1. INCINERATION AND EXPORT OF RECYCLABLE PLASTICS

Although energy is recovered from incineration, this processing method results in a negative climate effect (CO2 emissions) and an extra demand for oil for the new production of plastic. If we want to move forward towards a circular economy, we must discourage the incineration of recyclable plastics through an increase in waste taxation so that in 2030 recycling is the standard and incineration is much more expensive than recycling. Plastics which are recyclable from a technical point of view will only be incinerated if no other option is available.

In the long run, sufficient options are available to recycle plastics and to bring these materials back into the cycle through alternative methods such as chemical recycling and CCU (see below). The level of the waste tax must provide sufficient incentives for disposers of plastics to stop sending recyclable plastics for incineration. Only in exceptional cases can these waste materials still be sent for incineration. The demonstration of non-recyclability can, if desired, be supported with a certificate. A potential strategy to this effect should pay attention to the feasibility and enforcement of such a certificate and the reduction of administrative burdens.

Transformation of waste incineration plants

The existing waste tax on landfill and incineration is increased and expanded in the coalition agreement. In line with this, a possible export tax is also put on the agenda to prevent the leaking of plastic waste outside the collection-sorting-reuse/recycling circuit. The Netherlands Environmental Assessment Agency PBL confirms the need for an export tax to prevent the leaking of recyclable waste streams abroad. It is recommended to investigate how high the waste tax should be to make incineration of recyclable plastics unattractive vis-à-vis reuse and recycling. In addition, the potential should be explored, as should the remaining volume of non-recyclable plastics. During the transition process, waste incineration plants are only open to those plastic streams where material retention is not an option. At the same time, it is important to involve the waste companies and waste incineration plant operators in the upcoming and subsequent policy tightening in a timely manner. This will enable them to adjust their long-term business strategy and to initiate the conversion or downgrading of their plants. This has been further elaborated in the social agenda.

19	Intended result	Exploration of the potential and elaboration of the increase in waste materials, for more supply of recyclate
	Action holders	Central government (incl. Human Environment and Transport Inspectorate, ILT), Dutch Waste Management Association VA
	Budget required	€ 60,000 (one-off)
	Timeline	2018-2019

2. RECYCLED AND RENEWABLE CONTENT

Overview of available applications

products, but this does not yet generally occur. An overview of products that can be made from recycled or renewable plastic in the short term will be available in 2018. The list of products to be made in the short term from recyclate or renewable plastic can serve as input for the sector plans. The same overview also contains a list of applications which are more complicated to make from recycled material or renewable material and thus need longer time. In 2018 Netherlands Institute for Sustainable Packaging (KIDV) will be working on an inventory of restrictive laws and regulations concerning the use of recycled and renewable content in packaging and exploring possible solutions. This can be used as a basis for further study.

20	Intended result	Overview of applications that can be made in the short and longer term from a certain percentage of recycled or renewable material
	Action holders	Ministry of Infrastructure and Water Management (incl. Human Environment and Transport Inspectorate, ILT), Dutch Federation of Rubber and Plastics Industry NRK, producers, Netherlands Institute for Sustainable Packaging (KIDV)
	Budget required	€ 60,000 (one-off)
	Timeline	2018-2019

European covenant and guidelines for recycled and renewable content

At the European level, guidelines should also be drawn up, so that a level playing field is quickly created for those products for which the feasibility of manufacture with an (increasing) percentage of recycled and/or renewable content has been demonstrated. For this purpose, it is advisable to make agreements via a European covenant about blending in specific product chains and possibly between producers in the chain and governments at the national and European levels. In this respect, use can be made of the experience gained in chain projects implemented under the Chain Agreement for the Plastic Cycle.

21	Intended result	EU covenant on plastic applications with certain percentage of recyclate and/or renewable materials
	Action holders	Ministry of Infrastructure and Water Management, European Commission, Philips, Unilever, other producers, Nedvang [From Waste to Resources programme]
	Budget required	€ 80,000 (one-off)
	Timeline	2019

3. MECHANICAL RECYCLING

The current capacity for mechanical recycling needs to be expanded. Only then is it possible to place more renewable plastics on the market and prevent plastics from disappearing unnecessarily into the incinerator. The industry is expected to market not only more, but also a better quality of recyclate. The supply must match the increased demand. The waste tax, as mentioned in development line 1, will enable waste processors and recyclers to invest more in expanding the recycling capacity and in improving the treatment process. In this way recyclate will soon meet the quantitative demand and the quality requirements of the industry using it. We can learn from innovations that result from the collaboration between knowledge institutions and (SME) industry, united in the Research and Education RKI Platform, which includes Polymer Science Park, Windesheim, Stenden, and Hogeschool Zuyd.

It is now up to the recycling industry to develop an action plan for the mechanical recycling of plastics. The action plan must contain proposals to increase capacity from 250 kton (2016) to at least 660 kton (2030). This action plan must be developed in conjunction with the Action Plan for Better Quality and Environmental Efficiency (development direction 3). It should address the potential and the suitability of mechanical recycling for types of plastics and applications. In addition, the required capacity expansion and the way in which this capacity can be realised in the light of the steadily growing demand and quality requirements from the market must also be addressed.

22	Intended result	Mechanical recycling action plan, incl. hard recycling target of 50%
	Action holders	Dutch Federation of Rubber and Plastics Industry NRK, Dutch Waste Management Association VA, Plastics Europe, knowledge institutes, Nedvang [From Waste to Resources programme], Waste Fund
	Budget required	€ 60,000 (one-off)
	Timeline	2018

4. CHEMICAL RECYCLING

Chemical recycling potentially makes it possible to break down plastic into the smallest chemical building blocks (gasification) from which monomers and polymers can then be made, or, to a lesser extent, to molecular intermediate steps from the plastic production chain (depolymerisation, pyrolysis). Chemical recycling therefore offers a solution for the decreasing quality of the polymer chains after each cycle, for non-mechanically separable plastics, for plastics contaminated with glue residues (and the like), and for plastics containing undesirable dyes and other additives. In chemical recycling, all carbon-based contaminants and additives are broken down to the same smallest chemical building blocks as the plastic itself. Heavy metals and halogens (chlorine, bromine) are separated and these can also be reused. Chemical recycling also offers prospects for the complete phasing out of harmful, now prohibited additives that are included as "legacy" in the plastic waste, without slowing down the transition to the circular economy. The current problem is that the environmental benefits and economic benefits of chemical recycling do not always outweigh the energy consumption and the associated costs. A wide variety of technologies is possible, each with its own potential in terms of environmental efficiency, applications, and scale. Direction is necessary to ensure that the permitted technologies provide a good environmental return and the required quality. New lock-ins must be prevented. Chemical recycling is currently possible on a small scale; the commitment is to increase its application.

Sample project - PS loop
The Polystyrene recycling plant in Terneuzen is a good example of innovation. A chain of companies has united in a cooperative to share costs and revenues. Polystyrene insulation material (polystyrene foam) with the brominated flame retardant HBCD is processed in Terneuzen with the aid of an extraction technique into clean polystyrene and pure bromides, ready for reuse. This recycling technique is groundbreaking. The Basel Convention has labelled it as "best available" recycling technology for processing HBCD-containing waste. It is expected that the plant will be put into use at the end of 2018.

Sample project - Ioniqa
Ioniqa Technologies has developed a cost-effective recycling process that makes "the eternal PET bottle" possible. The technology is based on Smart Magnetic Materials, with which all types and colours of PET Polyester can be infinitely recycled into "virgin quality" PET raw material. This is a reclaimed raw material that competes in price and quality with original fossil raw material. The first Ioniqa plant will be opened in the Netherlands at the end of 2018.

CHEMICAL RECYCLING ACTION PLAN

From 2018, a chemical recycling plan will be worked out in conjunction with the chemicals sector. Among other things, the parties are working out an R&D programme for the next five years. The plan also contains a clear definition of chemical recycling, in which the choice of chemical recycling has been established. It shows which types of chemical processing of end-of-life plastics materials belong to what extent in a national innovation strategy for the long term (solvolysis, depolymerisation, catalytic pyrolysis and gasification). This also includes a public-private support programme for startups, so that they can make the step towards upscaling and market introduction with new, promising innovative technologies. This public-private R&D programme can link up with a covenant to be concluded between the national government, environmental organisations, and the chemical industry, possibly even in the EU or Northwest European context. This covenant must contain agreements on concrete targets for renewable content in the feedstock of the plastics producers and concrete agreements regarding private and public investments in R&D with regard to chemical recycling. The action plan must also link up with the Chemical Recycling Roadmap of the Netherlands Institute for Sustainable Packaging KIDV (to be available in early 2018). It will develop the path to scaling up, together with a broad consortium of potentially involved parties. The chemical sector has set itself the goal of achieving at least 10% chemical recycling by 2030, but with a combined effort this percentage could be increased.

23	Intended result	Action plan for Chemical Recycling, incl. Innovation strategy and PPP support programme
	Action holders	Plastics Europe, Stenden, Association of the Dutch Chemical Industry (VNCI), Top Sector Chemicals, Netherlands Institute for Sustainable Packaging (KIDV)
	Budget required	€ 80,000 (one-off)
	Timeline	2018-2019

DEVULCANISATION OF RUBBER

In recent years, investments have been made in recycling rubber. Twente University of Technology and Windesheim University of Applied Sciences, together with the industry, are carrying out various projects aimed at the devulcanisation of rubber. In particular, they aim to process rubber after the separation of rubber, cotton, and metal in such a way that it is suitable for reuse in a wide range of applications. The goal for two projects is:

- To develop the devulcanisation process for car tyre rubber as a pilot and to draw up a best practice for the use of devulcanised rubber in new motorways;
- To further develop the extruder devulcanisation process and make a manual on how to compound and process this material.

