# NETHERLANDS INTEGRAL CIRCULAR ECONOMY REPORT 2021

## English Summary

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# Monitoring and Evaluation Circular Economy

This report has been produced in the context of the Work Programme on Monitoring and Evaluation Circular Economy 2019–2023. This programme is a collaboration, under supervision of PBL Netherlands Environmental Assessment Agency, between:

- Copernicus Institute of Sustainable Development (Utrecht University)
- CPB Netherlands Bureau for Economic Policy Analysis (CPB)
- Institute of Environmental Sciences (CML, Leiden University)
- National Institute for Public Health and the Environment (RIVM)
- Netherlands Enterprise Agency (RVO.nl)
- Netherlands Organisation for Applied Scientific Research (TNO)
- Rijkswaterstaat (Government Service for Roads and Waterways)
- Statistics Netherlands (CBS)

The Dutch Government aims to achieve a fully circular economy by 2050. The purpose of the Work Programme is to monitor and evaluate the progress made towards that objective and to provide the necessary knowledge for an informed policy process. For more information on this Work Programme, please see www.pbl.nl/en.

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An English translation of the Dutch full report is expected to be published later this year.

PBL Netherlands Environmental Assessment Agency is the national institute for strategic policy analysis in the fields of the environment, nature and spatial planning. We contribute to improving the quality of political and administrative decision-making by conducting outlook studies, analyses and evaluations in which an integrated approach is considered paramount. Policy relevance is the prime concern in all of our studies. We conduct solicited and unsolicited research that is both independent and scientifically sound.

# Main messages

***The importance of a circular economy***
*Many of today's nature- and environment-related problems can be traced back to the wasteful use of natural resources. This leads to pollutants being emitted to air, water and soil, which in turn have undesirable effects such as plastic soup in the sea, ecosystem degradation from mining, large mountains of waste and loss of biodiversity, among other things, due to monocultural farming and nitrogen deposition. These problems will become more pressing in the coming decades, due to the increase in global demand and utilisation of material resources (e.g. minerals, metals, fossil fuels, biomass). The increasing use of such resources and the interdependencies in the long international production chains will also increase the risks for supply and price volatility. Considerably more efficient use of the available material resources — using them more often and more intensively and increasing their lifespan — generally reduces the environmental problems and will improve security of supply.*

***Several trends for material resource use not moving in the right direction***
*Looking at how material resources are being used in the Netherlands and the effects related to this use, we found that various trends are going in the wrong direction. Although it is true that resource efficiency has increased, this has not led to a sharp reduction in the use of raw materials. Since 2010, the total use has hardly changed in the Netherlands. Moreover, Dutch consumption also requires more and more land in the production chain. In addition, the amount of landfilled waste has increased since 2014, 6 of the 7 overall national targets for waste are not expected to be achieved, and the supply risks for the Dutch economy have also increased. Manufacturers are running the largest supply risks because of their dependence on rare earth metals, cobalt, tungsten, tantalum, tin and indium. These critical metals are used, for example, in machines, in vehicle parts and electronics, and are important for the energy transition.*

***Together with other parties, the Dutch Government has created a basis and structure for achieving a circular economy in the Netherlands**.*
*In recent years, the transition towards a circular economy has been on the agenda of government authorities, businesses, citizens, NGOs and knowledge institutes in the Netherlands. The Dutch Cabinet's ambition to achieve a circular economy by 2050 has since been included in the Dutch Raw Materials Agreement co-signed by over 400 parties and elaborated in 5 transition agendas for the priority themes of Biomass and Food, Construction, Plastics, Manufacturing and Consumer Goods. Cabinet has indicated which clusters of policy instruments it intends to use to accelerate the circular economy transition. These clusters include legislation and regulations, market incentives, monitoring, knowledge and innovation, and producer responsibility. In doing so, a basis and structure has been created for the transition towards a circular economy with a public-private approach.*

***For many years, recycling and repair have already been part of the Dutch economy which, for the most part, still functions rather linearly**.*
*The number of companies focusing on circular activities is increasing. In recent years, substantial financial resources have been used in circular activities or innovations in various support instruments of the national government, such as the R&D tax credit (*Wet Bevordering Speur- en Ontwikkelingswerk *(WBSO)) and the Arbitrary depreciation of environmental investments (*Regeling Willekeurige afschrijving milieu-investeringen *(Vamil)). However, the number of companies using a 'circularity strategy' has grown less rapidly than the total number of companies in the Dutch economy. In addition, the vast majority of these*

*so-called circular companies are focusing on repair, recycling and reuse. This type of activity already existed before there was any talk of a transition towards a circular economy. Examples include garages, waste collection facilities and thrift shops. Most innovative circular companies and circular projects are mainly technological and focus on recycling. There is less attention for innovations that could radically change the use of material resources. As a result, the economy still functions largely according to linear principles. This does not alter the fact that, throughout society, there are experiments and entrepreneurs focused on circular product designs, alternative revenue models and online platforms. These show that radically different methods of production and consumption are possible — as, for example, in the case of Auping's fully recyclable mattresses, LENA the fashion library's clothing and Camptoo's online platform for motorhomes.*

***More attention needed for socio-economic renewal in combination with conversion and phasing out of existing system***

*Recycling is an essential part of any circular economy. But recycling alone is not enough to realise the transition towards such an economy. Making production and consumption chains circular requires, for example, new circular business models, online platforms and changes in consumer behaviour. At their core, these are socio-economic innovations for which, to date, there has been little attention from either society or government. This also requires adjustments to or conversion of existing institutions, such as accounting regulations that hinder product-as-a-service companies. In addition to the development of circular production and consumption processes, the transition calls for the phasing out of linear chains and of products with a very short lifespan that place a relatively heavy burden on nature and the environment. Such phasing out could be achieved, for example, by increasing environmental taxes over time or by issuing a ban on disposable products.*

***The Netherlands, as one of the front runners, has an interest in EU circular economy policy***

*The Netherlands recycles 80% of its waste. This makes it one of the front runners in Europe, although it should be noted that this 80% often involves low-grade recycling. The use of raw materials for Dutch consumption is also a fifth lower than the EU average. EU circular economy policy is of great importance for the Netherlands, when it comes to taking further steps towards a circular economy. Setting requirements for the use of material resources in product design or the prevention of harmful substances in products particularly requires an EU approach. And if the EU elaborates its plans for producer responsibility and requirements for product design and repair, this will ensure a more level playing field between Member States. The Netherlands would benefit more than average from this, because of its very open economy and ambitious waste policy of recent decades, which has recently been further developed into a circular economy policy.*

***Stronger policy is needed to realise ambitions***

*National policy, to date, has mainly focused on the formation of a broad coalition of stakeholders within society and on facilitating circular initiatives — for example, by promoting knowledge development and bringing parties together on the basis of voluntary agreements such as the Concrete Agreement Netherlands and the Plastics Pact NL. This fits in with the initial phase of circular economy policy. However, voluntary and non-committal approaches will ultimately be insufficient to meet Cabinet's firm ambition to switch to a fully circular economy by 2050. We make the following recommendations for achieving the transition towards a circular economy:*

*1. Ensure that environmental damage is factored into the prices of products and services and that legislation and regulations no longer cause disadvantages for circular initiatives compared to the already established linear practices. For example, new raw materials,*

*currently, are cheaper than recyclates, and buyers are wary of circular products for which no quality standards have been set.*

*2. Make more use of coercive measures in circular economy policy, such as taxation and regulation, including standardisation. Important in this respect is the awareness that elaboration and implementation of regulating or guiding economic and legal instruments often take a long time, as shown by the long history of the introduction of a deposit refund system for small bottles. It is therefore important to start the process early.*

*3. Implement stepwise increases in the circularity requirements used in government purchasing and procurement, including those in the context of producer responsibility. Examples include a minimum recycling rate that is subsequently adjusted upwards, over time, and setting preconditions on purchasing and procurement that go beyond recycling. In this way, the quality of recyclates and high-quality reuse of material resources become benchmarks for designing production processes.*

*4. Develop an elaborated vision on the circular economy that is widely supported by companies and civil society organisations, and turn this vision into concrete goals. These goals can differ per transition theme, chain or product group, which calls for a differentiated approach. At the end of 2020, the national government started to develop such differentiated goals.*

