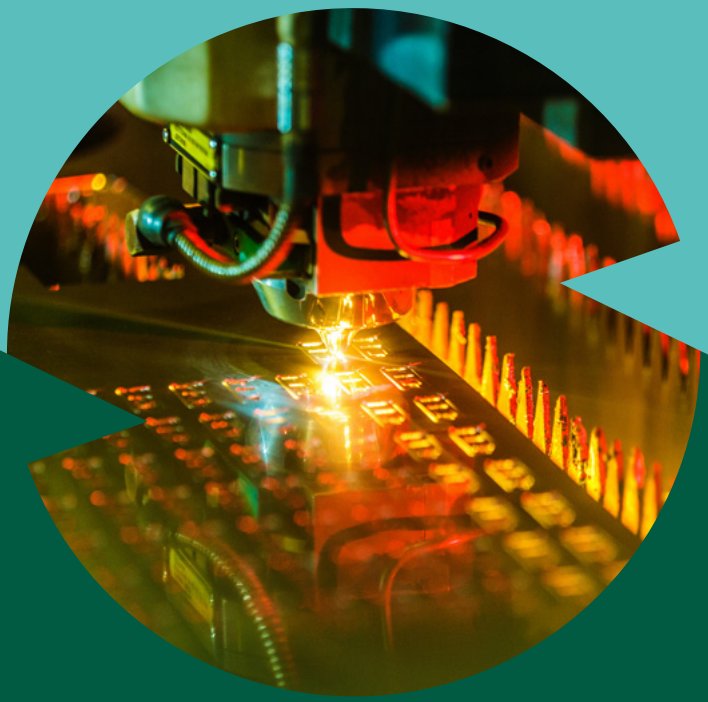
TRANSITION AGENDA
CIRCULAR ECONOMY | 2018



MANUFACTURING INDUSTRY

TRANSITION AGENDA
CIRCULAR ECONOMY | 2018

THE TRANSITION TOWARDS A CIRCULAR ECONOMY FOR THE MANUFACTURING INDUSTRY

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PREFACE

Over forty years ago, the Club of Rome issued its much-debated report 'Limits to Growth', in which was posited that economic growth is finite. As a young student, it impressed me greatly. The report was given global attention. We had debates about it.

Recent studies by, among others, TNO and the Social and Economic Council (SER) subscribe to the idea that our world is facing the limits of its current linear economic model. An increasing global population, ever increasing global prosperity and technological development and the related increase in material needs put more and more pressure on the climate, the environment, land, and resources. These developments require a different approach to how we design our technical and economic system. Contrary to what is posited by the Club of Rome, the challenge is achieving this while maintaining the current level of prosperity and increasing prosperity as a whole. This means we need to handle the materials we already have in a smarter way: circular economy.

Circular economy (CE) is a broad term for the valuable utilisation of means without loss of resources, products, capacity, and people. The goal is to achieve positive effects for the climate, environment, employment and economy with infinite (re)use of materials as the underlying principle. Infinite use requires significant changes to our lives and requires everyone to contribute: industry, government, and consumer. This document contains the Circular Economy Transition Agenda for the Manufacturing Industry in which representatives of the Dutch manufacturing industry, together with the government and other stakeholders, have drawn up an ambitious plan to create a circular manufacturing industry.

In physics, infinity is expressed with the lemniscate symbol: the double infinite loop, the western version of Yin and Yang, day and night, present and future. With some imagination, the lemniscate is also a rollercoaster that perfectly indicates what circular economy means for the Dutch manufacturing industry: high-grade technology, dynamics, and fun.

The goal of a rollercoaster, of course, is to have fun during the ride and then arrive safely back at the start. To this end, high-grade technology is used in a complex system of loops, accelerations and corkscrews that require extensive preparation in terms of design and engineering. Rollercoasters can often be disassembled for use at various fairs throughout the year. And at the end of the lifespan of a rollercoaster, the materials are used again in a car, a bridge, or electronics. Of course, a rollercoaster brings you an exciting ride with intense emotions and a lot of energy. We will encounter all these things in the journey to a circular economy in order to eventually get off feeling satisfied.

A second unforgettable impression on me was made by German Bundestag Member Herman Scheer during a presentation in 2003. He was the initiator of the Stromeinspeisungsgesetz and the Erneuerbare Energien Gesetz. Legislation that turned Germany into the frontrunner in the 'Energiewende'. Such a turnaround in terms of resources would support the circular economy in the Netherlands significantly.

This Transition Agenda was written to elaborate on the Raw Materials Agreement signed in January 2017 by over 300 social parties. In drawing up the agenda in barely six months, a small miracle was worked by the participants of the Circular Economy Transition Team, Manufacturing Industry (CETAM) and the four other tables of the programme. From the end of May to the end of November, a lot of energy was put into making an inventory of the issues regarding CE in the manufacturing industry, the opportunities, the required preconditions, and which projects can be a flywheel to boost the circular economy.

Just like a rollercoaster, getting CE started is the hardest part: pulling the cart uphill, to have the first companies do business successfully in changing conditions. Those are the companies that can be an example to others. If they succeed in lining up the financing, legislation, standards, technology and revenue models with a clear vision, then the exciting ride can start.

Enjoy the ride!

Fried Kaanen,
Chair CETAM team

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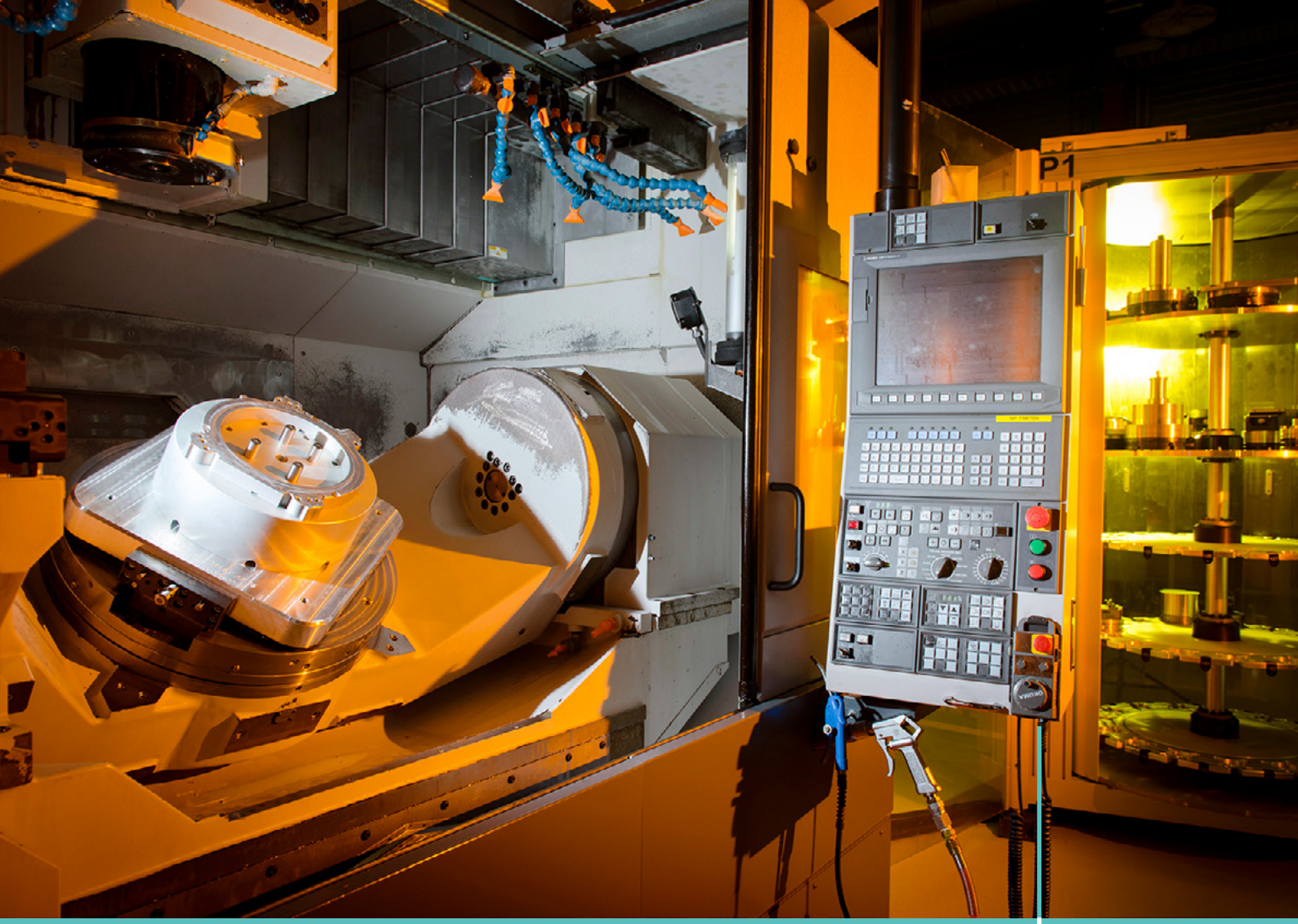

Photo: Sander van der Torren

THREE-PRONGED APPROACH

In order to realise the strategic goals of ecological and economic retention of value, a three-pronged approach has been developed:

1. Increasing the supply security of critical materials;
2. Reducing the environmental pressure of products from the manufacturing industry;
3. Closing the cycle for products from the manufacturing industry.

The approach is further detailed in 7 cohesive lines of action with which we can increase the scale and move towards a circular manufacturing industry through structural projects and investments.

SUMMARY

This Manufacturing Industry Transition Agenda was written to elaborate on the Raw Materials Agreement of January 2017. This agreement aims to achieve an increase in scale in the transition from a linear to a circular economy before 2030 and thus contribute to achieving the climate agreement's goals. In drawing up the agenda in barely six months, a small miracle was worked by the participants of the Circular Economy Transition Team, Manufacturing Industry (CETAM) and the four other teams of the programme. From the end of May to the end of November 2017, a lot of energy was put into making an inventory of the issues regarding CE in the manufacturing industry, the opportunities, the required preconditions, and of projects that can be a flywheel to boost the circular economy.

The Manufacturing Industry Transition Agenda gives content to the Raw Materials Agreement by selecting two strategic goals:

- In 2050, our aim is to have reduced the Netherlands' ecological footprint to a level in which we use one earth and comply with the agreements made in the Paris Climate Agreement. It is about retention of ecological value.
- In 2050, the manufacturing industry is still an important foundation for our resilient economy. The prosperity and well-being of the Netherlands are maintained, or even increase. In order to make this possible, the Dutch manufacturing industry must be able to compete in the global market. The transition to a circular economy leads to maintaining employment and an increase in the quality of the work. Social inclusivity is the basic principle in this. We summarise this with the term economic and social retention of value.

These goals are tackled with a vision and approach that consists of three components:

1. Increasing supply security of critical materials;
2. Reducing the environmental pressure of products from the manufacturing industry;
3. Closing the cycle for products from the manufacturing industry.

The core of the manufacturing industry transition agenda consists of an action agenda with seven priority themes. These themes are the result of the team's meticulous process of analysis and designate the route towards a circular manufacturing industry. The seven themes are different in nature and scope, but are inextricably linked and together explicitly form the action agenda which forms the manufacturing industry's answer to the Raw Materials Agreement en route to our two strategic goals. The Manufacturing Industry Transition Agenda's action agenda consists of seven lines of action:

1. Circular design: a successful design focuses both on the physical design and the design of propositions; [p. 14]
2. Supply security of critical resources: creating urgency about the supply security of resources, analysis of (future) problems regarding supply security that are not solved by the market; [p. 17]
3. Uniform basic principles and calculation methods: developing and implementing an environment database and standard assessment method; [p. 20]
4. Material efficiency: optimising the life cycle of products and closing the resource chain for end-of-life; [p. 23]
5. Recycling technology – closing cycles: optimising not just in terms of quantity, but also quality; ambition of no net loss of critical resources by 2030; [p. 26]
6. Facilitating circular business models: transition from product sale to service models; circular financing; [p. 29]
7. Circular procurement: Government and business community consider circular principles for each procurement / call for tender. [p.32]

PROJECTS & INVESTMENTS

In this agenda, the CETAM team determined a number of preliminary projects, in which a distinction is made between three types of projects with different goals: quick win (quick start), icon (visibility), and structural projects (large effect). This inventory must be further detailed and set out in more concrete terms. This depends on how the rest of the programme is structured in terms of organisation form and budget.

In tandem with the projects, we developed an investment agenda for the period from 2018 up to and including 2022 with a total financial scope of 108 million euro. This investment is required to actually make a jump to reach our strategic goals.

QUICK-WIN PROJECTS

- Setting up a resources desk and circularity database;
- Opening up or expanding the WBSO (Stimulation of Research & Development Act), MIA/VAMIL, and subsidy schemes for circular innovations and secondary procurement;
- Active supervision of a number of circular procurement projects of the government.

CONCLUSION, EXPECTATION OF FOLLOW-UP

The Manufacturing Industry Transition Agenda focuses on resources, with a special attention to critical earth metals required for the energy transition. New technology increasingly uses (rare) materials, that will be less easily available at acceptable costs in case of increasing prosperity and global population. Hence, the transition to a circular economy is a requirement for the manufacturing industry.

The transition towards the circular economy is complex. This agenda does not offer a recipe for all problems and challenges that are faced, but offers a good foundation for next steps. The way in which this takes place is not set in stone, but a number of things are clear:

- The government must provide direction to the process in a visionary way and take up a directing and facilitating role based on vision, knowledge, and coordination. Coordination within the government itself across various administrative layers, themes and roles is important.
- The industry needs to continue the current transition and, where possible, broaden the scope, deepen it and speed it up.
- Together with the government, the industry, social organisations and knowledge institutions need to look for solutions for the already identified issues and new issues.
- These solutions may, and in some cases must, lie in unconventional and so far unmentionable starting points, such as legislation, treaties, and (economic) structure.