The projects support the development of technology for chemical recycling. The introduction of devulcanisation needs support for upscaling.

24	Intended result	Technology available for reuse rubber based on market demand
	Action holders	Dutch Federation of Rubber and Plastics Industry NRK, RecyBem, Twente University of Technology, Groningen University, Windesheim
	Budget required	€ 50,000 (one-off)
	Timeline	2018

5. BIO-BASED PLASTICS

A. ACTION PLAN FOR BIO-BASED PLASTICS

In addition to mechanical and chemical recycling, the production of plastics from biotic raw materials also reduces the production of fossil plastics. Bio-based plastics generally have the same chemical properties as fossil plastics. These bio-based plastics can be divided into biodegradable (see (b.) below) and non-biodegradable. The latter group is created by converting biotic raw materials (grass, algae, etc.) in a chemical process into raw materials equal to or comparable to the raw materials used for the production of fossil plastics; the difference is that they are made from biotic material rather than petroleum or natural gas. Like fossil plastics, they are basically recyclable. Due to the faster renewal of the biotic raw materials, the CO2 footprint of bio-based plastics is generally lower than that of fossil plastics. The ecological footprint ultimately depends on the extent to which it displaces food production on scarce agricultural land and puts pressure on (scarce) nutrients. Bio-based material has great potential in the plastics economy of the future, provided that the sustainability criteria laid down in the context of the Green Deal Green Certificates are met. From this point of view it is necessary to develop an integral assessment framework in 2018, comparable to that of chemical recycling. In the Bio-based Plastics Action Plan, governments and industry jointly make chain agreements aimed at a 15% growth in the current production of bio-based plastics by 2030.

25	Intended result	Overview of producers and products that are suitable for use in bio-based plastics, bio-based composites
	Action holders	Corbion, Ministry of Economic Affairs and Climate Policy, Dutch Federation of Rubber and Plastics Industry NRK, PlasticsEurope
	Budget required	€ 60,000 (one-off)
	Timeline	2018

BIOPLASTICS FROM WASTEWATER

B. BIO-DEGRADABLE PLASTICS

Some bio-based plastics have the property of ultimately breaking down into CO2 and water. For this group it is important to see in which cases they have added value. Biodegradable plastics have different chemical properties to those of fossil and non-biodegradable bio-based plastics. In general, they only break down under special circumstances, such as in an industrial composting plant (with a higher temperature and longer residence time). The use of compostable (EN13432 certified) plastics is especially worthwhile if there are "co-benefits". Even if the risk of emissions to the environment is high, for example in agricultural plastic, the choice of biodegradable plastics is more likely. An important condition is that these biodegradable plastics meet the biodegradability requirements of their environment, for example ISO 17556 regarding biodegradability in the soil. Under the above-mentioned Bio-based Plastics Action Plan, it is desirable to make an inventory of the best possible applications for biodegradable plastics. The bio-based plastics industry, recyclers, and composters can then jointly make clear agreements about certification, among other things.

26	Intended result	Agreements between market parties about the use and processing of biodegradable plastics
	Action holders	Ministry of Economic Affairs and Climate Policy, Dutch Federation of Rubber and Plastics Industry NRK, PlasticsEurope
	Budget required	€ 50,000 (one-off)
	Timeline	2018-2019

C. OXO-DEGRADABLE PLASTICS

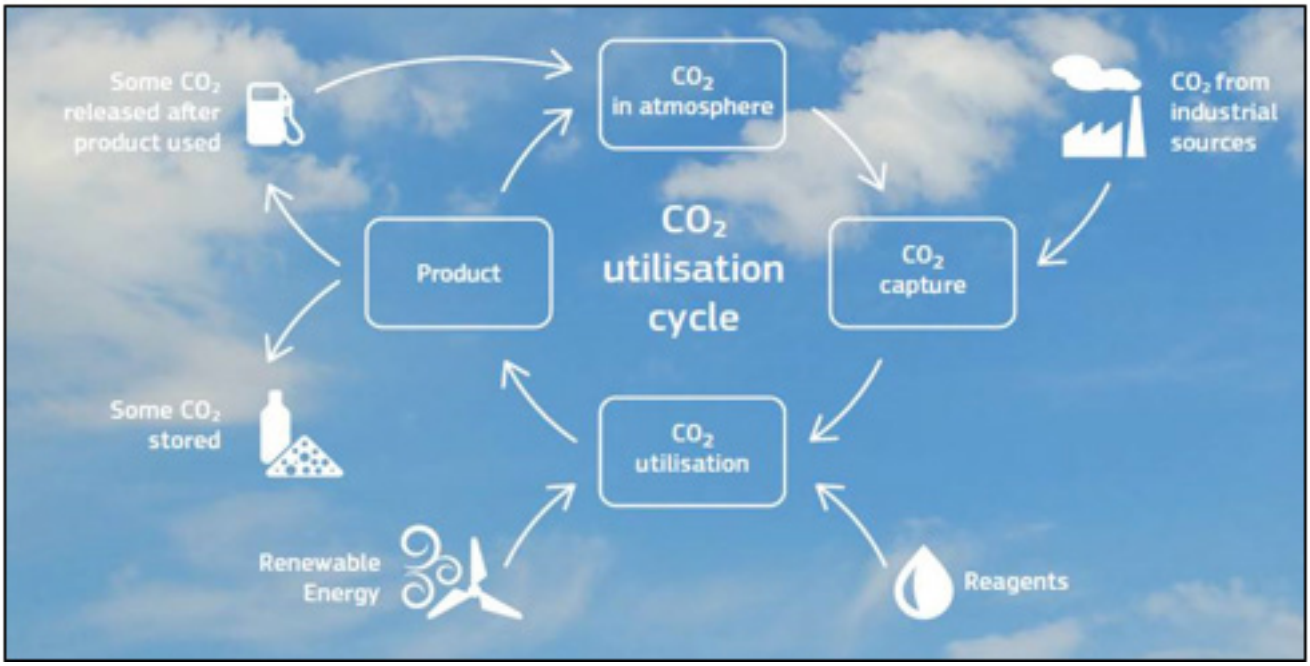
Oxo-degradable plastics appear to be plastics that remove harmful effects on the environment, but the opposite is the case: they only break down into microplastics. As a result, they still have a negative impact on the environment. To avoid misunderstandings among consumers, the use of oxo-degradable plastics needs to be phased out so that they disappear from the market. This is expected to be in line with the vision of the European Commission ("EU Strategy on plastics").

27	Intended result	Phasing out oxo-degradable plastics
	Action holders	Ministry of Infrastructure and Water Management
	Budget required	-
	Timeline	2018

[18] *Source: https://vito.be/nl/media-events/nieuws/van-co2-naar-plastics-met-vlaamse-technologie*

6. CARBON CAPTURE AND UTILISATION

Carbon Capture and Utilization (CCU) is aimed at capturing CO2 from point sources, such as factory chimneys or perhaps even from the ambient air in the future. It is then converted into useful applications, such as building blocks, into cement or building material, in greenhouses, and so on. This can be done using catalysts and biotechnological processes, which use enzymes or bacteria, and work with sustainable energy sources[18].



Source: European Commission

In addition to technologies for the direct use of captured CO2 emissions, there are also technologies where CO2 is indirectly applied. The use of catalysts is one of the biggest challenges in the application of CO2 as an economically attractive raw material for plastics. Nevertheless, CCU is already a promising technology for the future. LCA studies show that the use of CO2-based polymers offers clear environmental benefits compared to conventional plastics. These advantages can be further expanded by pursuing routes for the direct and indirect use of CO2. In addition to CO2, other greenhouse gases, such as methane, may also be used as raw materials for plastics.

28	Intended result	Exploration of possibilities for CCU
	Action holders	Ministry of Economic Affairs and Climate Policy, Top Sector Chemicals, Association of the Dutch Chemical Industry (VNCI)
	Budget required	€ 60,000 (one-off)
	Timeline	2019

[18] *Bron: https://vito.be/nl/media-events/nieuws/van-co2-naar-plastics-met-vlaamse-technologie*

DEVELOPMENT DIRECTION 3: IMPROVED QUALITY, HIGHER ENVIRONMENTAL EFFICIENCY

The proper recycling of plastics calls for clean (mono) flows. These can then be reprocessed cost-efficiently to a quality that the industrial sector is willing to use as a raw material again. Actions and interventions are needed to significantly improve the current quality and the environmental efficiency of plastic recycling and thus to meet the demand. An optimal collection and sorting system in combination with a clear policy supports that. In order to achieve this, incentives are needed throughout the entire chain, aimed at improving the quality of use, developing an efficient collection-sorting-recycling chain, and creating greater confidence in the quality of recycled and renewable plastics.

A. QUALITY ACTION PLAN

In 2018, a chain-wide action plan must be drawn up for the quality of plastics, addressing the following issues:

- Setting up standards for recyclate with different "grades", so that recycled plastics can compete with virgin plastics on the basis of quality and application possibilities and also be consistent in terms of quality and quantity;
- Drawing up guidelines for the use of "track and trace systems", such as markers and watermarks;
- Differentiated fees for collection (and sorting) financed from the waste management contribution paid by producers and importers to producer organisations under the various EPR schemes, depending on the quality (and contamination):
  - Higher collection allowance for municipalities whose plastic waste is cleaner and more suitable for recycling;
  - Producers and importers pay a lower waste management contribution if the marketed products are circularly designed and well recyclable (including being free from harmful substances) and/or contain recycled content as raw material.