*5. Ensure a clear division of roles between the various stakeholder involved in the implementation of circular economy policy. For example, what are the responsibilities and powers of the various transition teams and what is the role of the national government in these teams? These questions are currently being debated.*

***Circular economy is relevant to several societal objectives***

*A circular economy is about making far more efficient use of all the material resources available in the economy, both abiotic (minerals, metals and fossil raw materials) and bio-based resources (biomass and food), and contributes to several goals, such as combating climate change, halting biodiversity loss caused, among other things, by nitrogen deposits and plastic soup in the sea, and reducing supply risks. Currently, Dutch policy on the circular economy falls under climate policy in the Coalition Agreement of the 3rd Rutte Cabinet (2017–2021). Rather remarkably, the budget includes hardly any additional resources with respect to the circular economy. In addition to the fact that a circular economy could contribute substantially to $CO_2$ emission reductions, a more efficient use of material resources would also help to address other societal challenges.*

***A circular economy requires a cabinet-wide approach***

*A Cabinet-wide approach is important for a policy that promotes the circular economy. After all, such policy would cover various production chains, sectors and spatial scales, from agriculture to product design and from global to local levels. In addition to climate policy, for example, this includes policies aimed at improving the security of supply of material resources, green fiscal reform, making international trade more sustainable, promoting environmentally friendly innovations, aligning educational standards with circular production processes, and actively encouraging circular purchasing and procurement. Finally, a circular economy requires different rules that would balance safety, health, environment, economy and innovation. All this is not a matter for one ministry, but requires a cabinet-wide coherent approach in which each ministry has its own role to play. Although several ministries are currently involved in the circular economy policy, their individual packages of policy instruments are not all focused on achieving a more circular economy.*

# Findings

Dutch Cabinet intends to achieve a fully circular economy by 2050. It has asked PBL to report on the progress that is being made in this respect, in cooperation with other knowledge institutes. This request has resulted in this first integral circular economy report (ICER). It presents the state of affairs of the transition towards a circular economy in the Netherlands and describes potential starting points and next steps with which this transition could be achieved. This biennial report provides insight into the trends in material resource use and related environmental and socio-economic effects. The report also describes current activities within society, as well as the government's interventions that promote the transition towards a circular economy.

## The importance of switching to a circular economy

Industrial processes convert natural resources into materials (steel, concrete, plastics) and finished and semi-finished products, which are used in consumption processes and eventually end up in waste streams. All these phases produce emissions to air, water and soil, resulting in undesirable effects such as plastic soup in the sea, accelerated climate change, large mountains of waste and loss of biodiversity due to nitrogen deposition, open mining and monoculture farming, just to name a few. (IRP, 2019; OECD, 2019).

Without additional policy, this pressure on nature and the environment will continue to increase over the coming decades. The OECD (2019) and the International Resource Panel (2019) expect the use of raw materials to double by 2060, compared to 2017 levels, particularly due to the growing global population and the amount of consumption per world citizen. Under a scenario in which historical trends continue, and taking into account climate policies such as those applied up to 2015, greenhouse gas emissions are expected to increase by 49%, by 2060, compared to 2010 (IIASA, 2018; McCollum et al., 2018; Rao et al., 2017). The increasing demand for food and biomass is also projected to lead to an expansion of the agricultural area. This will be at the expense of natural ecosystems, such as forests and other habitats (Popp et al., 2017; IIASA, 2018; IRP, 2019), in turn leading to biodiversity loss and a further acceleration of climate change.

These nature and environmental problems would decrease if material resources would be used considerably more efficiently. This increased efficiency could consist of repairing products more often to extend their lifespan, rejecting certain types of products, improving both product design and production processes so that fewer raw materials are needed, people sharing things so that fewer products need to be produced, and reusing materials to reduce the amount of waste and reduce the demand for new raw materials. These forms of circular production and consumption, in principle, would reduce the demand for materials and thus also reduce the processing of material resources. The resulting decrease in environmental pressure would be more in keeping with the carrying capacity of the planet.

Although, for now, material resource use is likely to continue to increase, we will not immediately run out of most of the raw materials used. However, the supply risks of certain material resources will increase. This is of particular concern in the case of *critical materials* — those that are both economically important and have major supply risks — which include rare earth metals, cobalt, tungsten, tantalum, tin and indium. Critical materials are crucial,

for example, in producing electronic devices and generating sustainable energy, such as wind turbines and solar panels. In recent years, there has been a growing concern among companies and policymakers about the security of supply of specific material resources and the economic vulnerability of long international supply chains. Considerably more efficient use of the available material resources, in principle, would reduce such vulnerability, although this may be not the only solution strategy to follow.

Compared to the current practice of incremental efficiency improvements in the use of material resources, a circular economy means a radically more efficient use of those materials. This is not an end in itself, but a means to achieve the underlying goals of reducing the pressure on the environment and nature associated with resource use and reducing the supply risks of raw materials.

## At the core of a circular economy

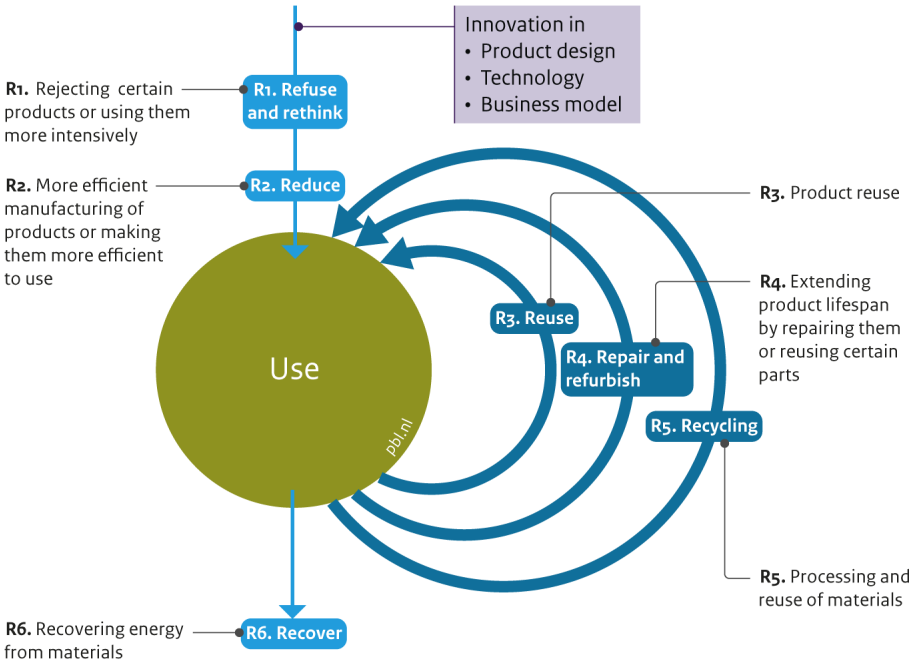
**Circularity strategies for a more efficient use of material resources**
In essence, a circular economy uses as few material resources as possible and generates as little waste as possible. It is aimed at the optimal use and reuse of such resources, materials and finished and semi-finished products; which means applying them with the highest value for the economy while causing the least damage to the environment (Rood and Hanemaaijer, 2017).

A significantly more efficient use of material resources can be achieved through various circularity strategies, or 'R-strategies'. These strategies include rejecting certain products or using them more intensively by sharing them with others (refuse & rethink), manufacturing products more efficiently (reduce), reusing products (reuse) and repairing them (repair & remanufacture) to extend their lifespan, reusing materials (recycle) so that less waste is generated and fewer new material resources are needed, and recovering energy from materials (recover).

The R-strategies can be combined to form a circularity ladder ('R-ladder'). For several years now, PBL has been using such a ladder with six circular strategies and this was also used for this report (Figure 1). As a rule of thumb, a strategy that is higher up the ladder (and therefore has a lower number), generally, requires fewer material resources or processing steps and therefore causes less environmental pressure. The R-strategies at the top of the ladder (refuse & rethink; reduce) decrease the total use of material resources (narrowing the loop). Those halfway down the ladder (reuse & remanufacturing; repair) postpone the demand for new material resources (slowing the loop). Finally, recycling is aimed at closing the cycle of materials (closing the loop). All R-strategies are needed to achieve a circular economy.