1. ACTION AGENDA

1.1 INTRODUCTION

The core of the Manufacturing Industry Transition Agenda consists of an action agenda with seven priority themes. These themes are the result of the team's meticulous process of analysis and designate the route towards a circular manufacturing industry. The seven themes are different in nature and scope, but are inextricably linked and together explicitly form the action agenda with which forms the manufacturing industry's answer to the Raw Materials Agreement en route to our two goals:

- In 2050, our aim is to have reduced the Netherlands' ecological footprint to a level in which we use one earth and comply with the agreements made in the Paris Climate Agreement. It is about retention of ecological value.
- In 2050, the manufacturing industry is still an important foundation for our resilient economy. The prosperity and well-being of the Netherlands are maintained, or even increase. In order to make this possible, the Dutch manufacturing industry must be able to compete in the global market. The transition to a circular economy leads to maintaining employment and an increase in the quality of the work. Social inclusivity is the basic principle in this. We summarise this with the term economic and social retention of value.

These goals are tackled with a vision and approach that consists of three components.
1. Increasing the supply security of critical materials.
2. Reducing the environmental pressure of products from the manufacturing industry.
3. Closing the cycle of products from the manufacturing industry.

The manufacturing industry's action agenda consists of the following seven priority themes:

CIRCULAR DESIGN

SUPPLY SECURITY OF CRITICAL RESOURCES UNIFORM

BASIC PRINCIPLES AND CALCULATION METHODS

MATERIAL EFFICIENCY

RECYCLING TECHNOLOGY – CLOSING CYCLES

FACILITATING CIRCULAR BUSINESS MODELS

CIRCULAR PROCUREMENT

[1] *The critical materials concerned are described in two reports by TNO ('Critical materials in the Dutch economy' of December 2015) and the EC ('Study on the review of the list of Critical Raw Materials' of July 2017).*

1.2 READING GUIDE

After the action agenda, there will be further explanation of why a circular manufacturing industry is required (chapter 2). Starting from this vision, the team's ambitions were formed (chapter 3). As stated, the action agenda is the core of our Transition Agenda and is complemented with a knowledge agenda, a social agenda, and an investment agenda (chapter 4). Finally, the manufacturing industry team gives direction to implementation of the monitoring process (chapter 5).

The action agenda was created during a six-month process. In order to give direction to our agenda, the foundation for a sector analysis was laid (Appendix II): 'Where do we place the manufacturing industry in the context of circularity?' Based on this analysis, further considerations and in-depth interviews were conducted in five sectors that can be viewed as archetypes of the manufacturing industry. The results of this were translated into generic issues for the manufacturing industry (Appendix III). All issues were translated into activities (Appendix IV) on the basis of which the seven stated priority themes were prioritised.

A 'TIS analysis' (Appendix V) was made to provide each theme with a clear action agenda. This provided insight into the correct starting point to achieve the desired change.

When the agenda was drawn up, apart from the structural projects included in the agenda, a lot of valuable initiatives and possible projects were discussed. We bundled these together in an overview (Appendix VI). This overview can definitely give content to the recurring goal of realising iconic projects for a number of our priority themes. However, we are convinced that we missed initiatives and ideas. That is why, in our agenda, we want to give the manufacturing industry as a whole the opportunity to propose iconic projects and turn this agenda into a dynamic one that can and must further develop itself over time.

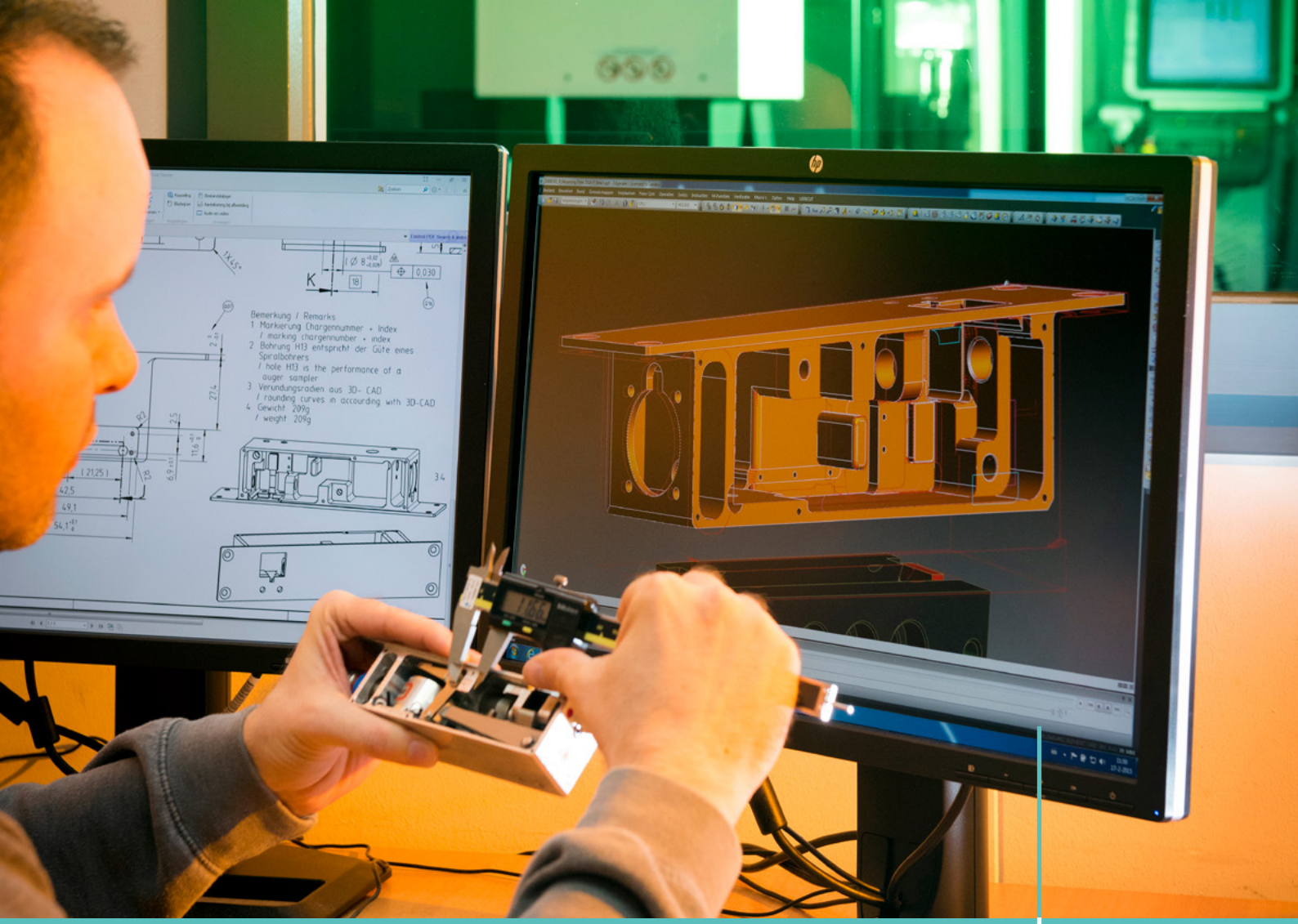

Photo: Sander van der Torren

CIRCULAR DESIGN

- At least one iconic process per market, further development of CIRCO approach in the 2018-2021 period.
- Before 1 January 2019, structure and financing for the expansion of CIRCO to a knowledge centre for circular design and business models (knowledge, promotion and implementation) have been developed. Ready for the runtime 2019 – 2029.
- Branding the Dutch CE knowledge and partnership skills as export items/export services.

1.3. ACTION AGENDA

CIRCULAR DESIGN

CAUSE AND GOAL

A successful circular product or service by definition has a profitable business model. A successful approach should therefore not only focus on the often physical material aspects of products, but also on the design of propositions; a combination of product, service, and business model in a system.

The current circular design is still too much focused on the individual product, whereas it should be a key to a complete solution in the circular system. Products are rarely independent things, but form part of a system of services and products from multiple providers, embedded in a social and economic ecosystem.

CE designing needs to be a basic skill for the 'creating' individuals, such as initiators, designers, and engineers. Moreover, CE thinking needs to be a basic skill of the entire working professional population and all consumers. There are a lot of stories out there, but a comprehensive approach has been lacking so far.

Developing the new propositions is a matter of the market and its collaborating partners.

The goal of our circular design action agenda is to bring together supply and demand in specific markets where the impact will be significant due to the scope, the influence of Dutch companies, or the presence of critical resources.
In the action agenda, we focus on:

- Automotive.
- Machines and equipment.
- Packaging.
- Construction and Infrastructure.
- Defence and safety.
- Healthcare and hospitals.
- IT and hardware.
- Sustainable energy.

POSSIBLE SOLUTIONS

Since 2015, the CIRCO project has supported the stated activities. Ever since the start, methods to scale up and reach out to players in the manufacturing industry have been developed. Among other things, this takes place by means of a network of trainers and a distributed approach with standardised materials. The innovation required – next to the inevitable scale increase – consists of organising an approach that brings together supply and demand in specific markets at a precompetitive stage. The planning for 2018 already partly provides for this, but more sizeable investments are required to reach the manufacturing industry as a whole.

The Transition Team's recommendation is to focus fully on design, within the stated vision. On the one hand, this entails structural continuation of the CIRCO programme, on the other hand it concerns the development and embedding of the current activities in a knowledge centre for circular design and business models. The business community, together with knowledge institutes and the government, provides a structural programme in this context. A programme with the ambition of offering 100% circular products and services within the scope of the aforementioned sectors. The programme links up with specific regional characteristics and activities that can ensure things are sped up. Points of attention for a knowledge centre are, among others, a flexible network organisation, further developing the knowledge and tools, and cooperating with financial institutes. The 'knowledge platform of circular design and business models' cannot simply be developed and used here; it also needs to be implemented internationally. The knowledge foundation offers opportunities for export.

MILESTONES

1. At least one iconic process per market, further development of CIRCO approach in the 2018-2021 period.
2. Before 1 January 2019, structure and financing for the expansion of CIRCO to a knowledge centre of circular design and business models (knowledge, promotion and implementation) have been developed. Ready for the runtime 2019 – 2029.
3. Branding the Dutch CE knowledge and partnership skills as export items/export services.

ACTION AGENDA

Milestone	Actions	Business community	Government	Knowledge institutes	Budget (k€)
1	As a first process step, develop a design-driven approach based on desired situations in 10 years within each market with driving forces and policy tool sets for design-driven innovation. Facilitate CE projects in the market (using CE change agents, CE chain project builders) with knowledge transfer of CE design and cooperation projects.	The business community takes the initiative to start the processes, together with CIRCO and stakeholders from the mentioned markets.	Facilitates the initiative and participates wherever they are a stakeholder in the market within the processes.	Participating in the processes with expertise.	7,000
2	Action plan for the manufacturing industry for a CE knowledge centre to transfer and implement new knowledge, feedback loop towards new research. Developing CE thinking, CE design, CE assessment tools, CE curriculum.	The business community is taking the initiative, together with frontrunners, to set up a plan of action and develop it within CIRCO.	Facilitating	Participating with attention to online education.	20,000
3	Branding the Dutch CE knowledge and partnership skills as export items/export services.	Initiator	Facilitating	Participating	1,000

SUPPLY SECURITY OF CRITICAL RESOURCES

- Launching the resource scanner per 1 January 2018 and implementing a knowledge transfer programme.
- Making a final estimate (risk analysis) of the future demand for rare resources and how this affects the chain before 1 January 2019.
- A multi-year programme, focused on substituting critical resources at material and product level, has been drawn up before 1 January 2019.
- Together with European frontrunner countries, a national policy focused on supply security of critical resources will have been implemented before 1 January 2019.
- In 2019, at least 1 iconic project with urban mining is executed that is scalable.

SUPPLY SECURITY OF CRITICAL RESOURCES

CAUSE AND GOAL

The supply security of numerous resources and semi-finished products are on the agendas of the European and Dutch governments. Supply interruptions can have a significant impact on Europe's national economies. Europe's major dependency on import led to the realisation that the European economy is at real risk. In Europe this has led to the following: the formulation of a resources policy, implementation of a European Innovation Partnership (EIP) on Raw Materials, stimulating innovation and research (among others by drawing up the EIT Raw Materials), and the publication of a regularly updated version of the most critical resources for the EU28.
The European policy is based on three pillars:

1. Stimulating a free and transparent global trade.
2. Stimulating European mining.
3. Reducing the resource dependency by aiming at more resource efficiency and developing substitutes that use as few critical materials as possible.

The urgency of supply security of resources is not yet tangible. It is important to get a clear idea of future problems regarding supply security that cannot be solved by the market. Or can only be solved with very negative effects for the Netherlands.

POSSIBLE SOLUTION

We focus on three tracks: knowledge, the international position of the Netherlands, and the social risks in the chain.

Knowledge in the field of (the importance of) supply security for the Dutch economy appears to have been fairly well-developed. But market information on the basis of which professionals can make daily decisions is missing. The resource scanner and a knowledge forum should give some direction. Apart from an awareness function, these tools can also play a strategically innovating role. Working on CE can be an inexpensive measure for achieving climate goals. For example, with urban mining regarding critical metals for, among other things, circuit boards, solar panels and wind turbines, the Netherlands can improve its position for specific product components. Moreover, switching critical materials for the least rare elements, so-called elements of hope, is vital. This requires extensive multi-year development of knowledge.

In parallel to the knowledge track, it is necessary that supply security in the context of free global trade is explicitly collaborated on at a European level. The Dutch government will have to take up a driving role for the manufacturing industry. Together with stakeholders, the manufacturing industry will work on addressing and preventing social risks in the chain.