29	Intended result	Action plan for quality
	Action holders	Parties associated with the Netherlands Enterprise Agency, Nedvang [From Waste to Resources programme], Association of Netherlands Municipalities VNG, Dutch Federation of Rubber and Plastics Industry NRK, National Institute for Public Health and the Environment RIVM, Netherlands Institute for Sustainable Packaging KIDV, Ministry of Infrastructure and Water Management
	Budget required	€ 60,000 (one-off)
	Timeline	2018

B. MORE AND BETTER SORTING

To guarantee the desired quality and availability of recycled material on the Dutch market, the quality of the sorting capacity must be expanded and improved. A "More and Better Sorting" Action Plan to be drawn up jointly between stakeholders should form the framework for this. The plan will contain standards for as many clean streams as possible that meet the market demand. More and better sorting concerns all plastics. The following issues need to be reflected in the plan:

1. MORE SORTING CAPACITY

More sorting capacity is a prerequisite for making the market pull towards recyclate successful. Developments on the supply side and demand side directly impact one another. Interconnectivity provides the security that both the demand and supply side need. The development of separation and recycling technology to achieve higher quality standards and good incentives for high-grade recycling is essential. This plan is supported by the construction of a number of new sorting plants, spread throughout the Netherlands in the period 2022-2025. Such plants must meet the new minimum sorting requirements, tailored to market demand and based on the most advanced separation technologies available in 2018-2020. As a result, the incineration and export of non-recyclable and so-called non-reusable plastics will become a thing of the past. This sets a new standard for plastic sorting in Europe and the old DKR standards are primarily no longer the guiding principles. The sorting centres are chosen in such a way that they fit into a smart logistics chain of collection-sorting-recycling-demand-driven use in products. In accordance with the above, the Government will include the new sorting standards in waste regulations in 2018 to support these investments[19].

More sorting systems at municipal or regional environmental waste sites and an increase in the number of environmental waste sites, in addition to the associated enforcement, are necessary to further support this quality incentive. Other aspects of a more optimal collection system for (plastic) waste materials and the connection between environmental waste sites and, among other things, thrift shops under the framework of "Circular Craft Centres", are addressed in more detail in the Transition Agenda for Consumer Goods.

2. SORTING BASED ON QUALITY CRITERIA

From 2020, a sorting obligation on the basis of quality criteria must be introduced. This prevents recyclable plastics from disappearing unnecessarily in the incinerator. At the same time, it encourages the disposers to collect plastic materials in as pure a form as possible. Consideration can be given to including a maximum pollution standard in the action plan "More and better sorting", which explores how this can be anchored in regulations and in enforcement and supervision. A good quality assurance system is desirable. Unsorted plastics should no longer be covered by the Waste Shipment Regulations[20], so exporting will no longer be a cheap alternative.

3. DEFINITION OF WASTE/NON-WASTE AND RECYCLING

Clarity is a requirement for recycled plastics to meet the conditions for "end-of-waste" as the waste legislation states; only then can they be brought onto the market. One of the conditions for the "end-of-waste" status is that the material complies with the applicable legislation. In this respect, REACH is particularly relevant. This requires access to expert knowledge about plastics in waste streams. The marketable residues resulting from a conscious production process and intended for a regular market are in principle not covered by the waste regime. This means that it is possible, under certain conditions, to market renewable and recycled plastics as "non-waste". Regulations need to be adapted whereby thinking in terms of waste and residual flows is redirected to thinking in terms of reuse. Prior to this, the definition of recycling must be clear. Recycling can only take place if the recycler transfers the recycled material to a producer for "next use". Clear agreements must be made about this, preferably in an EU context.

This requires research into new national (waste) legislation and regulations, better implementation of existing legislation (including the revised EU waste legislation) and innovation in enforcement and supervision. For new (waste) legislation, we will have to find a basis in an EU context.

4. OPTIMAL COLLECTION AND SORTING SYSTEM

The collection and sorting system in the Netherlands should focus on the highest possible quality of the final output towards recycling companies. Separation at source or post-separation will in any case have to contribute to this. Innovations in both separation at source and post-separation will ultimately determine the most cost-efficient collection and processing methods in the long term. This issue, which is broader than just the topic of plastics, is being tackled further and elaborated in the Transition Agenda for Consumer Goods.

[19] Such as the National Waste Management Plan (LAP3): New waste plan for more reusable raw materials

[20] European regulations for the transport of waste, the European Waste Shipment Regulation (WSR).

Source: Basfoto

WASTE TREATMENT

30	Intended result	Action plan for more and better sorting
	Action holders	Ministry of Infrastructure and Water Management, Association of Netherlands Municipalities VNG, Dutch Waste Management Association VA, BRBS Recycling, Dutch Federation of Rubber and Plastics Industry NRK Recycling, Royal Netherlands Association for Sanitation and Waste Management NVRD, Nedvang [From Waste to Resources programme
	Budget required	€ 100,000 (one-off)
	Timeline	2018-2019

C. DEMAND-DRIVEN STANDARDS FOR SECONDARY RAW MATERIALS

Product managers use "standards" when developing new products. Integrating the circular design and use of recycled material in such standards is a good step to take, so that this method is automated in day-to-day operations and the application is simplified. These standards must be comparable to the current "grades" for virgin materials. They ensure that recycled plastics can compete with virgin ones on the basis of consistent quality and quantity. To this end, the industry is working with the Netherlands Human Environment and Transport Inspectorate (ILT) and the Dutch standardisation organisation NEN to develop a plan for demand-driven standards for renewable raw materials, after which these standards can be placed on the agendas of CEN and ISO working groups for broader implementation.

31	Intended result	A "Dutch Technical Appointment" (NTA) for recyclate.
	Action holders	Dutch Federation of Rubber and Plastics Industry NRK, NEN, Human Environment and Transport Inspectorate (ILT), the business community, Waste Fund
	Budget required	€ 50,000 (one-off) (excl. Tool)
	Timeline	2018-2019

DEVELOPMENT DIRECTION 4: STRATEGIC (CHAIN) COOPERATION

Only when there is sufficient confidence in the entire product-material chain, can there be a good "match" between the supply of and demand for renewable plastics. This is also apparent from the (evaluation of) the chain projects of the Chain Agreement for the Plastic Cycle. The purpose of this transition agenda is to expedite. This can be achieved by making much more and better use of efforts that are already underway. By actively responding to such efforts, creating new connections, and creating trust, innovative projects can continue to grow and gain momentum. The conscious steering of new connections between stakeholders results in opportunities for new innovative chain projects.

Organisational development is an important instrument for substantiating the transition and realising the necessary reversal in organisations. Internal coordination is essential for a successful external chain approach, especially if we switch to system-oriented supervision, and the essential requirements need to be met earlier in the chain. This point has been further elaborated in the "social agenda".
In order to continue promoting the new connections and innovative chain projects, three themes have been developed with a number of underlying actions:

1. Chain management and transparency
2. Innovation and upscaling
3. The international perspective

1. CHAIN MANAGEMENT AND TRANSPARENCY

A. SETTING UP A NEW PLATFORM

The current platform Chain Agreement for the Plastic Cycle must be transformed into a physical and virtual platform enabling parties in the chain to join forces with respect to circular innovations and chain collaboration. The financing is done jointly by governments, industry, and knowledge institutions. The platform could be linked to a centre of expertise for plastic materials, where knowledge and innovation is shared with relevant stakeholders. Knowledge about the composition and separation of plastics, knowledge of additives and pigments that have been added. Insights about alternative materials and about legislative aspects such as REACH and "end-of-waste". This centre can advise companies on circular designs and business models that contribute to making the plastics chain more sustainable. Such an expertise centre could be an efficient substantiation of the expansion and intensification of extended producer responsibility. The Netherlands Institute for Sustainable Packaging (KIDV) may be a good model for the development of such an expertise centre for all plastics.

32	Intended result	Faster dissemination of best practices, insight into technologies, business models, upscaling perspective, feedback, and acceleration
	Action holders	Business community, government, participants (of the current) platform
	Budget required	€ 100,000 (per annum). Co-financing
	Timeline	2018-2022

B. VOUCHER SCHEME

In 2015 and 2016, the chain projects set up under the Chain Agreement for the Plastic Cycle successfully implemented a "voucher scheme". Parties in the chain could register jointly. They were subsequently supported for a maximum of one year by an independent supply chain manager, "paid from the voucher scheme". This helped the companies in an exploratory process around a concrete circular issue. This type of voucher scheme is a good way to promote private chain cooperation. That is why a follow-up to the current projects will be put on the agenda in 2018 and/or new projects will be initiated to help chain parties arrive at (or boost) strategic cooperation. The establishment of cooperatives can also help in this respect. Best practices serve as inspiration and a basis for subsequent chain projects. Chain transparency is stimulated in this type of process by the stipulation that lessons learned from the projects should be shared widely.

33	Intended result	Achieving circular successes by cooperating chain partners and exposure of those best practices. Acceleration in upscaling.
	Action holders	Ministry of Infrastructure and Water Management, Ministry of Economic Affairs and Climate Policy
	Budget required	€ 100,000 (per annum). Co-financing by participating companies
	Timeline	2018-2022

2. INNOVATION AND UPSCALING

It is important to pay additional attention to the innovations that can accelerate the transformation of the plastics chain and also to scale up such innovations. Experimenting, expediting, and institutionalising play a role in the dynamics during a transition. Four topics that should ensure acceleration have been worked out below.