Figure 1

**R ladder with circularity strategies**




Source: PBL

## The rationale for this report

In 2018, the Dutch Cabinet explicitly requested an integral report on the circular economy (ICER) (IenW, 2018). It did so from the conviction that the transition towards a circular economy requires changes throughout society. To enable a more radically efficient use of material resources in the long term, production techniques need to change, requiring new product designs and production methods, as well as different legislation and regulations, tax reforms and new ways of consuming (IenM and EZK, 2016). These coherent and fundamental changes are what the national government refers to as 'the transition towards a circular economy'. (IenW et al., 2019).

The integral circular economy reports (ICER) are to provide the knowledge base for government policy to achieve the transition towards a circular economy. The government intends to realise a fully circular economy in the Netherlands by 2050 and, as an intermediate goal, to halve the use of primary abiotic raw materials by 2030 (IenM and EZK, 2016). On the way to achieving these goals, the government is committed to the more efficient use of material resources, increased use of renewable raw materials and new ways of producing and consuming that are appropriate in a circular economy.

PBL has been asked *'to further develop the monitoring system, together with other knowledge institutes, to achieve a fully fledged measurement and control system. The purpose of this system is to monitor government policy and the efforts of parties in society, and to provide insight into the progress made on achieving the circular objectives, to determine whether policy adjustments are necessary'* (IenW, 2019). In order to fulfil this role of analyst and manager of knowledge development, PBL will be publishing an integral report on the circular economy (ICER) every two years, with the help of other knowledge institutes.

# Purpose and set-up of this report

The aim of the Integral Circular Economy Report (ICER, 2021) is to present the state of affairs of the transition towards a circular economy in the Netherlands and to make recommendations for achieving said transition. Much of the required knowledge is generated from the Work Programme Monitoring and Steering Circular Economy 2019–2023 (PBL, 2019; 2020), which PBL is implementing in collaboration with the following knowledge institutes: Statistics Netherlands (CBS), Leiden University's Institute of Environmental Sciences (CML), CPB Netherlands Bureau for Economic Policy Analysis, Utrecht University's Copernicus Institute of Sustainable Development, the National Institute for Public Health and the Environment (RIVM), the Netherlands Enterprise Agency (RVO.nl), Rijkswaterstaat (the Dutch Government's service for roads and waterways (RWS)), and the Netherlands Organisation for Applied Scientific Research (TNO). For more information on the organisation and results of this Work Programme, see https://www.pbl.nl/monitoring-circulaire-economie.

This report is part of the cycle of circular economic policy in the Netherlands. This report aims to bring together the best available knowledge on material resource use, activities and policy to accelerate the circular economy in the Netherlands. In this way, the Integral Circular Economy Report will be providing input for consultations between the parties involved in the Dutch Raw Materials Agreement and the five transition teams, as well as offering support for choices to be made on circular economy policy and the debate on these choices in the Dutch House of Representatives.

**The Integral Circular Economy Report considers material resource use, its effects and the transition process**

The first proposal for monitoring the Dutch transition towards a circular economy by PBL, CBS and RIVM indicates that this requires two elements (Potting et al., 2018). The Integral Circular Economy Report further elaborates on this proposal.

The first element is to provide insight into trends in material resource use and the related impact on nature and the environment as well as on socio-economic processes. Material resource use refers to the amounts of raw materials needed for production and consumption in the Netherlands, and involves insights into the use phase of products, the amount of waste generated and waste treatment processes. Determining the related effects on the environment and nature requires knowledge about, for example, climate change, loss of biodiversity and the presence of toxic substances. Relevant socio-economic effects include the supply risks of materials and the labour market effects of structural changes in the economy as more circular production and consumption become leading. This report is integral in the sense that its scope includes the total use of raw materials in the Netherlands and the related impact. This includes both bio-based resources (biomass and food) and abiotic raw materials (minerals, such as sand and gravel, and metal and fossil resources, such as oil, natural gas and coal). Another integral aspect of the report is that it also looks at relevant global and European developments with respect to material resource flows, stocks and uses. After all, the use of material resources in production and consumption processes in the Netherlands cannot be seen in isolation from the international chains within which products are both used and produced.

The second element of the Integral Circular Economy Report concerns the monitoring of the transition process and describes the activities, means and interventions by social parties and government authorities in the transition towards a circular economy. Think of pilot projects, subsidy measures for circular innovations and removing obstructive legislation on waste. The transition towards a circular economy is a lengthy process, evokes resistance and is hindered by behaviour, regulations and interests, as a result of which the effects of more circular

production and consumption will only become visible in due course. This does not alter the fact that a variety of social parties are already making efforts to make their production and consumption processes more circular. Because the transition process precedes its result, knowledge about the process is indispensable in order to be able to assess, at an early stage, whether the desired effects of more circular production and consumption can be expected in the long term and — if this is not the case or effects lag behind — what the causes may be. Changes, for example, in the behaviour of companies and consumers or in official regulations (EU, national government, regional government authorities) provide information about the direction of the circular economy and the pace at which it is currently taking shape.

**The knowledge base for the circular economy is being constructed**
The knowledge base for the circular economy is still under development. Although this report contains the best available, scientifically sound knowledge and the most recent data, this does not preclude further improvements. In the coming years, it is expected that changes in methods, more and better data and new scientific insights will lead to an increasingly better understanding of material resource use and its effects, as well as of the processes that should bring the transition towards a circular economy within reach.

This first Integral Circular Economy Report largely has an inventorying and indicative character. In this way, the report provides insight for accelerating the transition. Although the ambition for this report is to provide an integral picture, the knowledge about a circular economy is still being developed, at least partially, and therefore not yet complete. For example, there is still only limited insight into the effects of possible measures taken by companies to produce more circularly. This is part of the reason why this report evaluates only to a certain extent. However, it does contain conclusions on trends in the use of material resources, on specific developments in society that promote or hinder a more circular economy, and on policy interventions that aim to promote the transition towards a circular economy. The Integral Circular Economy Report also identifies a number of possibilities for adjusting social change processes that can bring a circular economy closer within reach.

## Progress on the transition process in the Netherlands

**Monitoring the transition process in order to make timely adjustments**
Process monitoring enables timely adjustments in the transition towards a circular economy, even before its effects can be registered. However, such monitoring is complex. Businesses, government authorities, citizens, knowledge institutes, networks and NGOs all play a role in the transition, without any of these parties dominating the others. In addition, the transition is not only about new technology, but also about other rules of the game (institutions) and new products, services and knowledge, such as products-as-a-service and online platforms. Finally, the transition towards a circular economy is actually a collection of change processes. This transition covers everything from plant-based proteins in food, to chemical recycling of plastics and appliances-as-a-service. Per theme, the transition process can vary in rate of change and solution direction. In order to monitor this complex whole, this report builds on two long-standing perspectives or frameworks: those of the innovation ecosystem (Hekkert et al., 2007; 2020) and those of transition management (Loorbach, 2007). Figure 2 and Text box 1 describe the elements that were combined in this report, which focuses on the national level, but where possible also shows insights derived from specific themes.

**The perspective on the transition towards a circular economy**

The transition combines processes that create circular production and consumption with those that transform or phase out linear production and consumption. The transition goes through several phases, each with dominant dynamics — often presented in a so-called X-curve (Bode et al., 2019). The framework for transition monitoring in this report focuses on various key functions that are crucial to the transition pathway. The cogs in Figure 2 show the various key functions. They are linked to actions that parties can take to speed up the change process and provide direct starting points for monitoring.

This report's monitoring approach looks at various key processes that are crucial for the development and rollout of circular innovations and for the phase-out and transformation of existing linear systems. Think, for example, of entrepreneurs experimenting with circular products, developing and exchanging knowledge, changes in legislation and regulations that remove obstacles to more circular production and consumption, breaking resistance (by creating legitimacy and increasing the pressure to change on the existing linear system) and the coordinating role of government (Figure 2).

Figure 2
**Elements of a successful transition to a circular economy**


Source: PBL 2013; based on Hekkert et al. 2021

**A great deal of attention for the transition towards a circular economy**
In the Netherlands, there is relatively much attention for the circular economy. Companies, research and educational institutions, citizens, regional government authorities and other parties undertake a variety of actions aimed at circularity. Although this report does not show how far the transition has progressed for all relevant sectors and product chains in the Netherlands, it does provide an overall picture of the efforts made by stakeholders within society. For example, there are more than 100,000 circular companies (i.e. those that apply one or more of the R-strategies in practice (RHDHV, 2020a)). And, in 2019, over 100 conferences on the circular economy were organised (RHDHV, 2020b). At several companies, for example from the textile sector and various branches of the manufacturing industry, the theme of circular economy has been put on the strategic agenda.