MILESTONES

1. Launching the resources scanner per 1 January 2018 and implementing a knowledge transfer programme.
2. Making a final estimate (risk analysis) of the future demand for rare resources and how this affects the chain before 1 January 2019.
3. Before 1 January 2019, a multi-year programme focused on substituting critical resources at material and product level has been drawn up.
4. Together with European frontrunner countries, a national policy focused on supply security of critical resources will have been implemented before 1 January 2019.
5. In 2019, at least 1 iconic project with urban mining is executed that is scalable, see the overview in appendix IV, among other things.

ACTION AGENDA

Milestone	Actions	Business community	Government	Knowledge institutes	Budget (k€)
1	Introducing a standard for price volatility calculations on public sites for thousands of product groups. Setting up a supply chain due diligence help desk.	The business community took the initiative to create a resource scanner. Together with the central authority, they take care of the launch and implementation.	Facilitating the resource scanner and taking the initiative to form a knowledge forum that can take care of the implementation together with the business community. Special attention will be paid to SMEs.	Providing lasting expertise for supply security focused on application in the resource scanner and knowledge sharing via the knowledge forum. Supply security focused on application in the resource scanner and knowledge sharing via the knowledge square.	2,000
2	Executing a strategic process with the participating companies and knowledge institutes focused on a long-term strategy for resource supply security for the benefit of the European Raw Materials Innovation Partnership. Research into vulnerability/instability in value chains important to the manufacturing industry in terms of supply security.	The business community will actively provide input for the required data and as a sounding board for the practical suitability.	Taking the initiative in conducting the studies.	Providing expertise.	500
3	Designing a method for substituting critical resources. Determining CE contribution for achieving climate goals (kilo CO2 reduction optimum).	Actively participating in research.	Facilitating focused research and iconic projects and supporting National knowledge institutes with European funds.	Taking the initiative in drawing up a programme together with the stakeholders within the European and international context of the issue.	20,000
4	Reducing trade barriers with countries that have a strong development cooperation relationship with the Netherlands. Implementing Dutch version of DERA (Deutsche Rohstoffen Agentur).		Taking the initiative together with the business community and frontrunners.		
5	Organising tenders.	Providing input and activating supporters.	Takes the initiative in drawing up requests for tenders and facilitates iconic projects.		2,000

Photo: Zero Fotografie

UNIFORM BASIC PRINCIPLES AND CALCULATION METHODS

- Before the summer of 2018 there will be a concrete agreement between all stakeholders to form a national system for environmental performance products in coordination with European and international developments and taking into account a level playing field for enterprises operating at an international level.
- In 2018 and 2019, a proof of concept of a database and a standard within a number of chains (at least three) are developed together with all parties: clients, designers, manufacturers, etc.
- Before 1 January 2020, the government will provide political direction as to how environmental performance in products can be turned into policy.
- A database and standard system will be operational before 1 January 2022.

UNIFORM BASIC PRINCIPLES AND CALCULATION METHODS

CAUSE AND GOAL

There is a lot of uncertainty in quantifying circularity in terms of environmental performance. Uniform standards and calculation methods are required as a communal 'language' in the transition towards a circular economy. Even though there are some good examples for some product groups, there is still a lack of unified and independent standards. The standards should not necessarily say whether a material in itself is good or bad; they should provide direction to objective information and to how the choice can be optimally made for a material based on the highest net environmental and climate profit throughout the lifespan of the product. It is about sustainable use of materials.

Different methods that are currently used come from specific parties, who often clearly also have their own interests in the proposed method. Standardisation is a process in which all stakeholders are equally involved, with a clear and substantiated intrinsic course and mandate.

POSSIBLE SOLUTION

We strive towards a practical operational system of a database and a standard Environmental Performance Products assessment method in which the system of the national environmental database and the environmental performance calculations (MPG) are explicitly recognised in the construction industry. Collaboration and coordination with European and international developments is our basic principle.

MILESTONES

1. Before the summer of 2018 there will be a concrete agreement between all stakeholders to form a national system for environmental performance products in coordination with European and international developments while taking into account a level playing field for enterprises operating at an international level.
2. In 2018 and 2019, a proof of concept of a database and a standard within a number of chains (at least three) are developed together with all parties: clients, designers, manufacturers, etc.
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ACTION AGENDA

Milestone	Actions	Business community	Government	Knowledge institutes	Budget (k€)
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2	Executing a strategic process with the participating companies and knowledge institutes focused on a long-term strategy for resource supply security for the benefit of the European Raw Materials Innovation Partnership. Research into vulnerability/instability in value chains important to the manufacturing industry in terms of supply security.	The business community will actively provide input for the required data and as a sounding board for the practical suitability.	Taking the initiative in conducting the studies.	Providing expertise.	500
3	Designing a method for substituting critical resources. Determining CE contribution for achieving climate goals (kilo CO2 reduction optimum).	Actively participating in research.	Facilitating focused research and iconic projects and supporting National knowledge institutes with European funds.	Taking the initiative in drawing up a programme together with the stakeholders within the European and international context of the issue.	20,000
4	Reducing trade barriers with countries that have a strong development cooperation relationship with the Netherlands. Implementing Dutch version of DERA (Deutsche Rohstoffen Agentur).		Taking the initiative together with the business community and frontrunners.		
5	Organising tenders.	Providing input and activating supporters.	Takes the initiative in drawing up requests for tenders and facilitates iconic projects.		2,000

Photo: Sander van der Torren

MATERIAL EFFICIENCY

- There will be a manifesto regarding the valorisation of material efficiency of products and services in the context of the European developments regarding Ecodesign before 1 January 2019.
- Before 1 January 2020, the government will provide political direction as to the development of a system (tax, regulatory, stimulating and economic) focused on preventing loss of value of products and services.
- The system will be operational before 1 January 2022.

MATERIAL EFFICIENCY

CAUSE AND GOAL

The circular economy is an economic and industrial system that uses the reutilisation of products and resources and the regenerative ability of natural resources as the starting point. A system that minimises destruction of value in the entire system and aims at value creation in every link of the system.

In other words: a circular economy focuses on retaining value and realising as low a pressure on the environment as possible. The focus lies on optimising the product life cycle and on closing the resource chain.

The unilateral goal of achieving the reduction of primary resource utilisation appears to be an incorrect focus. It does not necessarily lead to optimum use of products and resources. Realising the benefits of a circular economy will require a shift of focus to optimising the production life cycle, the reutilisation rate including refurbishing, remanufacturing and upgrades, and closing the resource chain at the end of the economic life of a product, the recycling rate.

POSSIBLE SOLUTION

Material efficiency is a key word in a circular system based on retention of value instead of costs. It is important to create awareness of and support for this so eventually policy and business can be based on it. For the material efficiency activities cluster, it is about twisting three linked dials: Firstly, directing the search process through a vision of transition, with an 'end of life' approach from consumption to use. Secondly, knowledge about this needs to be gathered and shared. Thirdly, incentives are required to prevent material consumption and to stimulate use. This requires a fitting tax system, economic system, and regulatory system. Stimulating demand is also required. The vision of material efficiency should also be leading for the monitoring process.

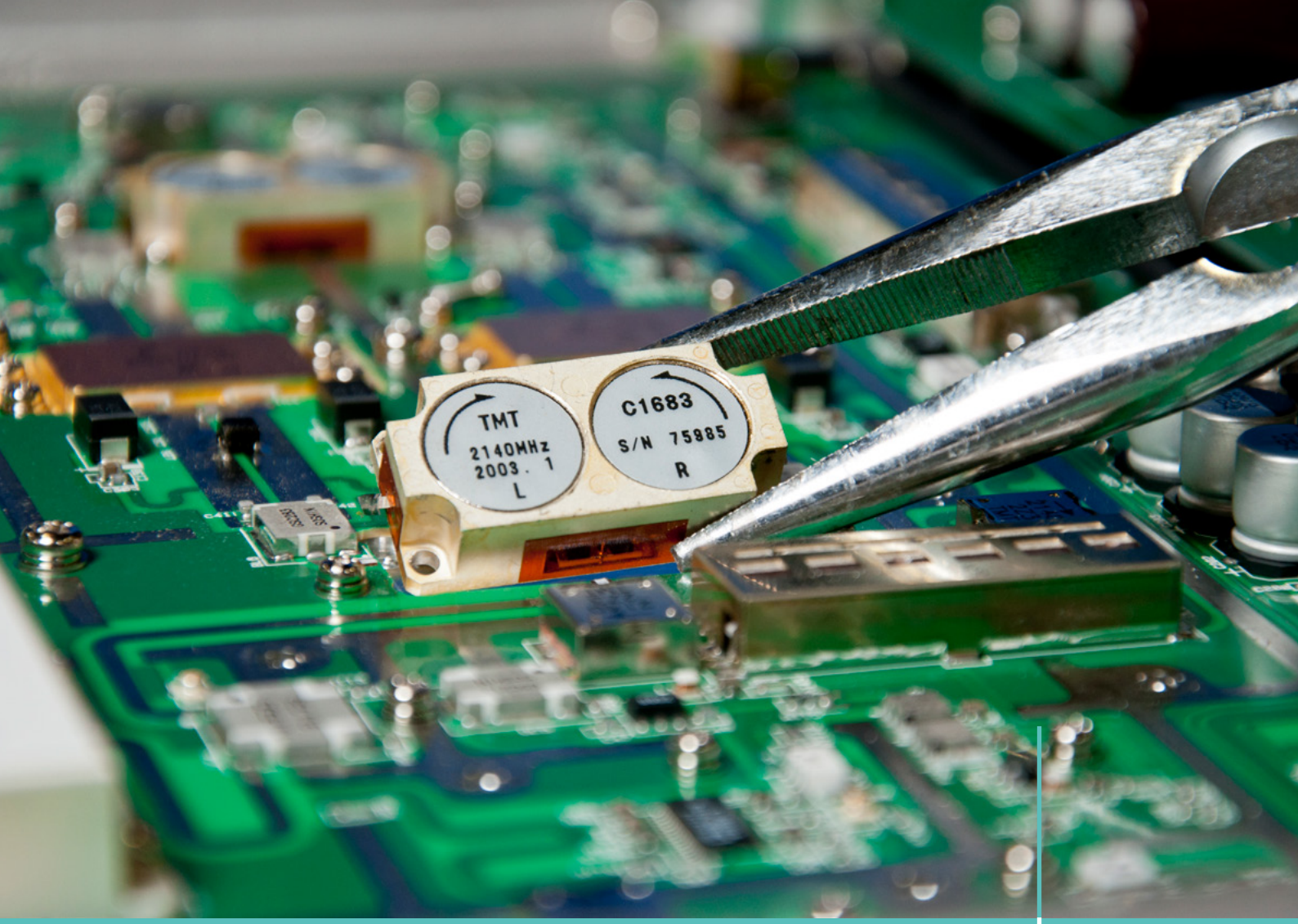
MILESTONES

1. There will be a manifesto regarding the valorisation of material efficiency of products and services in the context of the European developments regarding Ecodesign before 1 January 2019.
2. Before 1 January 2020, the government will provide political direction as to the development of a system (tax, regulatory, stimulating, and economic) focused on preventing loss of value of products and services.
3. The system will be operational before 1 January 2022.

[2] *TNO Kansen voor de Circulaire Economie June 2013, based on Ellen Mac Arthur foundation.*

ACTION AGENDA

Milestone	Acties	Business community	Government	Knowledge institutes	Budget (k€)
1	Convincing politics and government in a TED talk or manifesto, for example, that they need to opt for an LCA approach (and, as such, an 'end of life' approach) that is leading for fitting goals, incentives, and monitoring. Developing a standard for material efficiency with input and output factors.	The business community will take the initiative in drawing up a manifesto quantifying the frontrunner position of the Dutch business community in the context of the EU policy. The business community is actively participating, both nationally and internationally, in a standard for material efficiency.	Facilitating the standardisation work.	NEN will take the initiative in involving all stakeholders in the standard for material efficiency.	1,000
2	Policy viewpoint on utilisation versus consumption.	The business community will provide the input for the policy development.	The government will take the initiative in determining in which manner a policy can be drawn up for material efficiency and apply this in its own procurement policy.	Providing expertise.	
3	Creating a monitoring system for material efficiency.	The business community will provide the required data to execute and to monitor the policy.	The government will take the initiative in formalising and further developing the policy. In addition, the transfer of knowledge to procuring authorities will be further developed.	Providing expertise.	



RECYCLING TECHNOLOGY – CLOSING CYCLES

- Before 1 July 2018, the industry will have drawn up a concrete overview of limiting regulations for closing cycles on a national and European level. The overview includes concrete cases that fit in with the structure of room in regulations.
- Before 1 January 2019, there will be a political answer to these limitations focused on removing or otherwise solving the limiting regulations.
- Before 1 January 2020, a technological roadmap for optimum recycling of critical resources will have been drawn up.
- In the 2018-2022 period, there will be at least 2 iconic projects focused on recycling innovations in different product/material fields.

RECYCLING TECHNOLOGY – CLOSING CYCLES

CAUSE AND GOAL

The volume of primary metals will continue to increase in the coming decades. This is due to the growth of the general global demand and the high demand for (often rare) metals in the energy transition. The environmental impact will increase due to the necessity of mining at greater depths and having to process ore with lower concentrations.

Recycling is an important step in closing cycles, along with refurbishing, remanufacturing, and upgrading. A complication in recycling metals is that not all the elements from alloys can be reclaimed. It is important to optimise in terms of both quantity and quality. The more high-grade and clear an input stream, the less loss of kilogrammes and functionality in the recycling process. This also applies to other material streams, such as plastics for example. 'Bottle to bottle' recycling in this system is quite possible from a technical perspective, but is not the focus at an operational level. Which means we need to set requirements for collection.