SMALL WINS AND EARLY WARNINGS

A first step is to identify, support, and scale up small initiatives ("small wins") and new signals ("early warnings") that have a major impact. This approach focuses on taking small but meaningful steps with visible results to ameliorate the major social issues. The "small wins" and "early warnings" include profound changes involving drastically different views, problem definitions, and action perspectives. Consecutive "small wins" can result in large-scale changes by activating booster mechanisms. The same applies to picking up new signals that can have major consequences for a system change in the plastics cycle. A start is made with gaining insight into "small wins" and "early warnings" that are aimed at prevention.

34	Intended result	Trend analysis, incl. upscaling and implementation plan
	Action holders	Ministry of Infrastructure and Water Management, relevant businesses
	Budget required	€ 100,000 (per annum). Co-financing by participating companies
	Timeline	2018-2019

FINANCIAL INSTRUMENTS FOR CHAIN COOPERATION

To close the plastics cycle, innovation in plastics must be promoted. Startups and SMEs need organisational and financial support in the chain. To this end, the instruments of the national government and Netherlands Enterprise Agency RVO need to be transparent and accessible to the business community. Such instruments include the MIA/VAMIL tax schemes, but also other private funds that can be actively called upon, such as the Doen Foundation. Another option for attracting financial resources and supporting the transition to a circular plastics chain could be specific CE private equity parties. At the same time, new forms of organisation and financing are an interesting way to distribute the costs and benefits in the plastics chain equally among partners, such as the PS Loop project (see earlier in the document), involving a cooperative of chain partners sharing the costs and benefits of the pilot.

35	Intended result	Exploring new organisational and financing arrangements to realise scale with solutions found for distribution of risks and costs/ benefits in the chain
	Action holders	Ministry of Infrastructure and Water Management, Ministry of Economic Affairs and Climate Policy, Netherlands Enterprise Agency RVO, Ministry of Finance, Sustainable Finance Lab, Platform for Sustainable Financing of the DNB, Community of Practice Financial Institutes, Natural Capital
	Budget required	€ 60,000 (one-off)
	Timeline	2018-2019

SEPARATED COLLECTED PLASTICS, READY FOR FURTHER SORTING

IMPLEMENTING EXPERIMENTS

In order to scale up and create speed, educational establishments such as universities and secondary vocational training institutions need to be linked to "experimental spaces" / "breeding grounds" (also called labs and hubs). Breeding grounds can grow into "Silicon Valleys", where more innovations can be created and scaled up. This requires long-term public and private commitment; at the same time, linkage with education is a crucial success factor (e.g., the Polymer Science Park in Zwolle, the 3D Makers zone in Haarlem, the Centre for Sustainability). In the first instance, a connection is made with the Labs/Hubs, where local and provincial governments fulfil an important supporting role in connecting those types of parties and make space available for these activities. In the spring of 2018, a list will be drawn up of Labs/Hubs that offer interesting linkage opportunities in terms of circular plastic recycling. Setting up, connecting, and scaling up are central. Inspiring and promising innovations can then be disseminated and scaled up from the region. In order to scale up innovations, companies and financiers must be committed to those labs/hubs, as an interface between companies and sustainable financiers. A "dragons den" can be organised for this.

36	Intended result	Insight into the usage value of labs/hubs and the establishment of educational institutions in relation to these labs/hubs. Successful "Dragons Den" for financial support for scaling up innovations from these hubs/labs.
	Action holders	Regional educational institutions/development companies, Municipalities, Provinces, Ministry of Economic Affairs and Climate Policy, Ministry of Infrastructure and Water Management, Centre for Sustainability, OenO-VANG.
	Budget required	€ 80,000 (one-off)
	Timeline	2018-2019

3. THE INTERNATIONAL PERSPECTIVE

The transition to the circular (plastic) economy in the Netherlands will not succeed if this is not followed in Europe and the rest of the world. The plastic cycle will have to be closed everywhere to prevent unnecessary CO2 emissions and to combat plastic soup. Moreover, the circular economy offers jobs worldwide, especially in countries where people depend on expensive imports or have limited earning power and poor infrastructure. That is why the government, the business community, NGOs, and knowledge institutions in the Netherlands will have to work together to sow the "seeds of the circular economy" worldwide. In Europe to create favourable market conditions, to garner broad support for the adjustment of European regulations (such as Ecodesign, the EU Strategy on Plastics), and to create a level playing field for our innovative industry. In the rest of the world to reduce and prevent ecological disasters with plastic soup and to realise the SDGs, contributing to a more stable world . The Dutch business community can thus scale up the circular innovations globally. That is why it is vitally important to invest in the world around us. In chain cooperation, but also in concrete political and economic activities.

The establishment of chain cooperation with countries outside the EU must subsequently result in an international circular economy in which ecological and social impacts are no longer passed on to others. To realise a worldwide circular plastic economy, the following actions have been identified from three perspectives.

AGENDISING AND INFLUENCING

- Priority is given to the joint influencing of European member states through an EU lobbying strategy to achieve a good implementation of the EU Strategy on Plastics and to create broad support for topics that we want to see regulated at European level, such as prevention measures, use of recycled/renewable content, GPP reinforcement, investments in chemical recycling (H2020, ESIF), harmonisation, and intensification of EPR schemes. In addition, we need to work on the integration and implementation of a plastic product policy (Ecodesign) within the European framework. International networks such as UNEP (including Global Partnership on Marine Litter), OECD, and G20 can be used for this purpose;
- Multinationals must be informed about the transition agenda for plastics. They could then join forces with the national government to disseminate knowledge about the circular plastic chain, while also creating the possibility for scaling up new innovations;
- Preventing the unnecessary use of plastic, tackling plastic leakage, and chain cooperation should be incorporated into trade agreements and programmes aimed at development cooperation. This also concerns concrete turnkey projects;
- The Dutch commitment is important at the global level. Under the "Basel Convention", work is being carried out at a global level on (cross-border) waste policy, with specific attention also being paid to the plastic pollution of the oceans. In this forum, the Netherlands can make a case for the worldwide application of circular economy principles with respect to the substantiation of waste management in third countries. In the context of SAICM (chemicals and waste programme), the opportunities for plastic recycling and the possibilities of investment in innovative technologies (such as chemical recycling) for the period after 2020 could be worked out, which will result in the elimination of very harmful substances while concurrently advancing the circular economy.

[21] *Relationship with SDGs 1 (poverty), 6 (clean water), 9 (innovation), 11 (sustainable cities), 12 (sustainable production and consumption), 13 (climate), 14 (water), 17 (partnerships).*

FINANCING AND SCALING UP

- Between 2020 and 2025, we will examine which Horizon2020 applications are worthwhile in the purview of a public-private R&D programme for chemical recycling. This will take place in collaboration with the Top Consortium for Knowledge and Innovation in the Chemical sector. A similar process can be explored for the Bio-based Plastics Action Programme in relation to the Top Consortium for Knowledge and Innovation for the Bio-based Economy;
- For the financial support of the plastics chain, Netherlands Enterprise Agency RVO supplies input to the "Support to Circular Economy Financing" group of experts. Dutch companies can provide challenges and input to RVO;
- Given the scale of this international transition, it is worthwhile appointing a "special envoy for the circular economy", which can put both the Dutch State and the Dutch business community in a good position. This is to allow the ideas behind the circular (plastic) economy in Europe and the rest of the world to take root, but also to optimally position Dutch innovative business in this context;
- The public-private platform Holland Circular Hotspot (HCH) promotes and supports the international deployment of Dutch knowledge and expertise relating to the circular economy. HCH contributes to an international market for Dutch leaders and promotes the implementation of a circular plastic economy abroad. Companies can check in with HCH as a demonstration project for foreign countries. On the other hand, HCH is also putting up-to-date knowledge and experience on the agenda in the Netherlands. HCH is taking the lead in setting up Innovation Deals in a European context, using available dynamic standards as indicated by the EU. HCH is also used to create partnerships between front runners in different countries, for which they are organising an inbound mission in 2018.

COLLABORATION

- UN Environment (UNEP) is working on a resolution in the coming years to prevent plastic pollution of the oceans;
- This resolution is being submitted to the United Nations Environment Assembly (UNEA) and actions will emerge at a global level. In addition, the Netherlands is actively engaged in the work of the Global Partnership for Marine Litter (GPML). An attempt can be made to link up with these initiatives;
- To stimulate sustainable socio-economic development in other countries and to prevent the burden from being shifted to people and the environment, good initiatives and projects must be brought to the attention of the international community in order to be taken up collectively. E.g., the concept of the Clean Urban Delta Initiative (Rio de Janeiro, 2015) and the recent experiences with the implementation of the "Memorandum of Understanding on Waste & the Circular Economy" with Indonesia (November 2016);
- The actions set out in the Transition Agenda should be linked to (in particular) SDG 12, aimed at sustainable production and consumption. This will boost the efforts being expended by the European business community and support communication with individual citizens. Elements from the Transition Agenda for plastics could be put on the agenda of a side event hosted by HCH at the HLPF SDG summit in July 2018;
- Foreign companies can learn a lot from the Dutch CIRCO methodology. Sustainable ambassadors of Dutch multinationals can train their foreign counterparts to further disseminate this methodology through a "Train the Trainer" training programme;
- In anticipation of an amendment of the European regulations, Europe is opting for a more regional approach. Cooperation is being sought with other member states that are at the forefront of the circular economy;
- It is a good idea to position new innovations and other demonstration projects from the circular plastic economy at Circular Economy events, for example during the CE forum in Antwerp, February 2019. In 2018 applications can be submitted to organise an international Circular Economy Plastics Summit in 2021. In 2017, this CE or Plastics summit could be discussed in Davos with sustainable leaders present there.