Growth can be seen in various elements that are important for a successful transition (Figure 2). For example, the number of circular companies has increased by approximately 8% in the past two years (RHDHV, 2020a). The number of scientific publications on circular economy worldwide has increased from approximately 70 in 2014 to over 1,600 in 2019 (Türkeli, 2020). Since mid 2018, there have been increasing numbers of national and regional initiatives aimed at circular procurement, such as the Green Deal Circular Procurement 2.0, the Green Deal Biobased, the academy for circular procurement and over 200 pilot projects for climate-neutral and circular procurement (Zijp et al., 2020). Educational programmes and courses on the circular economy have also increased in the Netherlands. Almost half of the institutes of higher vocational education (HBO) and 80% of universities are paying attention to circularity in their curricula (RVO.nl, 2021).

**Circular is not 'the new normal' yet**
In spite of all these activities and deployment of resources, circularity is still far from mainstream. Circular companies make up only 6% of companies in the Netherlands (RHDHV, 2020a). The vast majority of circular companies already existed before the Dutch circular economy policy was implemented. Think of traditional businesses such as garages, waste collection facilities and bicycle repair shops. Furthermore, a small part of the budget of various policy instruments goes towards circular projects (RVO.nl, 2020). For example, the R&D tax credit (WBSO) supports companies by means of a tax deduction on employers' wage tax. Of the WBSO budget, 3.2% goes to circular economy projects. Consumer attitudes and behaviour also make it clear that the transition towards a circular economy is still in an early stage. Less than 40% of Dutch consumers is open to purchasing products that have been refurbished, and less than 15% to long-term leasing and borrowing via sharing platforms (ABN AMRO, 2018; Kantar, 2019).

**Many actions and resources are focused on recycling**
Much research and innovation is in line with the current system. For example, the majority (66%) of the 1,900 innovative circular companies in the Netherlands focuses on recycling (RHDHV, 2020a). Over half of Dutch scientific articles mention recycling (or recover) in their subject description, but none of the other circularity strategies (Türkeli, 2020). Many of the innovation projects supported by RVO.nl's instruments also have a technological character and focus on recycling. For example, 60% of projects from the MIT Scheme (SME Innovation Promoting Region and Top sectors) focus on recycling, two thirds of which are bio-based projects, and 90% of projects from the public-private partnership allowance focus on secondary raw materials (RVO.nl, 2020). Recycling is a crucial and indispensable part of a circular economy, where many technological challenges still lie ahead. Nevertheless, recycling has been an established and successful industry in the Netherlands for years.

**High-grade recycling is a point of attention**
The success of the Dutch recycling industry results from decades of waste policy with a strong focus on reducing waste volumes and minimising the amount of landfill. However, a circular economy also requires the application of high-grade recyclate, which means that plastic from bottles is more often reused to make new bottles and not immediately downcycled and processed, for instance, into recycled plastic bollards, and that demolition waste in construction is reused in new housing instead of being used as subgrade in road construction. It is, therefore, important to pay attention to high-grade recycling.

**Little attention for socio-economic reform and phasing out of the existing system**
Taking significant steps in making production and consumption chains circular, requires circularity strategies that are higher up the R-ladder than recycling. This involves, for example, rejecting products or using products more intensively, such as by sharing them ('narrowing the loop'). In addition, it is also about extending the lifespan of products, for example through second-hand use, repair, remanufacturing or modular design ('slowing the loop').

Such strategies require new circular business models, the organisation of sharing platforms and a change in consumer behaviour. At their core, these are socio-economic reforms for which little attention has yet been paid by either society or government. This also requires adjustments or conversions of existing institutions, such as existing accounting rules that hinder product-as-a-service companies if the assets on their balance sheet (e.g. the washing machines that are leased out) and slow cash flow (rental income) are seen by financiers as an increase in risk compared to the traditional sales model.

In addition to the development of innovative strategies, the transition also requires that attention is paid to the phasing out of linear chains and products that have a very short lifespan and a relatively high impact on nature and the environment. Means to achieve this, for example, include increasing environmental taxes over time and a ban on disposable products, as is already the case for free plastic bags. However, there is currently no broad, fundamental change from the existing linear system to a circular economy.

**Transition is still in its initial phase**
Overall, these signs indicate that the transition towards a circular economy is still in its initial phase. Although growth can be seen in certain areas, it cannot be concluded that the transition towards a circular economy is spreading across all sections of society and/or is accelerating to any substantial degree. There are also, as yet, few signs that the existing linear system is coming under pressure. This pressure is necessary if the government is to realise its ambition to accelerate and scale up the transition towards a circular economy (IenW, 2019). In Box 2, we examine the difficult question of how to recognise the start of the next phase in this transition.

**Indications of the next phase in the transition**

There is no instruction manual for what is needed to reach the next phase of the transition towards a circular economy. However, there are signs that would indicate whether the transition is moving into the next phase.

Larger scale innovation is such a sign, with existing circular activities connecting and being scaled up, and a critical mass of those involved is being created. Also consider the emergence of a larger market demand for several types of innovative circular products and services. Such processes of acceleration, scale-ups and connections form a prelude to a phase of institutionalisation, i.e. accepting and establishing new official and unofficial rules of

play that are in line with more circular production and consumption.

Another sign of the arrival of the subsequent phase is that of an elaborated vision on and direction of the transition. Such a vision not only relates to the desired developments but particularly also to those elements of the system that no longer fit within a circular economy. This creates a sense of urgency and pressure for change on the part of established parties. It may shake up the current system and create space for the targeted adaptation and phasing out of existing linear practices.

At the same time, the established interests may feel increasingly threatened and develop a resistance towards more circular production and consumption. Increasing resistance may be a prelude to fundamental changes in production and consumption processes that are or will be taking place on a large scale, and is therefore also an important indication that the next phase has been reached.

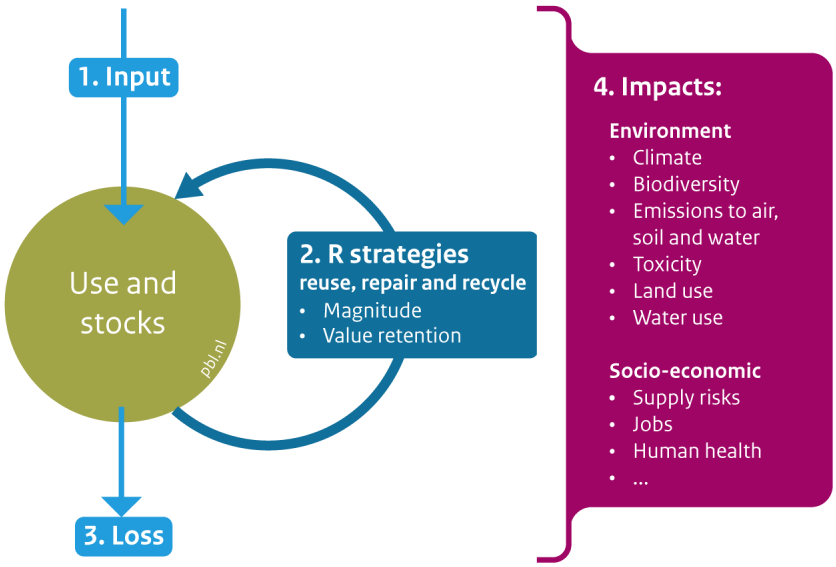
## Trends in Dutch material resource use and its impact

**Measuring the use of material resources and their effects**

In order to provide insight into the degree of circularity of an economy, indicators are needed to show the development in the use of material resources and the related impact. These indicators cover both the input of materials, their use in finished and semi-finished products, and the output of materials in the form of waste. But the indicators must also provide insight into the effects that a circular economy aims to achieve, namely the reduction in various forms of environmental pressure and the improvement of the security of supply of crucial materials and finished and semi-finished products (Figure 3).

Below, the main trends in the use of material resources and their impact are discussed. Table 1 provides the most up-to-date overview of indicators that are important for a circular economy. These trends and related effects are discussed in more detail, further along the text.