Moreover, we see that legislation for products, such as legislation aimed at hazardous substances (reach), does not properly link up with waste legislation. This creates all sorts of limitations in using recyclate; limitations in the (logistics) process of recycling and limitations in reuse, refurbishment, etc.

An example: AELS is a company that dismantles air planes in a circular manner and offers parts for reuse in operational air planes. Formally, the last flight of an air plane to the dismantling location cannot cross national borders, because there is no free traffic of waste in the EU. The focus needs to shift from waste to a resource aimed at further application.

POSSIBLE SOLUTION

Naturally, design for recycling/reuse needs to be a basic principle for new products and services, with a specific attention to hazardous substances. This includes, for instance, the substitution of substances of (very) high concern. However, we will have many decades of traditional material streams in supply. Further innovation and optimisation in the process is required for this, but specific choices will also have to be made. Choices in which applications are possible in a controlled manner for recyclate streams that are not entirely free of substances of (very) high concern, in order to retain as much value of materials as possible.

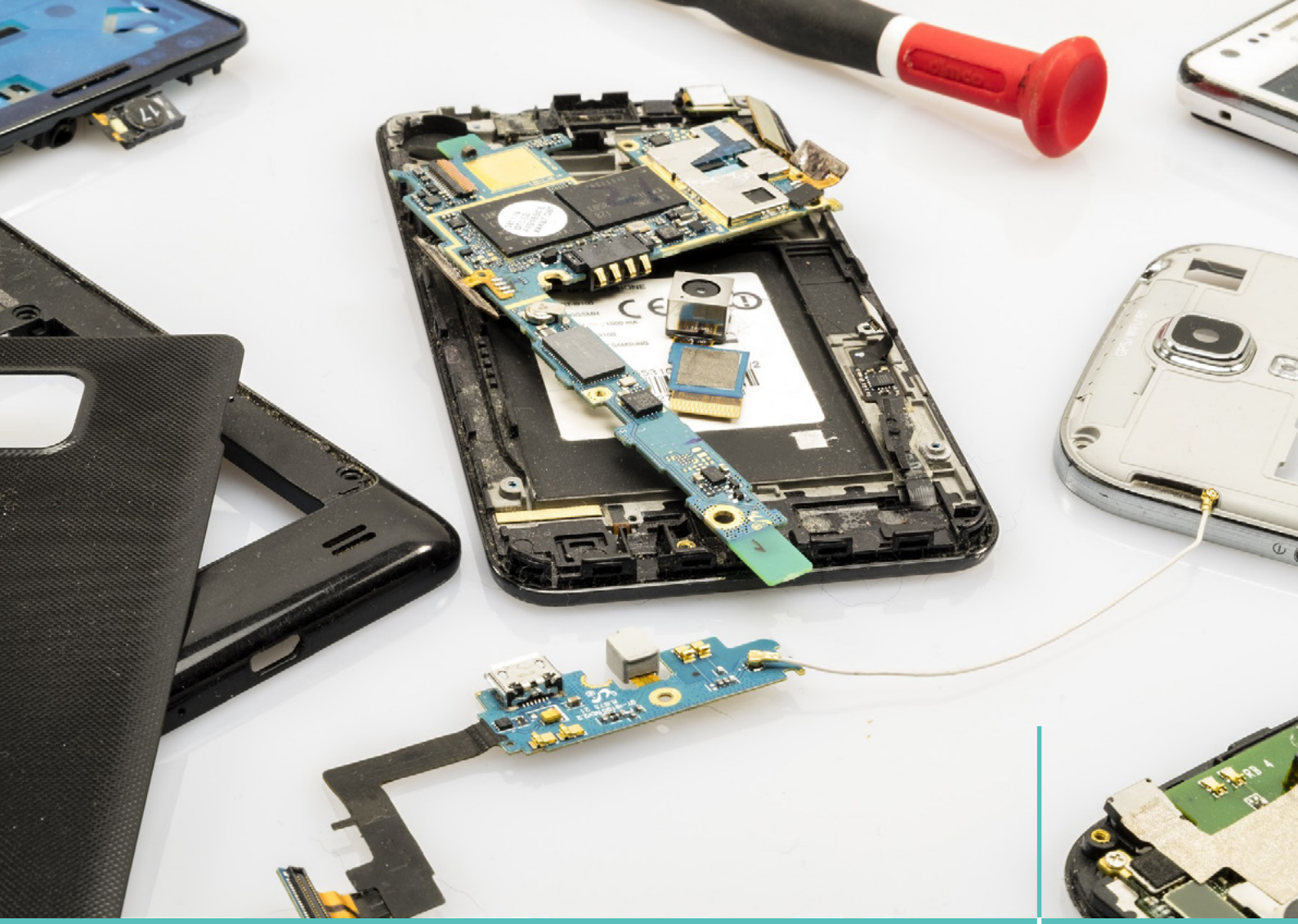
The ambition is to develop no net loss of critical resources by 2030. The recycling industry needs to be able to effectively use the urban mine in order to retain it. In the short term, the goal is to have an operational effective and closed system for resource registration.

MILESTONES

1. Before 1 July 2018, the industry will have drawn up a concrete overview of limiting regulations for closing cycles on a national and European level. The overview includes concrete cases that fit in with the structure of room in regulations.
2. Before 1 January 2019, there will be a political answer to these limitations focused on removing or otherwise solving the limiting regulations.
3. Before 1 January 2020, a technological roadmap for optimum recycling of critical resources will have been drawn up.
4. In the period between 2018 and 2022, there are at least 2 iconic projects focused on recycling innovations in different product/material fields.

ACTION AGENDA

Milestone	Actions	Business community	Government	Knowledge institutes	Budget (k€)
1	Consultation of supporters and tender cases. Insight into current actions for reported recycling & closing cycles bottlenecks regarding room to manoeuvre within regulations.	Takes the initiative in providing a full overview of bottlenecks.	Gives insight into the current affairs regarding room to manoeuvre within regulations.		200
2		Participates in response by facilitating dialogue with the business community.	Takes the initiative in providing the list with answers in the short term and puts the execution on the agenda.	Participates in the response by providing expertise for specialist issues	100
3	Developing technical (systems) standards for refurbishment, reuse, remanufacturing, etc. Phasing out substances of a very high concern (SVHC) from waste streams/secondary resources for clean streams in 2030 that can be used to close cycles in the automotive industry, IT hardware, medical equipment, and construction products. Specific attention needs explicitly to be paid to refurbished components that have already been introduced into the chain and for which extension of use can be a better choice than removal from the chain. Developing a uniform, practice-based matching platform for resource streams.	The business community takes the initiative in drawing up the roadmap.	Facilitates drawing up the roadmap.	Participates in drawing up the roadmap and also pays specific attention to European initiatives and studies.	500
4	Organising tenders.	Providing input and activating supporters.	Takes the initiative in drawing up requests for tenders and facilitates iconic projects.		10,000



FACILITATING CIRCULAR BUSINESS MODELS

- Before 1 January 2019, the financial institutions and the industry will have drawn up a circular financing roadmap for the manufacturing industry and its products. Tax incentive measures for circular propositions should be an explicit part of this. For example, the transition from labour tax to consumption tax, or a reduced VAT rate for circular or reused products.
- Before 1 July 2019, there will be political direction to the tax incentive policy for circular products.

FACILITATING CIRCULAR BUSINESS MODELS

CAUSE AND GOAL

The manufacturing industry increasingly makes its money with services. Whereas twenty years ago, almost two-thirds of the (labour) revenue came from production activities, this is expected to be slightly less than half in 2020. Especially for end manufacturers of capital goods, the so-called OEMs, there are opportunities to shift within their business model; shift from production and sale to a service model that is based more on service provision. This does require significant investments in, among other things, new technologies and employees. This is concluded by the ING Economic Agency in the report 'From product sale to sustainable client solution'.

The service model is an ideal first step towards a circular economy. Part of the service model is the collection (replacement) of the product. Control of the product stays with the manufacturer. Through smart design, disassembly, reuse or recycling can be much more effective. However, the value of the circular model should not (yet) be looked for in better procurement margins. What is more important is that the demand of major corporations and governments, including corresponding regulations, is shifting towards circular economy.

POSSIBLE SOLUTION

The transition from product sale to service model will need to take place step by step. The shift for manufacturers is a big one and requires time and financial investments, to develop technology that improves the maintenance and use (utilisation) of capital goods. The relationship with the client will be more intensive and requires further training of the sales employees. Soon it will be even more about a solution for the client. Finally, it requires capital, because the transition will require a lot of liquid funds in the first years.

MILESTONES

1. Before 1 January 2019, the financial institutions and the industry will have drawn up a circular financing roadmap for the manufacturing industry and its products. Tax incentive measures for circular propositions should be an explicit part of this. For example, the transition from labour tax to consumption tax, or a reduced VAT rate for circular or reused products.
2. Before 1 July 2019, there will be political direction to the tax incentive policy for circular products.

ACTION AGENDA

Milestone	Actions	Business community	Government	Knowledge institutes	Budget (k€)
1	Financing, coverage, and ROI models for new production among financiers, new models for longer and uncertain rates of returns.	Together with financial service providers, the business community will take the initiative to draw up a roadmap.	Participates in the roadmap by providing specific regulations that are required or need to be adjusted to execute the roadmap.	Participating in the roadmap.	200
2	Exploration for standard circular financial incentives, instead of custom solutions. Making WBSO means available for the SMEs' exploration of circular products and services. Generic MIA/VAMIL code for tax compensation for circular products and services resulting in placement of product/ service combinations in the 'Innovation box'. Immediate opening of subsidy schemes for secondary (used) products that are refurbished / reused. Reduction of VAT rate will stimulate the procurement of circular products.	Participates in response by facilitating dialogue with the business community.	The government will take the initiative in designing the generic tax incentive policy in such a way that it stimulates a circular economy.		

Photo: Mediatheek Rijksoverheid

CIRCULAR ECONOMY AS A MEANS TO AN END

The transition from a linear economy to a circular one is viewed by the authors of this agenda as a very important means for achieving two goals simultaneously.

1. In 2050, our aim is to have reduced the Netherlands' ecological footprint to a level in which we use one earth and comply with the agreements made in the Paris Climate Agreement. It is about retention of ecological value.
2. In 2050, the manufacturing industry is still an important foundation for our resilient economy. The prosperity and well-being of the Netherlands are maintained, or even increase. In order to make this possible, the Dutch manufacturing industry must be able to compete in the global market. The transition to a circular economy leads to maintaining employment and an increase in the quality of the work. Social inclusivity is the basic principle in this. We summarise this with the term economic and social retention of value.

CIRCULAR PROCUREMENT

CAUSE AND GOAL

In terms of moving towards a circular economy, the problem is that priority for price incentives and short-term profit play prominent parts in procurement. The dial that needs to be twisted first in the 'circular procurement activity cluster' is directing the search process for procurement. An important conclusion is that procurement needs to focus on retaining value during the lifespan, that it needs to be profitable, and that it must stimulate the circular economy.

Knowledge development and exchange of knowledge are the foundation for this exploration direction. Authorities and major corporations can take up an exemplary role by means of circular procurement projects, asset recovery projects, and peddling best practices from the market with sustainable procurement criteria and with, for example, lifespan-extending refurbishment of IT hardware.

POSSIBLE SOLUTION

Government and business community consider circular principles for each procurement or call for tender.

MILESTONES

1. Before 1 July 2018, there will be a proof of concept for circular principles in procurement processes that pays attention to procurement while taking into account life cycle, end of life, CO2 footprint, costs/performance (incl. transport), resources, and value loss.
2. Before 1 January 2019, there will be political direction to implementing these principles in government procurement at a national and regional level.
3. Before 1 July 2019, there will be a plan of action for removing remaining obstacles in circular procurement. This includes, for example, adjusting the tender regulations and financial systems/accounts, such as payment per month, getting money back through asset recovery.
4. In the 2018 – 2019 period, five iconic projects will be realised, at least one of which at the central government and two at regional authorities.

ACTION AGENDA

Milestone	Actions	Business community	Government	Knowledge institutes	Budget (k€)
1	Actively informing citizens/consumers/society about the relevance of circularity. Making an inventory of current procurement processes and CE criteria within the government (Directorate-General for Public Works and Water Management infrastructure, examples of facilities procurement and IT hardware).	Takes the initiative in recording the principles and involves frontrunners and stakeholders in this process.	Participates actively in the procurement process as a stakeholder.	Participates in providing expertise for specialist issues.	200
2	Companies are let down too often, because their competitor wins the tender with a non-circular or non-sustainable product that is cheap in the short term. Solution for socially responsible procurement: actually check if the provided products and services meet the predefined criteria in terms of sustainability.		Takes the initiative in embedding the principles in their own procurement policy and transferring knowledge regarding this to regional authorities.		
3	Consultation of supporters and tender cases.	The business community will take the initiative in drawing up the plan of action and involves the stakeholders in this process.	Facilitates the process of drawing up the plan and implements the execution of the plan of action.		200
4	Organising tenders.	Providing input and activating supporters.	Takes the initiative in drawing up requests for tenders and facilitates iconic projects.		2,500

2. WHY HAVE A CIRCULAR MANUFACTURING INDUSTRY?

2.1 VISION OF MANUFACTURING INDUSTRY TRANSITION TEAM

This agenda covers the issue of how the Netherlands can transition from a linear economy to a circular economy between now and 2050. With this agenda, the manufacturing industry concretely implements matters agreed to in the Raw Materials Agreement.

REDUCING THE ECOLOGICAL FOOTPRINT

The growing world population and our increasing consumption put more and more pressure on the available resources and energy of our planet. The pressure the world population's consumption can put on the earth without affecting the earth's regenerative capacity, or biocapacity, can be recalculated into an acreage of land required for the production of this consumption.