37	Intended result	The Dutch pursuit of a circular economy for plastics is acknowledged, appreciated, and where possible enforced on an international scale
	Action holders	Ministry of Infrastructure and Water Management, Ministry of Economic Affairs and Climate Policy, Ministry of Foreign Affairs, where necessary and possible, together with other European countries, HCH, European plastic networks
	Budget required	-
	Timeline	2018-2021

SOCIAL AGENDA

This social agenda reviews the social side of the desired social change in and towards a circular (plastic) economy. After all, the transition doesn't just involve the efficient use of raw materials and the task of protecting the environment or strengthening the economy. The transition may be more of a societal and therefore social task, in which human behaviour is decisive. The citizen as entrepreneur and employee, as producer and consumer. Every individual has, to a greater or lesser extent, a co-responsibility for this transition. This must be acknowledged and accommodated in the process.

When working in the circular plastics industry, pride, craftsmanship, entrepreneurship, quality and commitment are central. Employees from this sector contribute to a sustainable society. It means that the transition provides them with opportunities, but at the same time it leads to changes in working conditions, work climate, and operating procedures.

We will consecutively address the labour market (effects) of the transition, the role of employer and employee in the plastics chain, and the role of learning in education and practice. We don't want to reinvent the wheel here. In recent years, many relevant studies and advisory reports have been published that affect the implementation of this (social) Transition Agenda for Plastics. These include recommendations on social entrepreneurship, the craft economy, the "skills agenda", robotisation, and working and learning in the future.

The actions and interventions described above have consequences for employment, the required knowledge and skills, and the organisation of companies in the Netherlands. In addition to the four sectors that are central to this plan, the chemical industry and the waste sector will also be affected by the development towards the circular plastic economy. It is prudent for a company or organisation that works towards a circular business model to actively and openly seek dialogue with its own employees, including works councils and trade unions.

For each sector we will discuss the consequences for:
1. The labour market and employment opportunities
2. Training programmes and skills
3. The internal organisation of companies and the organisation of companies in (regional) networks

According to expectations, the consequences for the labour market will be different for the (basic) chemical sector, the plastics and rubber industry, the industrial sector, and the recycling sector. These are first described below. Subsequently, we zoom in on the consequences for training programmes and organisational development in companies.

1. LABOUR MARKET AND EMPLOYMENT

CHEMICAL INDUSTRY

Without the transition, the Dutch chemical industry will grow by about 1.5% annually on account of the increasing demand for plastics. We assume that this growth will be limited to 1% through prevention and economical use (development line 1). Given the expectation that the climate targets will impact the CO2 price, it will be attractive to opt for chemical recycling instead of fossil oil and gas, and for the addition of biotic raw materials in the production of new plastics. In the distant future, CO2 or methane could possibly be added as raw materials (CCU). However, this still requires a lot of research and possibly also a lot of investment in adaptation and expansion of plants. At the same time, oil and gas producing companies will focus more than ever on the production of plastics rather than fuels. Raw materials are purchased from other sources. This requires less investment from the chemical sector in exploration and more in strategic cooperation with other chain partners. Employment opportunities in exploration will decrease, but employment in the supplying recycling and bio-based plastics industry will grow. It means that there is relatively little change within the chemical industry in terms of type of work and working conditions. In addition to R&D, the chemical industry has to invest in training in particular. Employees need to be trained so that they gain knowledge of recycled and bio-based raw materials as a new "feedstock" for the plants. People must be versed in new innovative technologies for chemicals (use of catalysts) and biotechnology (use of enzymes and bacteria). Purchasers must receive different instructions and acquire more knowledge of the recycling market and the bio-based plastics industry.

38	Intended result	Study of the reorientation of the chemical industry to another market positioning and effects on employment (in terms of quantity and quality)
	Action holders	Plastics Europe NL, Association of the Dutch Chemical Industry (VNCI), Confederation of Netherlands Industry and Employers VNO-NCW, Top Sector Chemicals, chemical companies, Port of Rotterdam, Groningen and Zeeland Seaports, Holland Bioplastics, TNO
	Budget required	€ 60,000 (one-off)
	Timeline	2018-2019

PLASTIC AND RUBBER MANUFACTURING INDUSTRY

The plastic and rubber processing industry employs around 50,000 people. The companies (mainly SMEs) produce a wide variety of modules and (end) products for applications in industry, trade, construction, the packaging industry, and consumer use. The (indirect and direct) exports amount to more than 65% and have grown by an average of 3% in recent years. The transition requires an adjustment of the orientation of the companies in the material and product chain.

Due to specialisation, increasing quality requirements, and close cooperation and data/knowledge exchange with chain partners and knowledge institutes, the work in the companies is changing rapidly. All in all, the educational level in the sector is increasing. Whereas the lower vocational training level used to dominate, the secondary vocational education and professional higher education levels are gradually becoming the rule. The need for knowledge, training and permanent development is increasing. Automation and robotisation set new requirements for employees and for the business model of the companies in this sector. But there is a need for more knowledge among employees about the behaviour of recycled and bio-based plastics and the changing demand from the implementing industry (also concerning plastics without substances of very high concern). This calls for specific training, not only for technically skilled workers, but also for marketing and sales staff.

39	Intended result	Studies of the labour market effects for the plastics and rubber processing industry in the Netherlands, based on the developments outlined above, a growing demand for recycled and bio-based plastics, and the demand for high usage value of plastics based on standardisation and certification
	Action holders	Dutch Federation of Rubber and Plastics Industry NRK, Plastics Europe, Confederation of Netherlands Industry and Employers VNO-NCW, Social and Economic Council of the Netherlands (SER), Association of the Dutch Chemical Industry (VNCI), NEN [Dutch standardisation organisation], Natuur en Milieu, Ministry of Infrastructure and Water Management
	Budget required	€ 60,000 (one-off)
	Timeline	2018-2019

IMPLEMENTING INDUSTRY

The implementing industry in the four sectors named above will have to adapt: from the development of mass production to production, replacement, repair, and "tailored" refurbishment. This requires more investments in refurbishment factories for returned discarded plastic products because producers are increasingly selling products as a service. In addition to the well-known chains of the implementing industry, new markets will undoubtedly emerge in the circular plastic economy. The growth of 3D printing is going to change the market in any case. Producers are shortening chains through 3D printing, the Internet of Things, and blockchain technologies. They attempt to strengthen their connections with consumers through the decentralised repair and replacement of parts. As a result, production and repair are set up much in a more decentralised, digital, and small-scale manner to meet a demand that is based on "customised products" and "just in time", without costly storage. Actively engaging in such efforts will create new opportunities for the Dutch labour market. Fewer products will have to be imported, while repair shops and organisations emerge that offer assistance with services for plastic products. This will generate, e.g., new jobs for consultants to assist in lease agreements or mechanics to replace parts. All these developments offer prospects for new jobs for higher education graduates, people with a lower level of education, and people with labour market disadvantages (see Transition Agenda for Consumer Goods with regard to the "Circular Craft Centres"). Investment in training (see below) will subsequently continue to generate new jobs at the lower end of the labour market[22].

[22] *Source: Prof. Dr R.W.B. Blonk, Organiseren van een inclusieve arbeidsmarkt [Organisation of an inclusive labour market]*

40	Intended result	• Research into the possibilities and significance of 3D printing, "Internet of Things" and blockchain technology for employment (less mass production, more tailor-made production). • Research into the effects of chain shortening on the creation of and shift in employment opportunities.
	Action holders	Ministry of Economic Affairs and Climate Policy, Top Sector Smart Industries, Top Sector High-tech Systems and Materials, Netherlands Bureau for Economic Policy Analysis CPB, Statistics Netherlands CBS, TNO, Confederation of Netherlands Industry and Employers VNO-NCW, Social and Economic Council of the Netherlands (SER), regional LABS and HUBS, municipalities
	Budget required	€ 60,000 (one-off)
	Timeline	2018-2019

RECYCLING SECTOR

In the years ahead, the current waste and recycling sector will focus more on recycling and "resource management". At some point, recyclable plastics are no longer incinerated. Waste incineration plants can no longer count on foreign waste to compensate for the decreasing amount of waste streams to be incinerated. Elsewhere in Europe, more and more is being recycled and the demand for recyclate is increasing considerably, partly as a result of European climate policy. The waste sector must therefore transform into a mechanical or chemical recycler to further develop into an international raw materials broker. Robotisation will play an increasing role in the processing of discarded plastics, as a result of which working conditions will be cleaner.

Waste and recycling companies cannot get around developing a strategy on how they want to adapt their business models. They must enter into a dialogue with their works councils, trade unions, the government, and financiers to explore how they can bring about the business transformation. At the same time, it would be prudent for municipal and commercial collection and recycling companies to discuss with their works council and the trade unions how they can involve employees in the process. In this process, talents and creativity are used and new career paths (from work to work) are considered and experimented with. A good example is the bin man in Utrecht who is developing into a materials expert.

41	Intended result	• Widely supported strategy among waste companies regarding the transformation from waste incinerator to recycler and commodity broker. • Internal dialogues with employees to deploy talents and increase the scope for innovation.
	Action holders	Dutch Waste Management Association, Royal Netherlands Association for Sanitation and Waste Management NVRD, Confederation of Netherlands Industry and Employers VNO-NCW, Natuur en Milieu, Association of Dutch Municipalities VNG, national government
	Budget required	€ 60,000 (one-off)
	Timeline	2018-2019

2. TRAINING AND SKILLS

All the aforementioned developments have consequences for the curriculum of the basic courses (from lower vocational training to academic higher education) and for internal training and coaching ("learning on the job"). There is a growing need for craftsmanship, i.e., the development of "crafts 2.0". Those with low educational qualifications are valued and can once again be proud of the craft they practice. In the course of their profession, they are supported by new technologies, such as robotics, which foster high(er) productivity, quality, and better working conditions.