Figure 3
**Framework for targets and indicators of circular economy monitoring**




Source: PBL

**The Netherlands is one of the front runners in Europe**

With its 80% waste recycling rate, the Netherlands is one of the front runners in Europe, mainly because its waste policy has been strongly focused on recycling for decades. In addition, the Netherlands uses fewer material resources for consumption, compared to other European countries. These resources are therefore used more efficiently in the Dutch economy. In this respect, the Netherlands benefits from its high population density, which means that the large quantities of raw materials needed for infrastructure (e.g. roads, railroad embankments, pipelines) are used relatively efficiently. In addition, the Netherlands has a service economy that adds much value using relatively few material resources.

Because the Netherlands is already one of Europe's recycling front runners, its circular objective differs from that of most other European countries. In Italy and Eastern Europe, for example, substantial progress can still be achieved by reducing landfill and increasing recycling. For the Netherlands, the main challenge is that of applying high-grade quality recyclate in new products and to focus on other circularity strategies, such as reuse, design, refurbishing, sharing, and repair.

## Table 1 Overview of material resource use and its impact

| Indicator | Magnitude | | | Trend | | Compared with EU-27 |
|---|---|---|---|---|---|---|
| | 2010 | 2016 | 2018 | 2010–2018 | 2016–2018 | per capita in 2018 |
| **Natural resources required** | | | | | | |
| Material resources for domestic use, DMC[1] (Mt) | 195 | 193 | 195 | 0% | 1% | -22% |
| Material resource footprint domestic use, RMC[2] (Mt)** | - | - | - | - | - | - |
| Resource efficiency (GDP in EUR/kilo DMC) | 3 | 4 | 4 | 12% | 5% | +125% |
| Material resources for the economy, DMI[3] (Mt) | 401 | 402 | 397 | -1% | -1% | +95% |
| Material resource footprint of the economy, RMI[4] (Mt) | 597 | 627 | 647 | 8% | 3% | +89% (2017) |
| Share bio-based resources (kilo/DMI, in %) | 24 | 25 | 26 | 8% | 5% | +5% |
| Total sustainable renewable material resources (kilo/DMI) | - | - | - | - | - | - |
| Share secondary materials, CMUR (kilo secondary/DMI, in %) | - | 13 | 14 | - | 6% | +167% (2017) |
| **Use phase** | | | | | | |
| Lifespan | - | - | - | - | - | - |
| Value retention | - | - | - | - | - | - |
| **Waste processing and recovering** | | | | | | |
| Dutch waste (Mt) | 60 | 60 | 61 | 2% | 2% | +44% (2016) |
| Share recycled waste in processed waste (recycled waste/waste, in %) | 81 (2012) | 79 (2012) | 80 | -1%* | +1% | +31% |
| Recycled waste in the Netherlands (Mt) | 54 (2012) | 52 | 53 | -1%* | 3% | +111% (2016) |
| Incinerated waste in the Netherlands (Mt) | 10 (2012) | 10 | 11 | 11%* | 6% | +74% (2016) |
| Waste disposal in the Netherlands (Mt) | 2 | 3 | 3 | 51% | 14% | -81% (2016) |
| **Effects** | | | | | | |
| **Environmental impact** | | | | | | |
| National greenhouse gas emissions ($MtCO_2eq$) | 214 | 195 | 188 | -12% | -4% | +33% |
| Greenhouse gas emission footprint of consumption ($MtCO_2eq$) | 300 | 252 | 282 | -6% | 12% | +35% (2015) |
| Greenhouse gas emission footprint of production ($MtCO_2eq$) | 462 | 432 | - | -7% (2016) | - | +54% (2015) |
| Emissions to air, water and soil, such as nitrogen and particulate matter | - | - | - | - | - | - |
| Land-use footprint of consumption (million ha) | 10 | - | 10 (2017) | 3% (2017) | - | -15% (2015) |
| Land-use footprint of production (million ha) | 11 | 12 (2015) | - | 9% (2015) | - | -28% (2015) |
| Water abstraction | - | - | - | - | - | - |
| Water footprint consumption ($km^3$) | 52 (2008) | - | - | - | - | +21% (2008) |
| Biodiversity footprint of consumption (million MSA loss ha/year) | 19 | - | - | - | - | +1% (2010) |
| Biodiversity footprint of production (million MSA loss ha/year) | 20 | - | - | - | - | +2% (2010) |
| Toxicity | - | - | - | - | - | - |
| **Socio-economic impact** | | | | | | |
| Supply risks (indicator being developed) | - | - | - | - | - | - |
| Added value of circular activities (EUR billion) | 28 | 31 | 34 | 23% | 9% | - |
| Share circular activities (added value circular / GDP in %) | 4 | 4 | 4 | 1% | 0% | - |
| Circular employment (no. of circular jobs in FTEs) (*1,000) | 311 | 318 | 326 | 5% | 2% | - |
| Share circular employment (no. of jobs/total no. of jobs in %) | 4 | 4 | 4 | -2% | -2% | - |

Legend

Trends
- trend is moving in the right direction
- trend is moving in the wrong direction
- trend is stable; hardly any differences (up to 5%)

Compared with EU-27
- NL scores better than EU
- NL scores worse than EU
- hardly any differences (up to 5%)

Deviating years are provided between brackets
* 2012–2018, no data available for 2010
** RMC requires a new calculation
\- No data available

[1] Domestic Material Consumption
[2] Raw Material Consumption
[3] Domestic Material input
[4] Raw Material Input

**Various trends are not moving towards a circular economy**

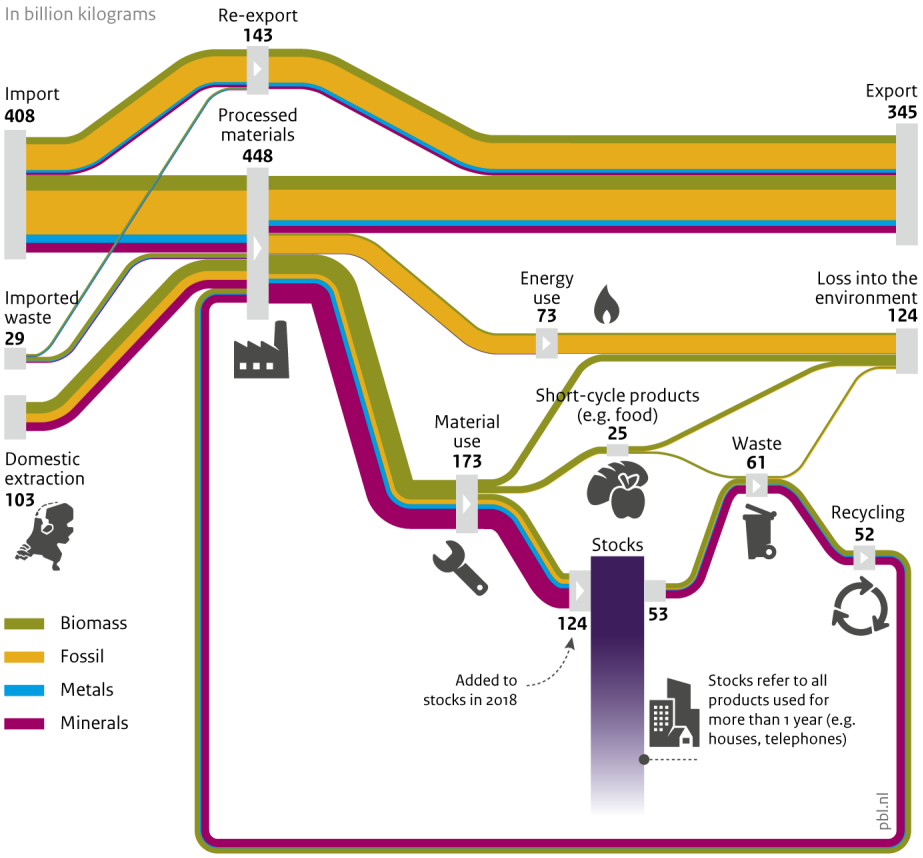
Looking at the entire use of material resources in the Netherlands and the related effects, various trends are not going in the right direction. It is true that, in the Netherlands, resources are used more efficiently than before, but this has not led to a sharp, absolute reduction in use. The total use of material resources in the Netherlands has hardly changed since 2010, with respect to both domestic consumption and the economy as a whole (see Table 1). This does not mean that the policy of promoting more circular production and consumption is failing. After all, the government-wide programme was not started until in 2016 and major shifts cannot be expected to be visible this soon. However, the transition towards a circular economy does require a reversal of these trends.