The ecological footprint (or global footprint, or footprint) for a specific year is a number that indicates how much biologically productive land and water surface is used by a specific population group in one year to maintain that group's consumption level and process that group's waste production.

The Netherland's ecological footprint is about 6 hectares per resident (source). In other words, the average Dutch person uses three planets instead of one. The ultimate challenge is to reduce this ecological footprint to the level in which we can use one earth.

COMPLIANCE WITH THE PARIS CLIMATE AGREEMENT

At a global level, there is clear evidence of the imbalance between our footprint and the earth's biocapacity. Emission of too much CO2 and other greenhouse gases that can no longer be absorbed by the planet lead to global warming. The Paris climate agreement records the upper limit of two degrees of warming with respect to the pre-industrial era in a legal instrument for the first time. Moreover, the desire to limit this global warming to 1.5 degrees has also been recorded. Furthermore, the use of fossil fuel needs to end quickly, because it is a primary cause of the excessive CO2 emission. Just like material use and CO2 emission go hand in hand, contributions to improving the circular economy are also contributions to achieving the climate goals.

PROSPERITY AND WELFARE OF MANKIND

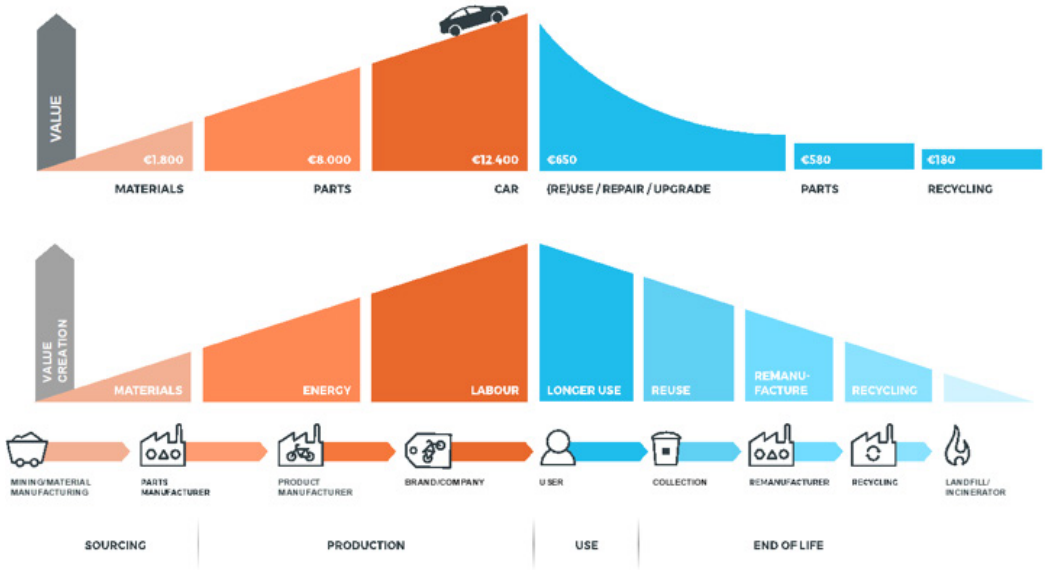
The prosperity and welfare of the population are equally important. The transition from a linear economy to a circular economy needs to at least retain the level of prosperity and welfare. However, more interesting and challenging is taking a course in which prosperity and welfare can be improved. The manufacturing industry will play a key part in this as developer, producer and supplier of many products and services that make our prosperity possible.

CIRCULAR ECONOMY AS A MEANS TO AN END

The transition from a linear economy to a circular one is viewed by the authors of this agenda as a very important means for achieving two goals simultaneously.

1. In 2050, our aim is to have reduced the Netherlands' ecological footprint to a level in which we use one earth and comply with the agreements made in the Paris Climate Agreement. It is about retention of ecological value.
2. In 2050, the manufacturing industry is still an important foundation for our resilient economy. The prosperity and well-being of the Netherlands are maintained, or even increase. In order to make this possible, the Dutch manufacturing industry must be able to compete in the global market. The transition to a circular economy leads to maintaining employment and an increase in the quality of the work. Social inclusivity is the basic principle in this. We summarise this with the term economic and social retention of value.

Our goal is illustrated through an example. In the linear economy, value is added in the production chain, from resources through semi-finished products to an end product. Value is added through an increase of functionality using technology, specific knowledge, and labour. The image below (source CIRCO) graphically represents this for a car. In the user phase, the value of the product immediately quickly decreases. After discarding, there still is a market with limited value for components and recycling products. In a circular manufacturing industry, a product is designed and produced in such a way that the loss of value in the use phase is balanced with the added value in the production phase. This has been represented graphically in the lower half of the image above. We retain value by maintaining functionality for a longer period of time; a longer lifespan, high-grade reuse, remanufacturing of components, and high-grade recycling. This results in a release of pressure on the environment, requires less primary production, and increases the economic and social value. This industrial chain for the use phase and onwards creates new employment options for all levels of society.



SUSTAINABLE ENERGY GENERATION AND ENERGY USE AS PRECONDITIONS

The policy focuses on a transition from an economy based on fossil fuel to an economy based on sustainable energy. That is the scope of our agenda. In other words, the Netherlands achieves the goals set out in the current Energy Agreement, which still needs to be concluded. For ease of use it is also assumed that the supply of sustainable energy is more than sufficient. As soon as these conditions are met, the attention will shift from a product's energy consumption to material consumption.

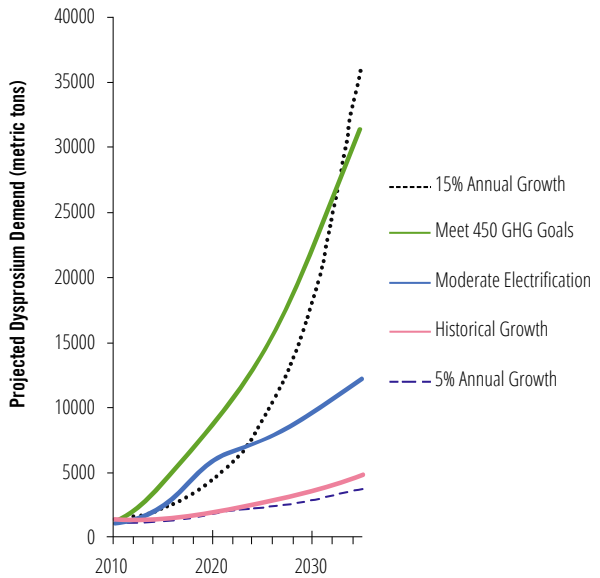
EXAMPLE

Once a car no longer uses fossil fuel, but hydrogen instead and once a building is energy neutral (EPC = 0) or even generates energy (EPC = negative), a product's environmental impact is primarily determined by the material consumption. The importance of limiting the use of toxic substances, for instance, will also strongly increase in that case.

CRITICAL METALS AND RENEWABLE ENERGY

Growth of solar and wind energy also requires more use of geopolitically rare metals. For solar panels, this concerns cadmium, tellurium and copper, indium, gallium and diselinide (CIGS), a by-product of copper extraction. For generators of modern windmills with strong permanent magnets, this concerns neodymium and dysprosium.

Research by the European Wind Energy Association (EWEA) based on research by the Joint Research Centre of the European Committee has reached the following conclusion: the European wind energy will use 0.81% neodymium and 0.95% dysprosium in its turbines.[2] Dysprosium will be the biggest issue: the demand is estimated to increase by factor 26 in the next twenty-five years. The demand for neodymium will increase by 700%. Future supply scenarios for these rare metals have been included in this estimate.



Source: https://www.visionair.nl/wetenschap/rapport-hernieuwbare-energie-leidt-tot-schaarste-metalen/

[2] *https://www.ode.be/ode/publicaties/nieuwsbrief/22-ode/ode/751-zeldzame-aardmetalen-in-windturbines60*

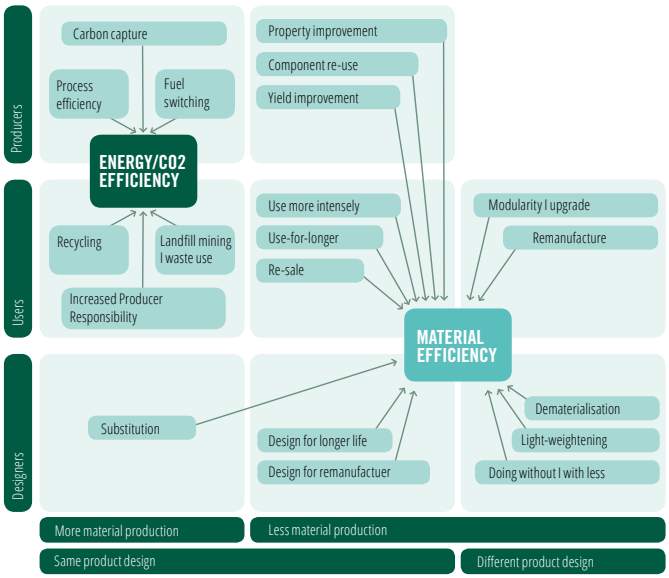
SMART INDUSTRY

Apart from the transition towards a circular economy, the manufacturing industry is currently in the middle of the transition to a digital world. A world in which IT is deeply embedded in all aspects of the production process. Smart Industry is driven by a smart use of IT that is utilised to connect machines to each other and allows for smart control. And not just within the plant itself, but also between companies and between companies and customers. It is about a combination of use of production technology, digitisation, and a network-based approach. And about smart products, processes, and services.
The smart industry transition can be a major enabler for the transition towards a circular economy. For instance, servitisation, a situation in which providing services is more important than providing products, plays a major part in both transitions..
To ensure that the smart transition has an enhancing effect on the circular transition, it is wise to make means available that ensure an extension and deepening in terms of circularity.
This will only work if it is regionally embedded, as is also stated in the Circular Economy Recommendation by the Social and Economic Council.

2.2 WHAT IS THIS AGENDA ABOUT?

REDUCING THE ENVIRONMENTAL PRESSURE OF PRODUCTS

We can reduce our footprint by reducing the environmental pressure of the products we use. A lot of attention and effort has gone into reducing the energy consumption of products and production. This is not enough, however. A substantial and increasing part of the ecological footprint of our products is due to the use of materials. The production chain – from primary extraction to end product – has a major global environmental impact due to emissions and land use. After discarding, the environmental impact of materials is still significantly high. Think of plastics in the ocean, dump sites with metals, and emissions as a result of incineration or flushing into the water.

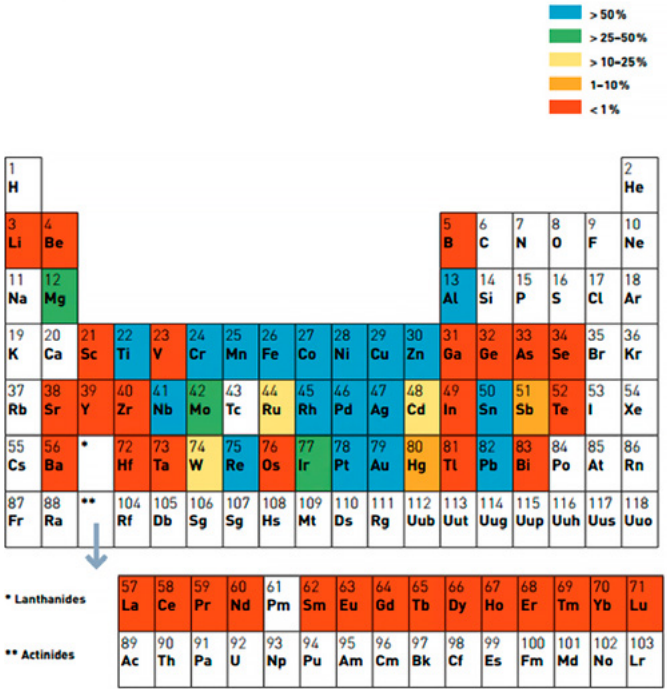


Our agenda focuses on these important material components. Material efficiency is at the heart of the matter (see image); we want to retain materials and thus also their ecological value. The manufacturing industry is currently transitioning from consuming materials to using materials.
To shape this transition, we need an agenda that focuses on designers.
Their challenge lies in looking for less environmentally taxing alternatives and functional designs for retaining value. The market, with its supply and demand, will need to develop models for the use phase that support retaining value, such as the longer and shared use and upgrading of products instead of replacing them. The production chain also faces an important challenge in redesigning the chain, in making and using secondary materials and components, and in further reducing the use of resources.

CLOSING THE RESOURCE CYCLE.

Fully closing the resource cycle goes beyond simply extending the lifespan of products or reusing them. This is again illustrated with the example of the car. In 2050, people will still want to travel with public transport and cars. The automobile is currently in the middle of a transition. In the previous century, the type of car that uses petrol or diesel was common. Now, we have hybrid cars, fully electrical cars, and are about to transition to solar-powered cars (TU Delft, and others), formic acid as a carrier for hydrogen (VDL Bus and Coach), and even aluminium-gallium-hydrogen granules are no longer science fiction.