There also needs to be a focus on a strong interface between practice and education. A good example is the Polymer Science Park (PSP) in Zwolle. The plastics technology programme at Windesheim UAS is linked to SME companies that can use the lab available there for their experiments and innovations. For Windesheim, this affiliation ensures the required work placements with the same companies. As in Zwolle, municipalities and provinces throughout the country can play an excellent role in establishing such long-term connections. However, companies can also make more and better use of sector funds for employee training, ERDF and R&D sector funds. It would be good if the partitions between the different funds were to disappear.

[23] *Incl. companies that still have waste incineration plants in use.*

42	Intended result	• Develop crafts 2.0 by investing in curricula for pre-vocational secondary education, lower vocational education, secondary vocational education • Support from municipalities and provinces for the development of Circular Polymer Valleys, following the example of PSP in Zwolle • Decompartmentalisation of R&D sector funds
	Action holders	Ministry of Education, Culture and Science, Association of Dutch Municipalities VNG, Association of Provincial Authorities IPO, Het Groene Brein
	Budget required	€ 60,000 (one-off)
	Timeline	2018-2020

3. ORGANISATIONAL DEVELOPMENT

transformation of the plastics chain can take root deeply in organisations and create action perspectives for each actor. This makes organisational development into an important instrument for shaping the transition and realising the necessary reversal in organisations. Internal coordination is essential for a successful external chain approach. It is only possible to strengthen the value of plastic in organisations if the requirements of the product and sustainability manager, the marketer, the buyer, and the financial manager are compatible. Companies can stimulate this by strengthening the role of the sustainability manager, internally placing the chain approach on the agenda, and incorporating circularity into the work process, the routines, and the structure.

B-CORPS

In order to break through behaviours, regimes, routines, and structures that hinder circular thinking and action, clear management from the top is desirable and set down in the organisational format. A better world and entrepreneurship can go very well together. The basis is a circular "mindset" regarding process and content, always and everywhere in the organisation. Working together on the economy of the future, through Benefit Corporations (B-corps), whose European head office is located in Amsterdam. B-Corps apply stringent social criteria and excel in terms of environmental impact, transparency, and corporate governance. More and more companies realise that consumers nowadays not only want to buy good products, but also insist that the companies contribute to a better world. The Social and Economic Council of the Netherlands (SER) has put forward this kind of company as an inspiring example[24].

THE NATURAL STEP

"The Natural Step" is a useful tool for companies to reformulate ambitions. It is aimed at making a restorative contribution to the environment and society, and at eliminating a negative impact. The carpet manufacturer Interface has successfully used this tool and produced striking results. The management literally asked employees for help: "How can you contribute to this objective based on your expertise?" This led to ideas for economical use of raw materials, energy and water, for new plastic products, processes, and business models. Employees will realise these innovations themselves, often in collaboration with chain partners or with companies from other sectors. A sense of pride arises if you can collaborate together in achieving both a better operating result and a more sustainable world. An ambitious vision results in greater involvement among employees, which boosts sustainable innovation, but also fosters sustainable employability and cost savings (e.g., lower absentee rates), a better reputation, and a future-proof organisation.

CIRCULAR VALLEYS

To attract the right expertise and organise internal incentives for innovation, plastic companies (from chemicals to the implementing industry) can also make more connections with other companies in their environment. This doesn't just entail the bundling of forces in Circular Valleys, such as the Transition Agenda for Consumer Goods aims to do, for example, with textile and the 3D Makers zone field lab in Haarlem, as referred to under development line 1. It also involves setting up a regional network with several small SME companies, such as Philips in Drachten. In addition, more attention must also be paid to quality management in the internal organisation. Company profits are directly linked to user quality, lifespan, and recyclability. This means that marketing and sales staff get a different perspective internally on what they sell.

[24] *Source: https://www.ser.nl/nl/publicaties/adviezen/2010-2019/2015/sociale-ondernemingen.aspx*

43	Intended result	Strategy for internal organisational change based on The Natural Step and B-Corp., and outcomes of the SCP/PBL study on how to deal with a change of mindset and behaviour in the CE
	Action holders	Interface, Unilever, Confederation of Netherlands Industry and Employers VNO-NCW, MVO Nederland, Zero Impact Plastics, Natuur en Milieu, national government, B-corp NL, BIT-IenM
	Budget required	€ 100,000 (one-off)
	Timeline	2018-2020

KNOWLEDGE AGENDA AND INNOVATION AGENDA

The action agenda and the social agenda generate many knowledge issues and innovation tasks. A list has been drawn up of fundamental and applied scientific knowledge questions. To bring about the transition to a circular plastic chain, these questions need to be put on the agenda of the knowledge institutes, the research institutes, and educational establishments.

It is crucial for knowledge to be developed, shared, and put into practice. Synergy in and coherence between the various circular (research) activities should result in a shared knowledge base for the development and acceleration of innovations (start-ups) and the marketing of such innovations (upscaling).

1. LINKING KNOWLEDGE AND INNOVATION AGENDAS FOR TOP SECTORS

Companies, knowledge institutions, and governments are organising and financing joint research and innovation in the Top Consortia for Knowledge and Innovation (TKIs) of the Top Sectors Programme. The following agendas are important for this circular plastics agenda:

CHEMICAL TOP SECTOR:

Issues from this CE agenda are being specifically addressed in the following roadmaps of the chemical industry:
- Chemistry of Advanced Materials, Task 1: Designing materials with the right functionality, Task 2: Thin films and coatings, Task 3: materials for sustainability.
- Chemical Conversion, Process Technology and Synthesis: Task 1: Making molecules efficiently, Task 2: Making molecules from biomass, Task 3: Making functional molecules.
- Chemical Nanotechnology and Devices: Task 2: Cradle to cradle 2.0

TKI - BIO-BASED ECONOMY:

The research agenda of the TKI - Bio-based Economy comprises four programme lines, three of which (Thermal, Chemical catalytic, and Microbiological conversion) are focused on the development of conversion technology from biomass to product. The fourth programme line (Solar capturing) is aimed at directly converting CO2 and water into other chemical substances using sunlight.

TKI - ENERGY AND INDUSTRY:

According the research agenda of the TKI - Energy and Industry it is particularly relevant to seek connection with programme line 3, Circularity, CCUS for the closing of the carbon chain. Our agenda also includes actions in the area of CCU. In addition, the TKI - Energy and Industry is working on the use and sharing of cogeneration for (primary) functions in companies. It is important that the developed technologies can also be applied on a smaller scale by (groups of) SMEs.

TKI - CLICKNL:

The TKI - ClickNL (Top Sector Creative Industries) comprises a Circular Society programme line. The transition from ownership to use is put on the agenda in this programme line. The functionality of products and services, the fulfilment of needs, and thus fundamental values in society are examined from another perspective. This focus is aligned with the National Science Agenda routes for the Circular Economy (2.3 Consumer and Society) and Smart Industry (1B Smart Services). In this context, CLICKNL is also implementing the CIRCO project, in which companies get to grips with the lessons from the Circular Society programme.

SMART INDUSTRY AGENDA AND TKI - HIGH-TECH SYSTEMS AND MATERIALS:

The TKI - High-tech Systems and Materials focuses on the Smart Industry agenda and the Materials Transition Programme. The so-called Field Labs model has been developed for the Smart Industry theme . The field lab "ThermoPlastic Composites Netherlands (TPC NL)" focuses on both fundamental and applied research into production with thermoplastic composites. "The Garden" field lab conducts research into Product Lifecycle Management, i.e., digital collaboration in the value chain to manage and improve the development, production, maintenance, and management of products and services in the entire process from idea to eventual recycling. The "3D Makers Zone" field lab offers infrastructure, knowledge, experience, networks, on-going projects, and knowledge about application in production processes of 3D printing of plastics, the Internet of Things, robotisation, and Big Data. In addition, several other labs and hubs can accelerate the transition to the circular economy in the plastics chain.

After joining a TKI, companies and research institutes in the plastics sector qualify for a Public-Private Collaboration project grant (for partnerships) and the MIT scheme (regional promotion of innovation within the SME sector and Top Sectors) for the implementation of this plastics agenda. Various instruments are available, including consultancy projects, feasibility projects, R&D collaboration projects, knowledge vouchers, TKI Innovation brokers, and network activities.

In the implementation of this transition agenda in 2018, ways will be explored, in collaboration with the industry, to more specifically direct the scheduling of the TKIs with respect to the circular plastic chain. This will also help to focus the top sector policy more strongly on the economic opportunities offered by the social theme of energy transition/sustainability.

44	Intended result	Collaboration between the TKI knowledge and innovation agendas, the CE knowledge and innovation agenda, and the Transition Agenda for plastics
	Action holders	Ministry of Economic Affairs and Climate Policy, TKI, Ministry of Infrastructure and Water Management
	Budget required	-
	Timeline	2018

2. INNOVATION POLICY

Innovation is not a linear process; it involves four phases: exploration, take-off, acceleration, and stabilisation. This is also reflected in the S-curve of the transition dynamics defined by Derk Loorbach. Within the innovation process, one part is focused on technology development, often using so-called Technology Readiness Levels (TRLs). Societal Readiness Levels (SRLs) have been developed as equivalent to TRLs and these provide an indication of the acceptance of an innovation by users and society. To accelerate this acceptance, a practical approach in which experimentation is central is of great importance. Giving this conscious thought and making use of the labs and hubs in which the knowledge and innovation questions come together can also expedite the upscaling process.