**Dutch economy requires many more material resources than are needed for Dutch consumption**

In 2018, the Dutch economy used nearly 450 Mt in material resources and, in addition, over 140 Mt in transshipment (see Figure 4). These numbers include raw materials as well as parts and products. Over two thirds of these resources are imported. Almost half of all the material resources used in the Netherlands is for domestic use; the other half is exported. This shows that the Dutch economy requires far more materials than are need for domestic use.

Figure 4

**Resource flows Dutch economy, 2018**




Source: CBS 2021

**The amount of material resources used in the Dutch economy is more or less constant**

The total use of material resources in the Netherlands has hardly changed since 2010, with respect to both domestic consumption and the economy as a whole. However, the amount of abiotic resources (i.e. minerals, metals and fossil raw materials) has declined, by 0.5% to 1%, annually. Resource efficiency has increased by 12% since 2010, but this improvement has not led to a significant change in the use of these materials in the economy. The material resource footprint of the Dutch economy increased by 8%, between 2010 and 2018 (see Table 1). This footprint also includes the resources used in the production processes of materials, parts and products abroad.

**More recycling will not substantially increase the share of secondary resources**

In 2018, secondary materials made up 14% of the total use of material resources in the Dutch economy. Over the 2016–2018 period, this share increased from 13% to 14%. As much as 80% of the waste is already being recycled. More recycling will therefore only be a limited contribution to further increasing the share of secondary resources. In addition, challenges in the housing sector and the energy transition will require more material resources in the coming years. This increase in demand cannot be met using secondary resources alone. However, gains can still be achieved through a higher quality use of available secondary resources (to which better recycling techniques also contribute). Currently, a large part of the collected plastics is either burned or processed into bollards instead of being turned into new bottles, and not many of the discarded textiles are being reused to make clothing.

**Many general national waste targets will not be achieved**

There are many targets related to waste, on both EU and national levels. The Netherlands is achieving most of the EU waste targets and has set additional further-reaching targets for many of its domestic waste streams. However, six of the seven national waste targets of the National Waste Management Plan will not be achieved. These targets relate to the amount of Dutch waste, the total of which is within the target range of no more than 61 Mt by 2023.

However, in order to achieve the target of 85% recycling by 2023, additional efforts are likely needed. Various other waste targets will almost certainly not be achieved. For example, the amount of household waste is still 200 kilograms above the target of 400 kilograms per inhabitant by 2020, and the amount of residual waste is even 80% above the target of 100 kilograms per inhabitant by 2020. Furthermore, also the target of halving the amount of waste in incineration and landfill by 2022 is not expected to be achieved. Although the percentage of the household waste that is sorted has increased in recent years (61% in 2018) after years of remaining stable, it is still a long way from the 2020 target of 75%. Furthermore, the amount of residual waste from companies, organisations and government authorities in 2018 was still twice the amount targeted for 2022.

More progress has been made on specific waste streams. The targets for waste from construction and demolition and that for various packaging materials have been achieved, while other targets are within reach. Only in the case of food waste has there, as yet, been no progress on the desired halving by 2030.

**Impact of Dutch use of material resources**

The impacts on nature and the environment from material resource use in the Netherlands, to a large extent, take place in certain parts of the production chain outside the Netherlands, especially in Europe, but also in other parts of the world. Nature and environmental effects include greenhouse gases and loss of biodiversity due to land-use change, nitrogen deposition and mining. In order to reduce the environmental impact of Dutch material resource use, it is therefore essential to consider the effects of the entire production chain. Between 2010 and 2016, there was a slight decrease in the footprints of greenhouse gas

emissions for both production and consumption. Land use for the Dutch economy (i.e. the production footprint) increased by 9% between 2010 and 2015 (see Table 1). This concerns mainly land use outside the Netherlands related to imported products, rather than land use within the Netherlands.

Dutch material resource use leads to both positive and negative socio-economic developments abroad. Employment in the exporting country is one of the positive effects. Negative effects also occur regularly, in the form of poor working conditions, child labour and human rights violations. This happens, for instance, in the mining industry and the production of cacao, coffee, palm oil and soya beans. In order to provide a detailed picture of these effects, it is crucial that companies are transparent about their work processes and their product information.

**Supply risks mainly affect the manufacturing industry and are increasing**
In the Netherlands, supply risks mainly relate to manufacturing, particularly because many companies depend on rare earth metals, cobalt, tungsten, tantalum, tin and indium. These are the so-called critical metals, because their supply carries the relatively high risk of disruption and because they are of great economic importance. They are used, for example, in machines, machine parts for certain modes of transportation and in electronics. Certain sectors are particularly dependent on them, such as the electronics industry, electrical appliance industry, transport manufacturing industry, the sector 'other industry', metal products and the equipment manufacturing industry. Since 2012, the supply risks for the Dutch economy have increased.

Supply risks are expected to increase further, as a result of the energy transition in the Netherlands. Achieving the energy transition will require an unprecedented acceleration of the increase in the annual production levels of many materials. Some critical metals, such as rare earth metals, silver, cobalt and iridium, are crucial in the production of solar panels, green hydrogen and batteries for electric vehicles. Current global production of a number of critical metals is insufficient to produce all the products needed for the desired energy transition, both for the Netherlands and for other countries. This applies in particular to the envisaged sustainable electrification. Added to this is the fact that the production capacity cannot rapidly be expanded — as opening a new mine, for example, would take at least 10 years.

**Information about material resources and products facilitates their reuse**
Many material resources are used in products that have a long lifespan, such as buildings, machinery and motorised vehicles. The materials stored in such products are also called *stocks for future use* or *urban mines*. In order to be able to reuse products and materials, it is crucial to have more information about the quality of secondary materials, second-hand parts and products. Good insight is needed into their amounts and location, as well as into the time at which they would become available for high-grade reuse, both now and in the future.

If companies and government authorities would have more and better data on the use of material resources, it would become easier to reuse materials, parts and products. At the moment, there is no such overview. First steps are currently being taken under the responsibility of the national government to create the Dutch Raw Materials Information System (GRIS). The development of this system will take a fair amount of time. In addition to the lack of a system that systematically maps material resource flows and stocks, there is also a lack of systematic information about higher circularity strategies, such as sharing, reuse, repair and refurbishing.

# Circular economy policy in the Netherlands

**The Netherlands has an interest in circular economy policy on an EU level**
In order to take further steps towards a circular economy in the Netherlands, EU policy is of great importance. This applies particularly to those areas where the EU has far-reaching powers, such as in trade, product and waste policies. Setting requirements for the use of raw materials in the design or repairability of products or concerning the presence of harmful substances in products particularly requires an EU approach. The European Union is also working on expanding producer responsibility, whereby producers remain responsible for what happens to their products after they are discarded by consumers. An EU approach would create a more level playing field for the Member States. This is to the benefit of the Netherlands, more so than is the case for other Member States, because the Netherlands has been pursuing an ambitious waste policy for decades and, more recently, a circular economy. As various Dutch companies have already developed innovative products and services, this can strengthen their competitive position on global markets.

**The Dutch Government, in cooperation with other parties, has created a structure and basis on which a circular economy can be achieved**
The circular economy is prominent on the agenda of government authorities, companies and civil society organisations. The Dutch Government's ambition to achieve a circular economy has now been endorsed by more than 400 parties under the Raw Materials Agreement. One of the things they agreed on is that teams of representatives from businesses, national government, government authorities, NGOs and scientific institutions have drawn up agendas for five priority transition themes: Biomass and food, Construction, Plastics, Manufacturing and Consumer Goods. Since 2018, Cabinet has concentrated policy efforts in 10 intersecting clusters of policy instruments. In doing so, it aims to accelerate the transition towards a circular economy. These clusters are: (1) producer responsibility, (2) legislation and regulations, (3) circular design, (4) circular purchasing, (5) market incentives, (6) financing instruments, (7) monitoring, knowledge and innovation, (8) behaviour and communication, education and the labour market, (9) international commitment and (10) *Versnellingshuis Nederland Circulair* (organisation to accelerate the Dutch circular economy).