Aluminium-gallium granules make it possible to turn water into hydrogen. Research at Purdue University in Indiana, USA proves this. This system can be applied to cars, but also in electronics like laptops. Hydrogen is viewed by many as the energy carrier of the future. An important downside to hydrogen is that it is very difficult to store. With this method the hydrogen is formed in the car itself. The reaction results in hydrogen, oxygen, and aluminium oxide. No toxic gases are released, and the aluminium oxide can be recycled. http://sync.nl/aluminium-korrels-voor-de-waterstofauto



In addition to the transition from fossil to hydrogen-based energy, cars also become ever smarter. Digitisation, Internet of Things, artificial intelligence, robotisation and Smart Industry allow for this transition. Cars will become autonomous and we will almost definitely, at least in part, switch from owning cars to using cars. Such a car will pick someone up to take them to work and then will drive someone else somewhere else. This will reduce the total number of cars. In principle, the self-propelled car will be worn out after, for example, 500,000 km, but the mileage will be reached much sooner than it will for a car that stands still 80% of the day. Even though the lifespan can be doubled by constantly replacing components, the car will come to an end at some point. The car is, in fact, still a linear product. In order to turn the car into a circular product, all of the car's materials, including parts that have been replaced during the use, need to be retained for reuse and recycling. We call this closing the resource and materials cycle.

Closing the cycles is a global challenge. The image displays the global recycling percentage of metals. Further developing the recycling technology and the concept of urban mining that allows us to get a better grip on waste streams is needed to contribute to increasing these percentages, in addition to designing more efficiently.

CRITICAL MATERIALS ARE VITAL

The list of all materials in a car is known to the industry as the so-called Bill of Material (BOM). Some materials can easily be replaced. Metals are basically infinitely recyclable, but can be lost through oxidation or mixed with other metals or materials to such an extent that there is loss of value. The same applies to plastics that get mixed with other plastics, pigments, (heavy) metals or plasticisers.

Looking at the supply of all materials, it becomes clear that not all materials have similar supply and prices. The location of materials is also not distributed evenly across the planet. Other metals are often released as by-products in the extraction of metals like iron, copper, zinc, gold, and aluminium. There is also a special group of metals, the so-called rare earth metals. These metals have unique properties, for which there are more and more applications in products.

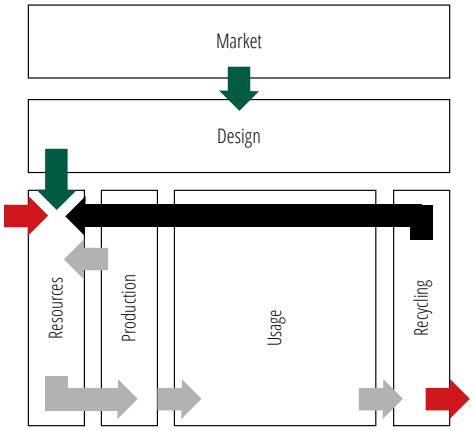
The supply security of rare earth metals is under pressure. Large supplies of resources are located in parts of the world that have more problems than Europe or the Netherlands. In the extraction of metals, people have to deal with wars and conflicts, environmental pollution, breaches of human rights, child labour, corruption, and other themes from the domains of international corporate social responsibility.
Moreover, countries or major mining corporations can decide who gets what. For instance, the 'China first' policy regarding restricting the export of rare earth metals in 2010 was an enormous wake-up call for the rest of the world (source: TNO Andre Diederen and HCSS https://www.nrc.nl/nieuws/2010/01/16/ chinezen-beheersen-de-zeldzame-aardmetalen-11838413-a836171). China's policy is aimed at securing the supply for China's own industry. Moreover, China buys up large strategic supplies abroad.
Germany looked into the effect of about a hundred innovations regarding the use of resources and summed up seven materials for which the demand will exceed the supply in 2030. Two of these are indium and gallium.
Each year, about 568 tons of the high-gloss metal indium – a by-product of lead and zinc – is used in solar panels and flat screens. Analysts estimate that this could grow to 1,700 tons per year in about twenty years. That is three times the amount extracted from mines each year currently.
For gallium, which looks like silver and is used in microchips, photovoltaic cells and white LED lights, the demand is expected to be six times higher than the supply in 2030. If the aforementioned aluminium-gallium-hydrogen granules become successful, this demand may easily be much higher.

[3] *Critical materials Research for the Dutch technological industry, April 2012*
By Derk Bol, M2I and Ton Bastein, TNO.

INCREASING THE SUPPLY SECURITY OF CRITICAL MATERIALS

For the majority of these resources the European economy depends fully on import from the rest of the world. This has been recognised by the European Commission and the Ministries of Foreign Affairs, Economic Affairs, and Infrastructure and Water Management. Without rare earth metals, we are lacking the strategic resources for our technological industry and are unable to make the transition to a sustainable economy. Research by order of FME (source) shows that the rarest earth metals do not reach the Netherlands as raw resources, but are already enclosed in components, semi-finished products, and products. The Netherlands is an assembly country that mainly adds value to products in the later links of the product chain. As a result of the above reasons, increasing the supply security of the critical materials is a required precondition for the shift towards a circular economy.

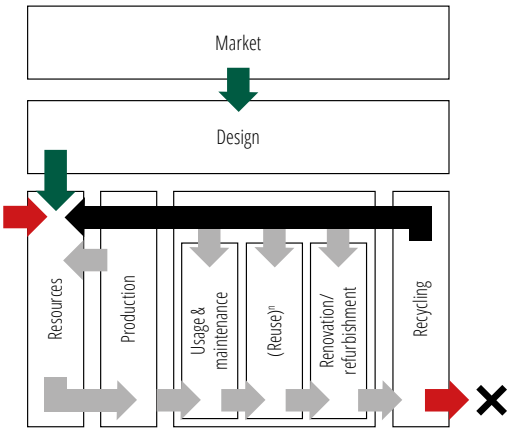
2.3 SCOPE AND POSITION OF THE MANUFACTURING INDUSTRY



The Dutch manufacturing industry has been schematically represented as follows:
The system is controlled by the market. The design of products fills the market needs and largely determines the life cycle of a product, from raw resources to discarding. In the current linear system the material streams in the system have been indicated with blue arrows. In conjunction with the 'internal' material streams, there is a net input stream in the system, as well as a net output stream.

The system of the Dutch manufacturing industry functions within a global context. Apart from the efficiency of the system, the volume of the global market also greatly influences the input stream. The Dutch manufacturing industry is characterised by the large import of semi-finished products, the resources for which are extracted and processed elsewhere.

In order to achieve the goals of retaining ecological value on the one hand and realising economic and social value on the other hand, the manufacturing industry needs to make structural adaptations.



The circular Dutch manufacturing industry has been schematically represented as follows: The model of the circular economy as defined by the Ellen MacArthur foundation is leading for ecological retention of value.
Reducing the environmental pressure is achieved inter alia by extending the lifespan and the introduction of strategies to keep products, components or materials in circulation functionally for a longer period of time. At some point, waste of the product or the service will occur. Think, for example, of an accident with a vehicle or a defect of a component is to close the cycle of all materials (outflow towards 0%). We want to place the focus on preventing the outflow of critical resources, because obtaining them will require high cost and effort. A second priority is to prevent the outflow of hazardous substances that have a negative effect on the environment and health.

In the interest of economic retention of value, it is important to note that the Dutch manufacturing industry makes products with added value for the Netherlands and abroad. This includes, for example, machines, automotive parts, and consumer items. The Dutch manufacturing industry makes a major net contribution to the GDP and we would like to continue doing that.

Moreover, products of the technological industry are required for the energy transition, windmills, transport, etc. This means that the demand for materials, including critical metals, will continue to increase to reach a global steady state in which there is a sufficient amount of materials in circulation in relation to the population growth (Social and Economic Council/Tukker). Only then will it be possible have a balanced ecological and economic retention of value or even manage actual separation. In the short term it is possible to significantly increase the ecological retention of value with respect to the economic growth.

2.3.1 INTERNATIONAL DIMENSION

A future-proof circular economy and society in the Netherlands can enhance our position as a knowledge country and simultaneously contribute to realising a better world for everyone. The UN global goals, the Sustainable Development Goals or SDGs, offer a framework and action perspective for this. The Netherlands can make a positive contribution to several of these global goals, including the goal regarding sustainable consumption and production. The switch to a circular economy in the Netherlands will have to take place, especially in an international context. The Netherlands and its manufacturing industry are not independent, after all.

It is expected that the circular economy will also be picked up in an international context. Companies that experiment successfully with circular products and services can obtain an international competitive advantage. It is essential here that these opportunities are taken up and that there is intensive collaboration, e.g. through the Holland Circular Hotspot initiative. Working on the circular economy reinforces the implementation of the Sustainable Development Goals both in the Netherlands and elsewhere. It is important to also view export of circular products to other countries within the context of development cooperation and to value its positive impact on realising the SDGs. Speeding up the transition towards a circular economy first and foremost requires an ambitious EU policy. A large number of actions required for the circular economy can only be implemented at an EU level or by cooperating with other countries. This concerns, for example, solving bottlenecks in the current EU legislation and regulations and a bigger use of market incentives to boost the circular economy market. An expeditious execution of the European Circular Economy Package and the formation of smart coalitions with other leading member states can be helpful. Finally, the Netherlands is known as the international frontrunner in terms of the circular economy. However, there is still much to learn from other countries, both within and outside of the EU. International cooperation also serves to speed up the transition towards the circular economy by exchanging experiences and best practices with other countries.

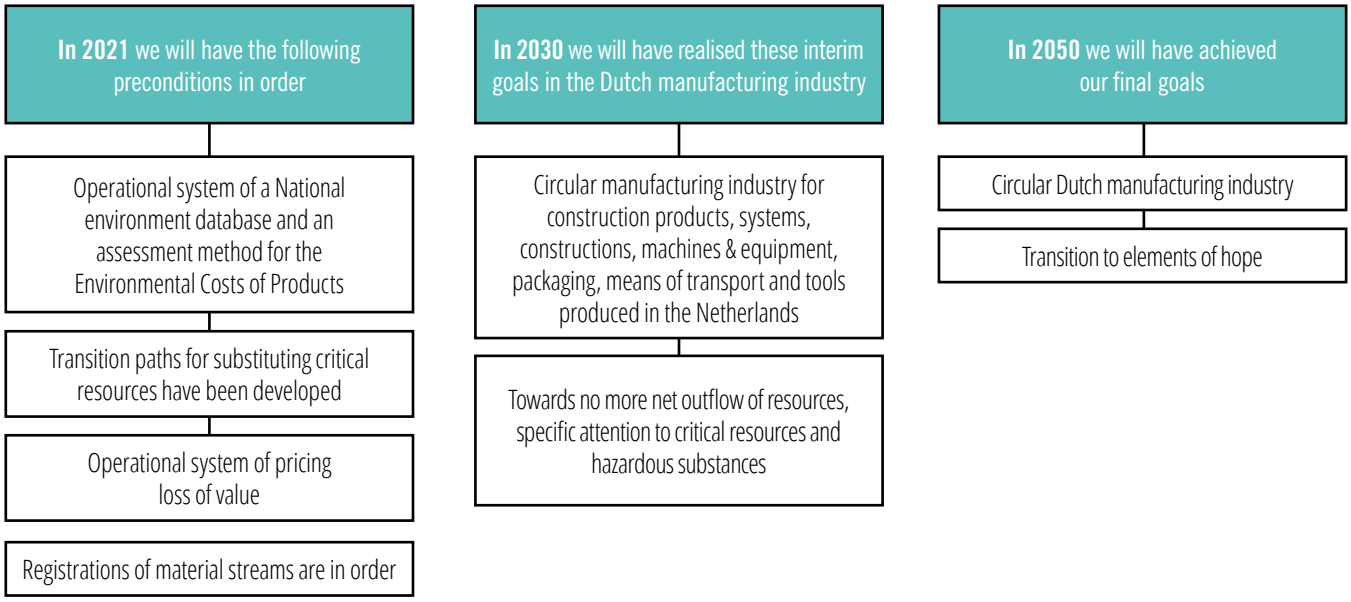
The Dutch manufacturing industry is definitely aware of the international dimension linked to a transition and the opportunities that are generated and will, as a result, wherever possible and useful, make connections during the execution of various actions in the action agenda.

3. AMBITIONS – WHAT, WHO AND WHEN?

The goal in 2050 is to have a circular manufacturing industry, including its products. The agenda for achieving this is an ongoing process where people learn constantly. It is not realistic to assume that we can plan the entire transition with the knowledge we currently have. We will have to achieve the 2050 goals in an iterative process of development, implementation, monitoring, learning and adjusting.

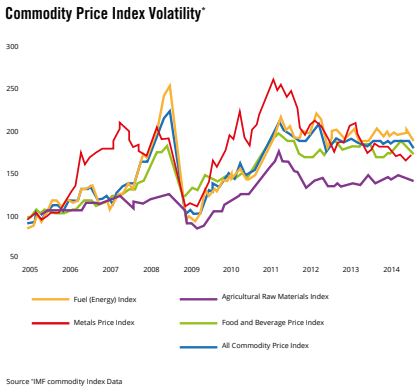
The parties represented in this agenda set the goal for themselves to have all the preconditional systems for the transition in order by 2021. Moreover, there are clear interim goals that we, just like Kennedy who wanted to put a man on the moon in within 10 years, put into place to apply focus and thus direct and speed up the transition.

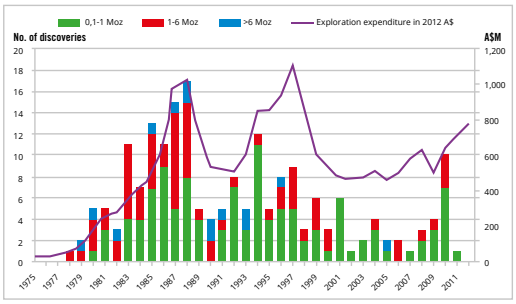
We are quite realistic with respect to our reach and sphere of influence en route to a circular manufacturing industry. After all, we are talking about a global challenge to transform this global industry. We have identified good opportunities for what we can do within a national context, which is what our ambitions for 2021 are aimed at. Based on this national context, we face this challenge in Europe together with the government and other stakeholders. Our ambitions for 2030 need to be realised in a 'we in Europe' context. Here, we can take up a leading role with our double goal as the basic principle. Our ambitions for 2050 will need to be realised together in a global context. As stated, we view this agenda and the transition as a learning process. The ecological, economic and social retention of value for the Netherlands will take shape in an iterative way.