When scaling up, explicit attention should be paid to the small-scale application of new technologies. Shortening the "time to market" of new technology and making it suitable for SMEs gives a huge boost to innovation and CO2 reduction.

By linking case holders and/or problem owners from the business community to the development and elaboration of these knowledge and innovation tasks, the upscaling process can also be expedited. The same applies to pilots launched by the government. Answers and innovations can thus be used and scaled up immediately after being tested in labs and/or hubs. Linking the business community explicitly to the knowledge and innovation questions will maintain feedback loops and the dynamics. When an innovation is new, the innovation system around it is still under development. Only a limited number of parties are involved and the cooperation is still under construction. An additional advantage is that this fosters the adequate training of young professionals who are desperately needed to realise a circular economy.

[25] *Source: www.smartindustry.nl/fieldlabs*

In the Netherlands, research and development (R&D) is carried out by various organisations and financed from various sources, both public and private. The most important organisations are universities, colleges, research institutes, and companies. A generic innovation instrument is available that plastic entrepreneurs can use, such as the RDA and WBSO tax incentives and the innovation box. In addition, a range of instruments is available at the national level for sustainable innovations. Circular plastic entrepreneurs can also make use of this . In addition, various instruments are available at European level . For innovation in the plastics chain, the ambition is to make as much active use as possible of European Commission's largest research and innovation programme, Horizon 2020. This involves looking at bilateral cooperation projects with neighbouring countries and, if possible, cooperation within the Mission Innovation initiative (for carbon conservation).

The National Science Agenda and the Top Sectors Approach are methods that give more direction to research programming. The KIEM-VANG scheme operated by the VANG (From Waste to Resources) research and training programme is specifically available for the plastics chain. The following knowledge issues must be contracted out in the years ahead. In addition, research must be conducted into the concrete innovation taskings in order to strengthen the innovation system.

45	Intended result	Concrete innovation taskings, processed in a SWOT analysis
	Action holders	Netherlands Organisation for Scientific Research NWO, Centre for Sustainability, Ministry of Economic Affairs and Climate Policy, Ministry of Infrastructure and Water Management
	Budget required	€ 60.000
	Timeline	2018-2019

3. KNOWLEDGE ISSUES

The knowledge (and innovation) issues are classified according to the four development directions and must be prioritised, elaborated, and subsequently contracted out in 2018.

KNOWLEDGE ISSUES RELATING TO DEVELOPMENT DIRECTION 1: PREVENTION, MORE WITH LESS, AND THE AVOIDANCE OF LEAKAGE

FROM PRODUCT TO SERVICE

- Which revenue models from the circular economy are suitable for supply companies in the plastics sector, and in particular for the packaging, construction, automotive, and consumer electronics markets?
- Are the developed revenue models for the packaging industry also suitable for introduction in other plastic markets?
- Do these earnings models indeed result in more circular thought and action, and/or should relevant side effects be taken into account?

FROM LINEAR TO CIRCULAR DESIGN

- In what ways can the importance of circular design penetrate to all layers of production organisations? Are the current CIRCO tracks the right instrument for this purpose, or are there (also) other instruments that require attention? For example, Unilever's approach. And is this approach broadly applicable or do the construction, automotive, and consumer electronics markets require a specific approach in that context?
- Where are the focus points and specific opportunities for the circular design of plastic food packaging, including in the healthcare sector?
- How can product developers be encouraged to experiment with the use of fewer additives?
- Which nature-based products and materials are suitable for use in the plastics chain?
- What opportunities does education offer for increasing the level of knowledge about plastics at all levels? For example, relating to the origin of plastics, the plastic soup issue, the difference in and the advantages and disadvantages of bio-based versus biodegradable plastics.
- How can education contribute to preventing plastic leaks in the environment and increasing plastic recycling?
- How can fully-fledged circular design methods be embedded in education?

[26] *Source: https://www.rijksoverheid.nl/binaries/rijksoverheid/documenten/publicaties/2015/01/20/overzicht-van-de-nationale-middelen/overzicht-van-de-nationale-middelen.pdf*

[27] *Source: https://www.rijksoverheid.nl/binaries/rijksoverheid/documenten/publicaties/2015/01/20/overzicht-europese-fondsen/overzicht-europese-fondsen.pdf*

FROM ECONOMIC VALUE TO USAGE VALUE

- Is an overarching description possible for the usage phase of products?
- What are elements of an overarching calculation method for the added value of a product in the usage phase?
- What are the calculation factors for converting the usage value to euros?
- How should this usage value be designed to make it accessible to producers and consumers?
- How can the usage value (benefits) of a product be related to the ecological footprint (costs) of a product?

FROM ONE-OFF TO MULTIPLE-USE

- Are there overarching system characteristics that promote or prevent the transition from one-off to multiple-use?
- What are the greatest opportunities for replacing the production and use of disposable products with reusable products? And is it wise to focus on circular innovation in product design rather than in return logistics? Which regulations and market incentives can accelerate a transition from one-off to multiple-use?
- How can organisations organise strategic product management for products with multiple use phases, and who manages this process within the company?

FROM LONG TO SHORT CHAINS

- Where do the packaging, construction, automotive, and consumer electronics markets offer opportunities for shortening the plastic product chains by means of digitisation and 3D printing?
- Is the merger of "smart industry" and the so-called circular HUBS the best way to strengthen these innovative companies in their development or are other measures more effective? In this context, what can be learned from earlier "Silicon Valleys", "testing grounds", and other innovative networks that have arisen in recent years?
- What can encourage companies to limit stocks and search for "just in time management" systems? What risks can be eliminated for these companies?

DEVELOPMENT DIRECTION 2: INCREASED SUPPLY OF AND DEMAND FOR RENEWABLE PLASTICS

INCREASED DEMAND

- In the years ahead, to what extent (percentage) is it possible to blend renewable plastics, recyclate and bio-based materials into the production process?
- What can governments and large companies do to stimulate circular procurement in the packaging, construction, automotive, and consumer electronics markets? Which concrete projects can be initiated first??
- How can tenders be designed so that they can focus more on the choice of recycled and bio-based plastics for products to be purchased?
- What can the Netherlands learn from existing EPR schemes in other countries? What are the "best practices" and which successful elements should in any case be reflected in the EPR schemes that are yet to be introduced and/or intensified?
- How can the current EPR schemes for the automotive (EPV), consumer electronics (WEEE), and packaging (ROVII) sectors be intensified, so that producers take more responsibility for redesigning, repairing, and refurbishing products, and bring the recycled products and materials back into the cycle?
- How can extended producer responsibility for the recycling of plastic products in the construction sector be substantiated? And which starting points do current European and national regulations offer?
- Which countries are currently developing new EPR schemes? How can we join forces with these European leaders to create a level playing field for businesses?

INCREASED SUPPLY

- What is the proven quantity of plastic residue streams that can be processed via mechanical recycling with the current state of technology?
- Which market incentives encourage waste companies to bring mechanical recycling of plastic waste to a higher level (in terms of quality and volume)?
- In what ways can the mechanical recycling branch be further professionalised and knowledge and expertise be combined?
- For which plastic residue streams is there a particularly obvious chemical recycling method (solvolysis, depolymerisation, catalytic pyrolysis, gasification)? What are the possibilities for closing the loop via chemical recycling in terms of environmental efficiency, material retention, and cost efficiency?
- What R&D is still required for large-scale chemical recycling of plastics? What obstacles are there currently that stand in the way of large-scale use of chemical recycling? In what way can the instruments of the Top Sector Chemicals contribute to removing such obstacles?
- What is the potential of bio-based plastics and to what extent can it meet the demand for plastics from the packaging, construction, automotive, and consumer electronics sectors in terms of quality and quantity? In which cases do bio-based plastics have a comparative advantage over "virgin" fossil plastics because of their specific properties? Where can bio-based plastics replace fossil plastics in the short term, and how could this be encouraged?
- Which plastic products can be produced from biodegradable materials and also have a high social (environmental, economic, health) value? For example, applications in the food chain, medical applications or temporary underground plastic pipes.
- In which ways and by what methodology can targets be best set so that they grow with the technical possibilities offered by adding mechanically or chemically recycled and bio-based plastics?
- What can design mean for the deployment or marketing of waste and residual flows? How can we expand the range of products made from residual materials whose design holds great appeal to users?
- How can the quality of recycled and bio-based materials be determined in different phases and how can this be incorporated into the design and business model?
- How can design influence the perception of materials? And following on from this: How can the image of recycled materials be improved?

DEVELOPMENT DIRECTION 3: IMPROVED QUALITY, HIGHER ENVIRONMENTAL EFFICIENCY

- How can a material passport for plastic products be developed and introduced without this resulting in (excessively) high administrative burdens for the companies involved?
- composition of discarded plastic products and materials? Which regulations and market incentives are needed to take further innovation steps in that context? In this respect, a distinction must be made between packaging, construction, the automotive sector, and consumer electronics.
- How can we work towards standardisation of the quality of recycled and bio-based plastics ("grades")? What role do the business community and the government play in this?
- How can consumers and companies be better informed and encouraged to carefully separate plastic waste? What role do communication tools play?
- Which intervention strategy will help provide consumers with a clear action perspective for the separate collection of different types of plastics?
- What lessons can be learned from separating other waste streams in the Netherlands (glass and paper) and abroad (Germany and Belgium) in order to work towards increased and higher-grade collection, sorting and recycling of plastic materials? Does new robotics technology offer possibilities for realising a higher grading quality of plastics?
- Various strategies are in place for the development of "sustainable" products. How can these strategies be applied to plastic products and what are the consequences of the choices between the different strategies?
- How do we ensure ample opportunities for the recycling of plastics in relation to food grades?
- How can the multiple (economic, ecological, and social) value of products and services be determined? Which circular opportunities does this offer? How can the value of a product and the component materials be determined in different stages of their life? Is it also possible to determine the value on the basis of the use of the product rather than based on raw materials and labour?
- What role does the consumer play in creating circular products and services (participation, self-reliance, home producer), and how can circular design and creative professionals play a role in this?