The Circular Economy Implementation Programme 2019–2023 (IenW et al., 2019) elaborates on these intersecting clusters of instruments and includes concrete actions and projects for the five priority transition themes. The Netherlands has a public–private approach to the transition towards a circular economy, and focuses on 5 priority transition themes (societal domains) and 10 clusters of policy instruments. This policy approach, together with social stakeholders, has created a good basis for initiating the transition towards a circular economy.

**The transition themes cover most of the environmental impacts**
The five transition themes cover most waste flows, the use of material resources, land use and the loss of biodiversity. The transition themes are less focused on greenhouse gas emissions; together, they cover 35% of greenhouse gas emissions in the Netherlands, 42% of the greenhouse gas footprint of consumption and 56% of the greenhouse gas footprint of production. This reason for this lesser focus is that a significant proportion of greenhouse gas emissions originate from refineries, energy supply and transport. These sectors are not directly included in the priority transition themes. In contrast, however, these subjects are given ample attention in the energy transition and in climate policy. Distinguishing what does and does not fall under the priority transition themes is relevant, but calls for certain assumptions. For example, not all sectors clearly fall under a particular transition theme.

**National policy so far mainly uses voluntary instruments**
In order to stimulate the circular economy, national policy so far has focused on forming a broad social coalition and supporting the initiatives of companies, NGOs and consumers, using communication and facilitation tools. Think of knowledge development, the establishment of *Versnellingshuis Nederland Circulair* and voluntary agreements, such as the Concrete Agreement Netherlands, Plastics Pact NL and the establishment of the foundation *Samen tegen voedselverspilling* (together against food waste). In addition, existing financial instruments, such as the 'Arbitrary depreciation of environmental investments' (Vamil) and 'environmental investment rebate' (MIA), have been made available for circular investments. Such support actions are in line with the start-up phase of the circular economy policy. However, some of the current regulations and standards as well as certain consumer behaviours are not in line with more circular production and consumption, creating all kinds of obstacles for circular initiatives. For example, primary raw materials are cheaper than recyclates, market demand for circular products is often still limited and customers are reluctant to use circular products because there are no quality standards or guarantee schemes for these products. In order to overcome these barriers, the government has a wide range of policy instruments at its disposal.

**Regional policy crucial for bringing parties together and exchanging knowledge**
In addition to the national government, regional authorities can also support companies and other parties in their search for circular production methods. Local parties are located nearby the material flows and are in close contact with each other, making it relatively easy for them to create the networks or chains that are required for circular initiatives and innovations. Regional authorities, companies and other regional 'accelerators', such as economic boards and environmental federations, are actively developing circular initiatives at various locations in the Netherlands. These regional parties and government authorities can accelerate the transition if they cooperate more and learn from each other's experiences. Analysis shows that front running regional authorities mainly focus on *facilitating* companies; for example, by stimulating new forms of cooperation and providing them with experts, free of charge, to help further develop their circular initiatives. Many activities are focused on the preparatory phases, pilot projects or testing. Regional government authorities often use their purchasing power to stimulate the circular economy (RHDHV, 2020; Cramer, 2020).

## Recommendations for strengthening circular economy policy in the Netherlands

**Intensification of policy is needed to realise circular ambitions**
In order to accelerate the transition towards a circular economy and realise the Dutch Government's ambition of a fully circular economy by 2050, policy needs to be intensified. This intensification can be seen as the next phase in the transition. Voluntary and non-committal approaches will not be sufficient to achieve the government's ambitious objectives. Environmental policy over the past 50 years (PBL, 2013) has shown that ambitious goals and emission reductions of 50% to 90% cannot be achieved through covenants and voluntary agreements alone. In addition to setting the agenda, incentivisation and creating support, more stimulating and coercive measures are needed, as well as the development of a broad-based vision of the desired direction worked out into concrete goals. These can be combined with further actions aimed at strategies higher up the R-ladder. Government may also promote circularity-related innovation; for example, by broadening producer responsibility and increasing circular purchasing and procurement policy. Both instruments are priorities in this Cabinet's approach to the circular economy.

**Working towards a shared vision with concrete and measurable goals**

As an intermediate goal towards a fully circular economy by 2050, the Dutch Cabinet strives to halve the use of primary abiotic raw materials by 2030. The ultimate objective and intermediate goals have a mobilising effect in the initial phase of the transition. However, acceleration and scaling up of the transition requires a detailed and broad-based vision to provide clarity for businesses, local authorities and social partners about the transition's development direction and related concrete and measurable goals that this would require.

In 2019, PBL advised policymakers to start working with a set of targets for the input, use and output of material resources, measured in both quantities and euros (Figure 3) (Kishna et al., 2019). Such a set of targets must be aimed at the intended effects of less environmental pressure in the chain and improved security of supply for critical materials. It is important to note that the relevance of the sets of targets may differ per domain or product group. For example, the most important effects in relation to plastics are litter and $CO_2$. For the manufacturing industry, in addition to $CO_2$ emissions, there are various public health and environmental effects, such as toxic emissions to air, soil and water, and, for certain materials, there are also supply risks in this domain. Against this background, it is desirable to develop targets for each individual theme, specific product group or region.

Dutch waste policy has already set targets for reducing the outflow of materials in the form of landfill and incineration and for promoting recycling. This can be used as a starting point, with more attention being needed for high-grade recycling and the share of secondary materials in products. For the future, it is relevant to consider the targets and instruments that can be used to stimulate other circularity strategies. This could be targets related to product groups or additional product life cycle requirements and transparency in product design. Further elaboration, here, requires a tailored approach.

The Dutch Government has adopted PBL's earlier recommendations (Kishna et al., 2019) and, in 2020, started to further concretise the 50% reduction target and to set additional targets. A distinction was made between strategic targets and operational targets (IenW Parliamentary Letter, 2020). This enabled the focus on operational targets in addition to those aimed at the effects of material resources use. An example of this is the national target to save 1 Mt $CO_2$ through circular purchasing. In this way, such operational targets are logically positioned in the policy to stimulate a circular economy and can form part of a roadmap to be developed by the transition teams.

**Further elaboration of the division of roles is a step towards the next phase in the transition**

In order to be able to implement the concrete goals and agreements differentiated according to the various themes, product groups and regions in the next phase of the transition, a clear division of roles between the various parties involved is important. What, for example, are the authorisations and the mandate of the various transition teams working on realising the transition agendas? And what is the role of the government in these teams? And what is expected of the various ministries directly involved in the transition towards a circular economy? In practice, the focus of the participating ministries is mainly on the transition agenda for which they themselves are primarily responsible, as a result of which the coherence between themes and agendas is insufficiently guaranteed (IenW & MinFin, 2020). Increasing the degree of clarity about the responsibilities of the various stakeholders and the discussion about this is therefore important in order to guide the transition towards a circular economy into the right direction (IenW & MinFin, 2020).

**More frequent and earlier application of stronger instruments, such as taxation and regulation**

In order to take the next step in the transition towards a circular economy, policy needs to use 'push and pull' mechanisms more often, in the short term. Examples include regulatory taxation, setting standards and placing conditions on the granting of permits. The justification for this is that environmental damage has so far not been sufficiently priced and that the current rules of the game favour linear practices over circular initiatives. The total monetary environmental damage resulting from the emission of harmful substances in the Netherlands is estimated at a minimum of 4.5% of GDP (Drissen & Vollebergh, 2018). And, as indicated, raw material extractions, the production of materials, finished and semi-finished products, product use and the production and processing of waste, all contribute significantly to these emissions. Product prices currently are often too low, as production decisions do not take sufficient account of the costs of the damage caused by those products to nature and the environment. Consumers also lack this type of important information about the products they are buying.

So far, few legal and economic instruments have been applied in Dutch circular economy policy. And those that are in place still need to be worked out and their implementation formally confirmed. Legal and economic instruments, however, have been implemented in the existing waste policy. Examples include a tax on waste incineration and landfill bans on recyclable waste. The policy aimed at limiting the amount of waste and promoting more recycling has therefore been developed further than the policy aimed at initiating new chains, market formation, new business models, circular design and high-grade recycling. Interventions such as adjustments to legislation and regulation and price incentives usually take time (time needed to create social and political support for the legislative process), as demonstrated by the long time it took to implement deposit schemes for small bottles. It is therefore important to start this process early or accelerate existing processes.