The urgency behind the Transition Agenda for the Dutch Manufacturing Industry lies in a number of threats and opportunities.

There are many threats, such as the increasing insecurity in global resource prices, the increase in exploration costs of primary resource extraction, and the excessive increase of environmental impacts resulting from processing lower concentrations of ore. In the past decades, we have seen an increase in both price volatility, exploration costs and environmental impact per kilogramme of pure metal (see Figure XX). Moreover, there are social and political urgencies regarding conflict minerals, and there is an unpredictable increase in demand for resources due to consumption in developing economies in the coming years.





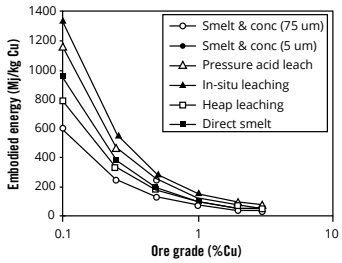


Figure 1, 2, 3: More unpredictable, more difficult to reach and more polluting: the (sources: IMF Commodity Index Data; Minerals Council of Australia gold exploration, minerals.org.au; Norgate, 2007, JoCP)

The opportunities made urgent by this Transition Agenda relate to the potential contribution of a circular economy to the climate goals. Most Western economies are emitting most of their greenhouse gases through the manufacture of goods and not through the use of services or energy consumption of households. Moreover, the Dutch manufacturing industry is most important in terms of maintaining a favourable Dutch trade balance. On top of that, the manufacturing industry, in contrast with service provision, is usually the motor behind a productivity increase of economies.

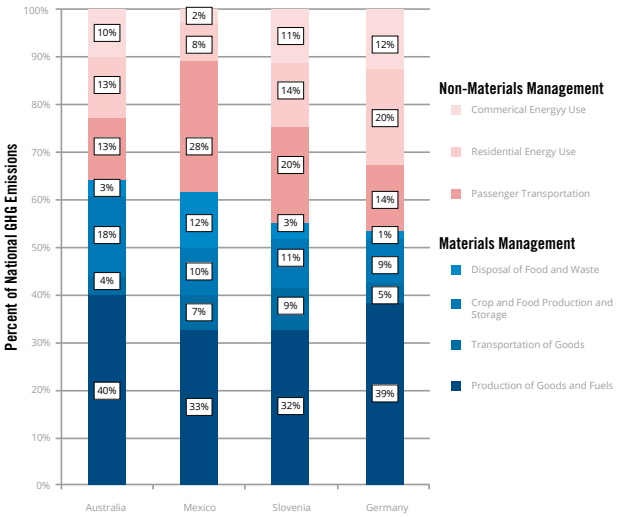


Figure 4: a number of countries comparable to the Netherlands have been indicated in blue, the share of greenhouse gases linked to the manufacturing industry is indicated in shades of blue, and the share linked to the whole of services and domestic use is indicated in shades of red.

The opportunities and threats, as already stated in the Transition Agenda, are not enough, however, to instil a general sense of urgency in important public and private stakeholders.

4. MANUFACTURING INDUSTRY AGENDA

An agenda has been drawn up in order to fulfil the ambitions of a circular manufacturing industry with circular products with a strong focus on the first steps in our sphere of influence. The agenda consists of a clear action agenda, a knowledge agenda, and a social agenda. The action agenda includes an investment agenda.

4.1 KNOWLEDGE AGENDA

We emphasise the importance of a comprehensive knowledge agenda in which the national programme, the five Transition Agendas and the Top Consortia for Knowledge and Innovation resulting from the top sector policy join forces. Moreover, we expect active participation of knowledge institutes in various elements of our agenda. Finally, knowledge institutes play an important role in the international coordination or integration of our action agenda.
In terms of knowledge, we ask specific attention in our action agenda for:

Action agenda	Milestone *Actions*	Knowledge institutes	Government	Business community
Supply security of critical resources	Making a final estimate (risk analysis) of the future demand for rare resources and how this affects the chain before 1 January 2019. Executing a strategic process with the participating companies and knowledge institutes focused on a long-term strategy for resource supply security for the benefit of the European Raw Materials Innovation Partnership.	Providing expertise	Taking the initiative in conducting research.	The business community will actively provide input for the required data and act as a sounding board for practical usability.
	A multi-year programme focused on substituting critical resources at material and product level has been drawn up before 1 January 2019. Making a method for substituting critical resources. Determining CE contribution for achieving climate goals (kilo CO2 reduction optimum).	Taking the initiative in drawing up a programme together with the stakeholders within the European and international context of the issue.	Facilitating focused research and iconic projects and supporting national knowledge institutes with European funds.	Actively participating in research.
Material efficiency	There will be a manifesto regarding the valorisation of material efficiency of products and services in the context of the European developments regarding Ecodesign before 1 January 2019. Developing a standard for material efficiency with input and output factors.	NEN will take the initiative in involving all stakeholders in the material efficiency standard.	Facilitating the standardisation work.	The business community is actively participating, both nationally and internationally, in a standard for material efficiency.
Recycling technology - closing cycles	Before 1 January 2020, a technological roadmap for optimum recycling of critical resources will have been drawn up. Developing technical (systems) standards for refurbishment, reuse, remanufacturing, etc.	Participates in drawing up the roadmap and also pays specific attention to European initiatives and studies.	Facilitates drawing up the roadmap.	The business community takes the initiative in drawing up the roadmap.

	Phasing out substances of a very high concern (SVHC) from waste streams/secondary resources for clean streams in 2030 that can be used to close cycles in the automotive industry, IT hardware, medical equipment, and construction products. Specific attention explicitly needs to be paid to refurbished components that have already been introduced into the chain and for which extension of use can be a better choice than removal from the chain. Developing a uniform, practice-based matching platform for resource streams.			
Circular procurement	Before 1 July 2018, there will be a proof of concept for circular principles in procurement processes that pays attention to procurement, while taking into account life cycle, end of life, CO2 foot print, costs/performance (incl. transport), resources, and value loss. Actively informing citizens/consumers/society regarding relevance of circularity. Making an inventory of current procurement processes and CE criteria within the government (Directorate-General for Public Works and Water Management infrastructure, examples of facilities procurement and IT hardware).	Participates in providing expertise for specialist issues.	Participates actively in the procurement process as a stakeholder.	Takes the initiative in recording the principles and involves frontrunners and stakeholders in this process.

4.2 SOCIAL AGENDA

On a social level there are many challenges. From digitisation and technological innovation to circular thinking and circular action, a more flexible labour market, and quality of vocational education. There is strong competition and developments move fast in the manufacturing industry. The formation of new jobs where other jobs disappear is nothing new. However, there are more and more circular initiatives in which resources, components and (end) products can increasingly be linked to labour capital. This creates opportunities. In the manufacturing industry, the developments of robotisation and automation also proceed at a rapid pace. It is now a matter of having these types of developments lead to opportunities for the social agenda as well, with adequate policy and steering in terms of labour market transitions and optimisation of regional and sector transitions.

Parties are not alone in this positive basic attitude. TNO also describes these opportunities in the report 'Opportunities for the circular economy in the Netherlands'4. In the metal sector, around an additional € 575 million a year can be earned by placing a sharper focus on circularity. More importantly: it would lead to reinforcing the manufacturing industry and to a structural increase of over 10,000 new jobs, inter alia in the maintenance and repair sector, logistics, etc. This would be caused by a value increase through maintenance, reuse of products and components, and through recycling.

[4] *http://bit.ly/2yMuxrg*

LABOUR MARKET

The manufacturing industry is vital for the Netherlands. and requires a properly functioning labour market. Research by ING shows that one job in the manufacturing industry leads to one and a half job in other sectors, such as service provision or transport. However, the labour market's demands continue to develop, mostly because it is not sure how matters will develop as a whole. For instance, there was no robot welder ten years ago. That is why companies need to be agile and operate flexibly.

The shift of attention towards product/service combinations and the included shift to production with retention of value, as noticed, result in more work.
The intensified attention on the R strategies from the model by Ellen McArthur is expected to lead to more deployment of labour. For example, in designing, leasing and sharing products, disassembly, repairs, collection, etc. However, there may also be shifts within specific sectors (e.g. within the resource and recycling sector), which means the net positive effect may be lower.

These circumstances mean that we need to think carefully about the layout and functioning of the labour market. Not all employees will manage to keep standing, though, if only because of the simple fact that they cannot meet the higher knowledge and skill requirements. In order to ensure that this group is not permanently sidelined, work-to-work processes can be implemented.

EDUCATION

There is a certain mismatch between education and labour market demand. As a result, vacancies for technical professionals are hard to fill and good employees need to be found abroad, too. There is primarily a need for sufficient and well-trained technical employees. That is why the manufacturing industry needs to be visible to students in secondary schools. For education, the challenge lies in finding a balance in teaching IT skills and professional knowledge and skills. These are 21st century skills: critical thinking, creative thinking and solution-oriented thinking, social, information and IT basic skills and being able to work together, plan and organise.

The educational field needs to anticipate all these new developments, and senior secondary vocational education (MBO) institutes, universities of applied sciences (HBO) and universities need to possess an adequately equipped physical learning environment and knowledge. Companies can help improve the current educational offering. Apart from talent capable of achieving technological breakthroughs, the craftsmen who can actually make things are just as important. Employees are often trained in-company, an environment that needs craftsmen who both control the basic processing methods for the material and are able to provide input for high-tech development.

Both employers and employees themselves need to invest in:
- Life-long learning, both in the classroom and on the job.
- A culture in which trust and commitment are core values.

It is important that employees constantly anticipate future developments and are given the opportunity to do so. The employers can also expect their employees to constantly ask themselves how they can retain their value in the labour market for the purpose of continuously being employable.

Flexibility and self-management are part of an uncertain future. Employees who constantly develop themselves are also capable of organising their own work activities. Self-management, self-scheduling and placing responsibilities at low tiers in the organisation are themes that need to be specifically looked into. Enticing the employee to co-create within the work organisation as well as developing cross-company and cross-sector work processes will contribute to the aforementioned flexibility. Conditions for this are vitality, multidisciplinary work, entrepreneurship, and self-sufficiency. Naturally, the employer takes up a stimulating part in this, in which involvement and trust are important basic principles for entering into a dialogue with the employee.

INTERNATIONAL CONTEXT

Many products are created in international chains, in which resources come from many countries and trade extends across different parties in different countries. Effective action requires international cooperation throughout the chain at EU or global level. The circular economy can also serve here as a driver for the implementation of IMVO covenants, because transparency in the chain is key in these covenants. An already implemented example from our sector is the IMVO responsible gold covenant'.

SOCIAL AGENDA ACTIONS

- Making further agreements between the partners of the Raw Materials Agreement (employers' organisations, trade unions, nature and environmental organisations, various ministries, lower government organisations, etc.).
- Realising CE with the formed lector platform.
- The Circular Metal Chain (CMC) asked CINOP several years ago to research what adjusted expertise entrepreneurs expect of circular employees and what consequences this should have for their educational programmes (especially for MBO and HBO).
- CE design in curricula of all relevant course programmes and additional training offering or reskilling offering.
- CE thinking in curricula of primary and secondary education.
- Designing learning processes in a chain context within the regional network of companies.
- Using insights of the Social Innovation Field Lab from the smart industry agenda; a virtual testing ground that focuses on the people in an organisation, with a regional network of government, business community and knowledge institutes.

4.3 INVESTMENT AGENDA

The investment agenda is an important factor of success in the Transition Agenda. Our investment agenda discusses the required investments and developments from society, the business community, and the government.
On 19 July, the joint table chairs wrote a letter to the informateur with the following appeal to the new cabinet.

1. Make circular economy a multi-year spearhead in policy and record this goal (as is the intention of a climate agreement) while taking into account the international competitive position of the Dutch industry.
2. Provide a joint vision and coordination on the government side:
   - cross-file (climate - circular economy - food)
   - between scale levels (international - national - regional - local)
   - at all levels (policy - granting of licenses - authorisation)
3. Give the right example as the government as a launching customer and procurer/investor
4. Reserve a €100 million budget for our future revenue capacity for the execution of the national circular economy programme and the transition agendas for the 2018-2022 period (programme resources & implementation capacity) and €500 million for the investment agenda.

To realise this agenda, we are anticipating the following budget needs for the coming years (accumulated from the budgets in the action agenda):

MANUFACTURING INDUSTRY TRANSITION AGENDA	2018 (K)	2019(K)	2020(K)	2021(K)	2022(K)
Platform work	6,000	8,000	8,000	8,000	8,000
Circular design	3,000	9,000	6,000	5,000	5,000
Supply security of critical resources	2,500	7,000	5,000	5,000	5,000
Uniform basic principles and calculation methods	700	1,200	500	500	500
Material efficiency	1,000				
Recycling technology	300	5,500	5,000		
Facilitating circular business models	200				
Circular procurement	200	700	500	500	500
TOTAL	**13,900**	**31,400**	**25,000**	**19,000**	**19,000**

5. MONITORING

In a transition from 'as is' to 'to be', a distinction needs to be made between indicators that:
1. inform about the state of the circular economy.
2. tell you where you are in the transition.

Many of the indicators we use now to assess the state of the economy are universal; e.g. GDP, employment rate, etc. This does not mean that they are related to the selected economic model (linear or circular). Additional indicators are required to assess the result of our economy in terms of the transition towards a circular economy. Think of, in any case:
- Retention of value, material efficiency.
- Environmental pressure in the entire chain, CO2, but also other environmental effects, local, national, and international.
- Use of critical resources in the manufacturing industry. The nature, scope, and functionality.
- Share of circular products or services in the GDP.
- Export of (critical) resources in nature, scope, and functionality.