DEVELOPMENT DIRECTION 4: STRATEGIC (CHAIN) COOPERATION

- What successful forms of chain collaboration that bring together the costs and benefits of innovative projects in the chain are there?
- In what way can local spatial planning policy effectively support the closure of the plastic chain?
- Which trends and innovative developments support the further closure of the plastics cycle? And how can parties best respond to this?
- Which are the best countries within and outside the EU for building a long-term relationship with to plant and distribute the "seeds of the circular economy"?
- In what way does the plastic soup issue also hold opportunities for the Dutch business sector, and specifically for the plastics sector?

INVESTMENT AGENDA

Private investments depend on market conditions, which are partly determined by the interventions that have been proposed for this purpose in the transition agenda. When estimating the required investments, it must be assumed that these conditions will be met in the years ahead.

The majority of the activities are based on co-financing. These amounts have not yet been made explicit. When reading this section it must be realised that this is a rough estimate.

DEVELOPMENT DIRECTION 1: PREVENTION, MORE WITH LESS, AND AVOIDANCE OF LEAKAGE

An amount of € 1,580,000 is required for the one-off actions in this development direction. The costs of the annually recurring actions amount to € 250,000.

DEVELOPMENT DIRECTION 2: INCREASED SUPPLY OF AND DEMAND FOR RECYCLED AND RENEWABLE PLASTICS

An amount of € 780,000 (one-off activities) is required for the activities in development direction 2. In addition, investments will also be required for the period 2018-2030 for the infrastructure and the capacity to increase and enhance the supply of recycled and renewable plastics on the market. This has been further elaborated under the heading "Additional investments".

DEVELOPMENT DIRECTION 3: IMPROVED QUALITY, HIGHER ENVIRONMENTAL EFFICIENCY

An amount of € 210,000 (one-off activities) is required for the activities in development direction 3. This does not include the investments in infrastructure and capacity mentioned below.

DEVELOPMENT DIRECTION 4: STRATEGIC (CHAIN) COOPERATION

An amount of € 240,000 (one-off activities) and € 200,000 for the annually recurring activities is required for the activities that fall under strategic chain cooperation. This does not include the costs for the international activities. The implementation of the actions and interventions related to development direction 4 not only requires local, regional, and national-level investments in the reinforcement of strategic chain and network collaborations, but also investments at the European and global levels. In some cases, this does not require any additional funds, since these activities are already taking place; it just calls for a different approach. Explicit details have not yet been developed.

SOCIAL AGENDA

The investments for the social agenda amount to € 400,000.

KNOWLEDGE AND INNOVATION AGENDA

The investments required for the implementation of the knowledge and innovation agenda will be covered within the existing budgets within the framework of the National Science Agenda, the Top Sectors, and the regular national and European budgets for knowledge and innovation, as described above. An amount of € 60,000 has been budgeted for detailing the innovation tasking for the Transition Agenda for plastics.

In the following table, all the activities required for expediting the circular plastic economy are further detailed into proposed roughly estimated amounts and a proposed time frame for implementation.

TA Plastics Action-intervention agenda & required budget				
	Actions & Interventions	**One-Off**	**Annual**	**Planning**
Development direction 1: Prevention, more with less, and the avoidance of leakage				
1	From product to service (inventorying)		€ 50.000	2018 annually up to 2022
2	From linear to circular design (sector planning)	€ 250.000		one-off, 2018/2019
3	CIRCO tracks to support sector plan		€ 200.000	2018 annually up to 2022
4	Circular design research focus area (development)	€ 500.000		2019
5	From economic value to usage value (development)	€ 460.000		one-off, 2018/2019
6	From one-off to multiple-use (inventorying)	€ 50.000		one-off, 2018/2019
7	Microplastics by conscious addition (phasing out)			2018-2019
8	Innovations for wear and tear (development)	€ 60.000		one-off, 2018/2019
9	Natural alternatives for SVHC (development)	€ 100.000		one-off, 2018-2020
10	From harmful to natural additives: biomimicry (development)	€ 60.000		one-off, 2019
11	From harmful to natural additives: rubber (development)	€ 50.000		one-off, 2018/2019
12	From long to short chains (organisation)	€ 50.000		one-off, 2018-2020
		€ 1.580.000	€ 250.000	
Development direction 2: Increased renewable supply and demand				
Increased demand				
13	Price incentives (insight)	€ 80.000		one-off, 2018-2020
14	From ownership to right of use (study)	€ 60.000		one-off, 2018-2020
15	Circular purchasing in Eco-labels and Green Deals (organising)	-		2018
16	Green deal circular purchasing II (organising)	-		2018-2022

17	EPR per sector (exploring intensification)	€ 80.000		one-off, 2018-2020
18	EPR expansion to litter	€ 50.000		one-off, 2018/2019
	Increased supply			
19	Incineration and export (exploration)	€ 60.000		one-off, 2018/2019
20	Application of recycled and renewable content (research)	€ 60.000		one-off, 2018/2019
21	EU chain covenant for recyclates and renewable materials (exploration)	€ 50.000		one-off, 2019
22	Action plan on mechanical recycling (drafting)	€ 60.000		one-off 2018
23	Action plan on chemical recycling (drafting)	€ 60.000		one-off, 2018/2019
24	Devulcanisation of rubber	€ 50.000		one-off 2018
25	Bio-based action plan (drafting)	€ 60.000		one-off 2018
26	Biodegradable applications (research	€ 50.000		one-off, 2018/2019
27	Oxo degradable (phasing out)	-		2018
28	Action plan CCU (exploration)	€ 60.000		one-off, 2019
		€ 780.000		

Development direction 3: improved quality, higher environmental efficiency				
29	Quality action plan (draft)	€ 60.000		one-off 2018
30	Action plan for more and better sorting	€ 100.000		one-off 2018/2019
31	Demand-driven standards (development)	€ 50.000		one-off 2018/2019
		€ 210.000		

TA Plastics Action-intervention agenda & required budget				
	Actions & Interventions	**One-Off**	**Annual**	**Planning**
	Development direction 4: strategic (international) chain collaboration			
32	Chain management and transparency (improvement)		€ 100.000	2018 annually to 2022
33	Chain projects (organising)		€ 100.000	2018 annually to 2022
34	Small win approach and early warnings (development)	€ 100.000		one-off, 2018/2019
35	Cost benefits in the chain (setting up)	€ 60.000		one-off, 2018/2019
36	Labs and hubs approach (setting up)	€ 80.000		one-off 2018/2019
37	International approach (scheduling)	-		2018-2022
		€ 240.000	€ 200.000	

	Social agenda			
38	Chemicals (reorientation)	€ 60.000		one-off 2018/2019
39	Rubber and plastics industry (exploration)	€ 60.000		one-off 2018/2019
40	Implementing industry (research)	€ 60.000		one-off 2018/2019
41	Recycling sector (strategy)	€ 60.000		one-off 2018/2019
42	Training and skills (planning)	€ 60.000		one-off 2018/2019
43	Organisational development (development)	€ 100.000		one-off 2018-2020
		€ 400.000		

The required investments per kton can be roughly estimated:

Required investments in capacity (in € million)			
	P	q	p*q
Waste collection facilities	1,5/100 kton	200	300
Sorting	15/100 kton	8,86	133
Mechanical recycling	100/100 kton	4,5-5,0	450-500
Chemical recycling	2,5/100 kton	250	625
Bioplastics[28]	250-300/75 kton	5	1.200-1.500
Total in period 2018-2030			2.458-2783
Total average annual investments in capacity			205-232

[28] It is expected that 5 plants, each with a capacity of approx. 75 kton - and with a diversity of production of BioPE, PLA, PF, PBS, PHA - will be required to produce 350 kton extra.

Knowledge and innovation agenda				
44	Connection of top sectors (coupling)	-		2018
45	SWOT / concrete innovation projects (overview)	€ 60.000		one-off, 2018/2019
		€ 60.000		
	Total budget required for activities	**€ 3.270.000**	**€ 450.000**	

This brings the provisional amount for the implementation of the one-off actions to € 3,270,000. This is a rough estimate; a more sophisticated prioritisation will spread the costs of the one-off actions over the years. The proposed annual campaigns also amount to € 450,000 per year.

ADDITIONAL INVESTMENTS IN INFRASTRUCTURE

Required Investments in capacity expansion with regard to increased supply, improved quality, and higher environmental efficiency

To be able to meet the increasing (qualitative) demand, investments will have to be made to increase the volume and raise the quality of collection and sorting efforts; eventually, this will lead to more investments in increased and better mechanical recycling, chemical recycling, and bio-based plastics.

Based on the previously set quantitative targets for the period 2018-2030, the following capacity expansion is required in terms of collection, sorting, recycling, and renewable plastics:

Required extra capacity (in kton)			
	2016	2030	Capacity growth
Collection (including waste collection facilities)	874	1760	886
Sorting	874	1760	886
Mechanical recycling	250-300	750	450-500
Chemical recycling	0	250	250
Renewable / bio-based plastics[29]	20	370	350

[28] *In the long term, this can also include the development of CCU.*