**Focusing waste policy on the use and quality of secondary materials**

Traditionally, waste policy has been aimed at reducing the amount of waste that leaves the chain, and at promoting recycling as this limits the amount of waste that is incinerated or ends up as landfill. Policy is paying far less attention to the quality of the recyclate and its application in products. This means opportunities are missed for reduced raw material use and for environmental benefits, as the successful application of secondary materials imposes minimum and specific quality requirements on recyclate. The higher the quality, the more high-grade recycling of secondary materials. More circular production and consumption, therefore, requires further development of waste policy that not only focuses on waste volumes but also on the optimal use of the material resources they contain and thus on the quality of the recyclate.

**Circular purchasing policy may increase environmental benefits**

Government authorities can also stimulate the development of circular products and services by increasing the demand for them themselves; they could directly create a market demand through their purchasing policies. Purchasing policies could focus even more on circularity for various product groups, such as office furniture and road construction. There are still considerable opportunities for increasing the environmental benefits. It is not only the purchasing policy that plays a role in this. If certain products, such as office chairs, are purchased and are intended to last longer than they did before, this must also be embedded in the corporate culture and administrative processes. This is in order to prevent such chairs from being discarded prematurely, in practice, which would undo the envisaged environmental benefits. In addition, it is often possible to apply circular purchasing more ambitiously and to start more innovative procurement processes, rather than just set requirements for recycling. Finally, for some product groups, such as ICT, it makes sense for

contracting authorities to enter into joint purchasing. In this way, more far-reaching circular requirements can be placed on suppliers and thus also influence the market, in the process.

**Producer responsibility is crucial for environmental benefits**

In a system of extended producer responsibility (EPR), producers are responsible for their products also after consumers discarded those products. EPR increases the share of discarded products that are collected and recycled in the relevant product groups. This also produces a larger and more stable supply to recycling markets. In order to increase the environmental impact of the EPR systems, however, design is crucial. For example, it is effective to use flexible economic instruments, so that producers continue to be stimulated to design their products circularly, at an earlier stage. Think of requirements for waste collection and processing that are tightened over time. A second recommendation is to differentiate return premiums according to, for example, recyclability and the proportion of recycled material (CPB & PBL, 2021). The more recyclable a product is, for example, the higher the reimbursement for its producer. In addition to the share of products that are collected or recycled, the quality of those materials is also important.

**Synergy and tension between circular economy and energy transition**

Circular economy policy could greatly contribute to achieving energy and climate goals. Conversely, an increase in the use of renewable energy sources, principally, would lead to a decline in the demand for primary fossil energy sources. In addition, the energy transition requires sustainable biomass and critical earth metals for wind and solar power plants. However, sustainable biomass is not infinitely available. Moreover, biomass is preferably used in high-grade applications, such as for food or furniture, in the construction sector and in the chemical industry; using biomass for energy generation is a lower-grade application (SER, 2020). Furthermore, there are supply risks associated with the large-scale use of critical earth metals, partly because of the dependence on China, which has a dominant position in the extraction and refining of several of these raw materials.

An important difference between the two policy areas is their focus. Policy that promotes the Dutch energy transition focuses mainly on greenhouse gases emitted from Dutch chimneys, whereas the focus of circular economic policy includes greenhouse gases emitted throughout the entire chain — also on those that originate and have their impact abroad. This can create a certain degree of tension between these two policy areas. Companies that invest in greenhouse gas reduction outside the Netherlands are not rewarded for this under current Dutch energy and climate policy. This continues to be an issue as long as circular economy policy is part of climate policy, whereby the use of public funds is assessed almost exclusively in terms of reduction potential with respect to Dutch greenhouse gas emissions. The search for possibilities to reward companies for reducing greenhouse gas emissions earlier in the chain (i.e. abroad) is relevant to achieve a more efficient use of material resources as well as global greenhouse gas emission reductions.

Two other conflicting issues between the energy transition and the circular economy relate to the lifespan of products and linking the incineration of waste to heating networks. For example, the continued effort to replace electrical appliance stocks with more energy-efficient appliances may be at odds with the environmental impact of such replacements, as additional raw materials have to be extracted for the production of these new appliances, more products need to be made and more waste is, thus, being generated. The direct link between waste incineration plants and heating networks also leads to friction with circular economy policy and incentivises, because this gives an incentive to waste incineration rather than waste recycling.

The above shows that the energy transition and the transition towards a circular economy are strongly intertwined. To date, policy has mainly focused on the contribution of the circular economy to the energy transition and this is also true for the available government resources for the circular economy. At the same time, limited attention was paid to the possibilities of climate policy to contribute to a more efficient use of material resources. It would therefore be sensible to award greater attention to the coherence, opportunities and risks of both these pathways, so as to ensure that the desired effects along one pathway do not lead to undesired effects along the other.

**Circular economy requires a cabinet-wide approach**
It is important that the policy to promote a circular economy is addressed cabinet-wide. After all, such policies cover various production chains, sectors and spatial scales; from agriculture to product design and from global to local levels. In addition to climate policy, for example, this includes policies aimed at improving the security of supply of material resources, green fiscal reform, making international trade more sustainable, promoting environmentally friendly innovations, aligning training requirements with circular production processes, and promoting circular purchasing and procurement. Finally, a circular economy requires different rules to ensure there is a balance between safety, health, environment, economy and innovation. All this is not a matter to be addressed by a single ministry, but requires a cabinet-wide approach in which each ministry has its own role and task, forming a coherent whole. Although several ministries are currently involved in the circular economy policy, their individual packages of policy instruments are not all focused on achieving a more circular economy.

## Towards another phase of the transition

**Policy is able to influence the direction and pace of the transition**
The transition towards a circular economy is a process that involves many parties, and cannot be guided by the government alone. But policy does influence the direction and pace of the transition. When policy provides more focus, it can actually accelerate the transition. Entrepreneurs and innovators want to take the next step, but lack clarity about the appropriate direction and concrete goals in which circularity strategies other than recycling will play a major role. Without explicit policy efforts to deploy a broad repertoire of R-strategies, the focus will remain on recycling.

In order to further accelerate the transition, attention for the direction of the transition remains necessary. The currently dominating developments can mainly be described as incremental improvements to the current system (i.e. system optimisation), while system innovation or a significant change in the system is required.

Specification of the direction and its differentiation into the various domains and/or product groups is needed, otherwise waste management and low-grade recycling remain the dominant strategies. Each domain (construction, plastics, manufacturing, transport, food supply) has its specific environmental problems; for example, manufacturing faces the issue of security of supply, but this is hardly an issue in the plastics industry. This makes the transition towards a circular economy a collection of domain-specific transitions — even more so than is the case for the energy transition. And because change processes in sub-domains can differ in the pace and direction of solutions, domain-specific operational goals and strategies will also be needed. The common denominator here is that a reduction in the use of primary resources (to reduce environmental pressure or improve security of supply) will require this use to be radically more efficient. This applies both to the input of new raw materials and to materials that are already available within society.

**Guiding the transition is an ongoing process**

Guiding any transition requires a clear vision of exactly what this process involves, and how it may develop over time. Such a perspective must be constructed and based on logical expectations and assumptions about human behaviour, events and circumstances. This, for example, relates to the expected roles and behaviour of the various parties in the transition towards a circular economy, new business models and forms of collaboration between companies. It is also about regulations that impede the transition, knowledge that is required, and market demand for circular products that needs to be developed. There may also be resistance from vested interests, and the process also involves identifying the things that would enable and promote breakthroughs towards circular production and consumption.

Such a vision helps to categorise and understand what happens during the transition. Of course, experiences with these processes of change, over time, will lead to new knowledge and insights, thus requiring the perspective on the transition to be adjusted, but without changing the function of such a perspective. This function is to distinguish between main and secondary issues, to identify the roles of the various parties in the change processes, to understand setbacks and obstacles, and to design roadmaps for desired intermediate goals and realising the final ambition. A transition perspective is also useful in the debate with all those involved, and ultimately for support and legitimisation — so that stakeholders all use the same road map to explore new areas, exchanges experiences, speak the same language and use the same knowledge base, whereby the 'map' is improved, over time.

Managing transitions is therefore an ongoing process of planning, taking action and intervening, followed by monitoring and adjusting the resulting impact. The Integral Circular Economy Report — the current publication as well as every following edition — play an important role in this respect; presenting the best available and current knowledge about circular economy processes, thus offering the possibility for adjustments to be made along the way.