It is important to make a number of things clear. Are the indicators about:
1. circular economy or a growing circular economy?
2. a product's full life cycle or a single phase in the cycle?
3. waste or resource?
4. material consumption or use?
5. the share of secondary use of materials in total material use (recycled content) or the recycling rate?
6. material productivity or retention of value?
7. Dutch society or the Dutch economy?

From measurements to predictions and goals.
Predicting how society and a shift to a circular economy will develop is difficult. We are switching from a diesel car to a hydrogen plane mid-transit as it were. That is why it makes more sense to simply start the switch to a circular economy. Moreover, it is logical to develop, in parallel to this, a monitoring system in the coming X years in order to be able to measure the circular economy and make it predictable. Once this step has been taken, policy goals in terms of X per cent reduction over Y years can be agreed on.

AFTERWORD

It has been an eventful and passionate six months ,during which all members of the team have created a great agenda with a lot of enthusiasm and commitment. I want to thank all team members for their contribution. All of them have, in a very short amount of time, made a contribution with the best possible intentions and expertise to provide an as complete as possible overview of the direction we have to and want to move in. Consultation with the supporters of the participants has not always been complete, but the importance of acting and moving towards a closed resource system is perceived by all stakeholders. In order to quickly present a clear vision and activities, coordinating to such an extent was not always the best option as it would have led to delays.

Circular economy and resources are complex, comprehensive topics that have consequences in numerous fields. As such they require specific attention and coordination with special attention for the overlaps with and effects on climate, economy, and prosperity and well-being. As you will understand, an agenda like this one cannot be written in a few months and deserves a proper follow-up to be further concretised and developed.

This follow-up requires patience and proper direction, as well as understanding the position of all stakeholders. The insights into and developments regarding the circular economy are and will remain ongoing for now. That is why the CETAM team is envisioning a rolling agenda that is periodically adjusted and followed up on. Not only by the government, but also in co-creation, with input and coordination of all stakeholders.

The way in this takes place is not set in stone, but a number of things are clear:

- The government must provide direction to the process in a visionary way and take up a directing role based on vision, knowledge, and coordination. Coordination within the government itself across various administrative layers, themes and roles is important.
- Together with the government, the industry, social organisations and knowledge institutions need to look for solutions for the already identified issues and new issues.
- These solutions can, and in some cases must, lie in unconventional and so far unmentionable starting points, such as legislation, treaties, and (economic) structure.

In the past six months, the members of the CETAM team were brought closer together in terms of language, understanding, and insight. That is why we prefer to keep working as a team, possibly in a somewhat changed composition and role, because we are convinced that the transfer of the results of a participatory process will be at the expense of support, energy and momentum as well as intrinsic assessment and cohesion. If a central party is opted for in the context of following up on this agenda, we could take up a coordinating or assessing role, for instance. We do not feel it is a good idea for the government to pull in these agendas themselves. It will result in solutions that do not sufficiently match the reality of all stakeholders. Drawing up the best governance for executing the transition is crucial - and therefore a priority. A central knowledge and direction centre could be a good solution for this as a part of governance as a whole. It can and should answer the many issues that will need to be solved from a clear role, composition, mandate, and activities.

The developing insights should also mean that the set goals may be adjusted. This has consequences for how these goals are monitored. To take halving the consumption of primary resources in 2030 as a starting point is too short-sighted.
The programme should aim for the most valuable use and reuse of resources and products. And for the best-performing system with a balance between climate, scarcity, environment, economy, and prosperity and well-being.

The rollercoaster with the lemniscate symbol needs to start and everyone needs to be on board. This will require all parties to make investments, which will not be an easy task. Along the way, there will be parties that cannot follow and new players will enter the game. But the goal should be clear and leading: well-being and prosperity for all; people, planet, and profit.

On behalf of the CETAM team,

Friend Kaanen
Chair of Koninklijke Metaalunie
Board Member of MKB Nederland

APPENDIX I DEFINITIONS

1. Circular economy (Social and Economic Council): an economy that handles products, materials and resources efficiently and socially responsible within ecological preconditions, so future generations maintain access to material prosperity.
2. Biological cycle (Social and Economic Council): the circular system has two materials cycles: a technical and a biological cycle. In a biological cycle, waste substances will return safely back to nature after use. Also see technical cycle.
3. Technical cycle (Social and Economic Council): the circular system has two materials cycles: a technical and a biological cycle. In a technical cycle, products and product components are designed and marketed in such a way that they can be reused in a high-quality, high-grade manner. This means the economic value is retained as much as possible. Also see biological cycle.
4. Top Sectors (Statistics Netherlands): the cabinet presented 9 top sectors; Agriculture & Food, Horticulture and Basic Materials, High-tech materials and systems, Life sciences, Logistics, Water, Chemicals, Creative Industry, and Energy. These are sectors that are (1) knowledge-intensive, (2) export-oriented with (3) usually specific legislation and regulations that (4) (can) make an important contribution to solving social issues. In so-called top teams, entrepreneurs, scientists and the government jointly worked on recommendations in which they indicate with which measures the sector can continue to compete on the global market.
5. Manufacturing industry (Panthea): The (manufacturing) industry concerns companies that process materials into new products. The following business operations are included in the manufacturing industry: the food, beverages and tobacco industry, the textiles and leather industry, the paper industry, publishers and printers, the oil industry, the chemical industry, the rubber and plastics industry, the basic metal industry, the metal products industry, the machine industry, the electrotechnical industry, the transportation industry, and the wood, furniture and miscellaneous industry.
6. Supply security/resource security (Social and Economic Council): securing the supply of resources.
7. Renewable materials (Social and Economic Council): materials that are used for production and that cannot, in principle, run out, such as wood, agricultural crops, and wool.
8. Finite materials (Social and Economic Council): materials that are finite and thus available in and on earth in limited amounts, e.g. oil, natural gas, metal ore, coal.
9. Refuse (PBL): making a product unnecessary by not using its function, or providing for that function with a radically different product.
10. Rethink (PBL): intensifying product use, e.g. by sharing products or through multifunctional products.
11. Reduce (PBL): manufacturing a product more efficiently by using less resources and materials in the product.
12. Re-use (PBL): reusing a discarded, but still fine product in the same function by a different user.
13. Repair (PBL): repairing and maintaining a broken product for use in its old function.
14. Refurbish (PBL): renovating, modernising a used product.
15. Remanufacture (PBL): using components of a discarded product in a new product with the same function.
16. Repurpose (PBL): using a discarded product or components thereof in a new product with a different function.
17. Recycle (PBL): processing materials into the same quality, higher quality (upcycling) or lower quality (downcycling).
18. Recycled content (based on BuildingGreen): recycled content refers to the fraction of materials used in a product that do not end up in the waste pile at the end of the lifespan.
19. Critical materials (Social and Economic Council): these are rare materials that are essential for certain branches of industry for which the supply security is low.
20. Primary resources (Social and Economic Council): raw resources. Unprocessed materials that have not been used, processed or consumed before and serve as the basis for production.
21. Secondary resources (Social and Economic Council): reclaimed, reusable resources, substances that have been extracted from prior used resources.
22. Domestic Material Consumption, DMC (based on TNO/ Eurostat): measures the total amount of materials used directly by an economy. The DMC consists of the annual amount of extracted raw resources within national borders plus the amount of physically imported resources, minus all physical export.
23. Scarcity (Ensie): scarcity means that something is low in supply. Another word would be rarity. In the economic world, however, scarcity means goods that are made by using means of production.
24. LCA (National Institute for Public Health and Environmental Protection): (environmentally-oriented) LCA is a method for mapping out the influence of products and human activities on the environment. It uses special calculation models. LCA looks at the entire life cycle of a product or activity, from the extraction of resources to production and (re)use up to and including waste processing. In other words: from the cradle to the grave. Because this is about a chain of processes, LCA is considered a form of chain analysis.
25. Business case (Ensie): a business case is a project management term in which the business decision of starting a project or task is described. In many cases, a business case is used to decide whether or not to continue a project.
26. Business model (Ensie): a business model is a model used to map out various business aspects and manage them. These could be operational, organisational and financial activities. A business model can also be used for ideas and image. Revenue model (Ensie): a revenue model is the result for an entrepreneur or enterprise of costs incurred and income earned.
27. Ecodesign (Social and Economic Council): designing products in such a way that that the environmental impact in all chains of the life cycle is limited, e.g. by simple disassembling products after use so they can be reused.
28. Valorisation (Social and Economic Council): valorisation is the creation of more value. This is possible in three ways: economically, socially, and environmentally.
29. Value destruction (Social and Economic Council): there is value destruction if value disappears after discarding a product.

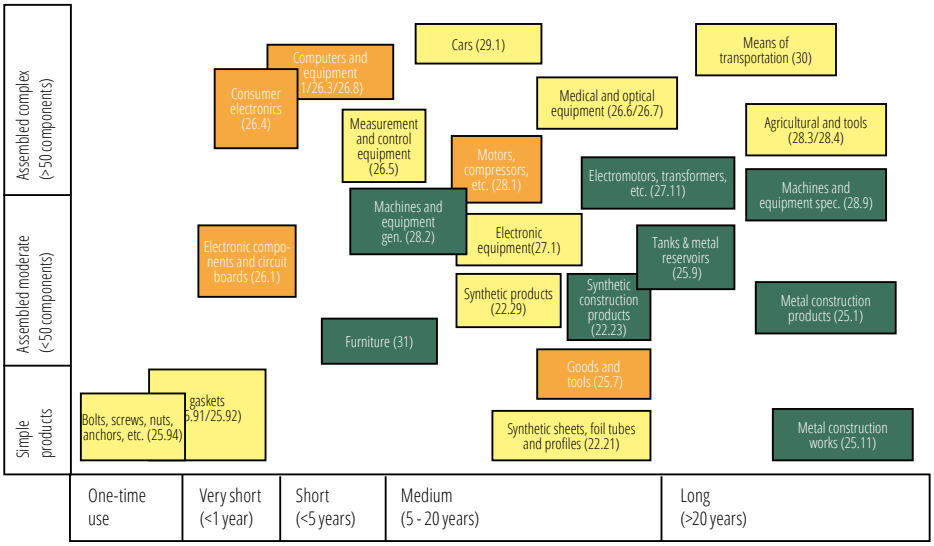
30. Transition (Social and Economic Council): structural process of change that takes place over a longer period of time (one or two generations), a process that is complex and involves various uncertain factors.
31. Chain (Social and Economic Council): the production process of goods via resources, production, semi-finished products, production, finished products, and users.

APPENDIX II SECTOR ANALYSIS

The manufacturing sector is a very broad sector with a large variety of products, value chains, and markets. In order to actually capture the manufacturing industry through the selection of a number chains, it was necessary to map out the sector further. This was done based on three relevant variables.

1) Turnover speed or (technical) lifespan.
   Within the sector this variable varies widely between products: from one-time use to products with a very high lifespan. From a CE perspective, the lifespan influences the possible solutions and strategies.
2) Complexity.
   Products from the manufacturing industry vary from simple to highly complex assembled products. This variable also influences the possible solutions and strategies and is also a good indicator for the application of scarce metals. The more complex, the more scarce metals are used.
3) Influence within the Netherlands.
   The extent in which a national agenda can be successful partly depends on the position of Dutch companies in the value chain. Apart from achieving short-term successes by picking 'low-hanging fruit', volume also plays a part in the choice.

To make the selection, the manufacturing industry, as determined in the scope, is positioned by SBI code in a matrix with variable 1) turnover speed and 2) complexity on the axes. A colour code was used to score variable 3): green = large, yellow = limited, orange = low.



The selected chains (archetypes for the manufacturing industry) are:

1.	Road transport	assembled complex, long lifespan, limited influence.
2.	Machine construction	assembled moderate, moderate lifespan, major influence.
3.	Medical equipment	assembled complex, moderate lifespan, limited influence.
4.	Construction products5	simple products, long lifespan, major influence.
5.	IT hardware	assembled complex, (very) short lifespan, minor influence.

Ad. 5 ICT-hardware.

[5] *Despite the fact that there is also a Construction Transition Agenda, a choice has been made to look at the issues in the construction materials chain from the material perspective and considering it in the formulation of goals for a circular manufacturing industry.*

The Consumer Goods Transition Agenda does not pay attention to consumer electronics, such as computers and mobile phones. The reason is that most important – most valuable – materials in these products consist of rare metals. The metal and electronics sector is closely involved with the Manufacturing Transition Agenda in this context, which makes it more logical that sustainability of the consumer electronics chain is included in this agenda.

Interviews with stakeholders by Manufacturing Industry Transition Agenda participants.

Stakeholders from sub-teams consisting of members of the Manufacturing Industry Transition Team from the five chains (resources/semi-finished products, transport, end product, distribution, use and discarding as waste/end-of-life), have been sent out with (equal) interview instructions. Furthermore, they have assessed promising products, market type, and strategic partners. The stakeholders asked these strategic partners about opportunities, obstacles, risks, preconditions, and issues in the value chain.
During the interviews, the sub-teams kept the strategic goals of 'A Circular Economy in the Netherlands' and the themes formulated at the start in the back of their minds:

1. Increasing supply security of critical materials. If substitution of a critical or environmentally taxing material is successful, this solves a problem for a company or may create a competitive benefit and improve a company's reputation.
2. Reducing the environmental pressure of manufacturing industry products. Mostly based on ecodesign principles and LCAs, with additional attention to circular design for efficient reuse, repairs and fixing products or parts and optimisation of the lifespan according to prioritisation of R-strategies.
3. Closing the cycle of products in the manufacturing industry by clarifying which substances limit recycling and by looking at where the use of these substances can be prevented or reduced.
4. Applying knowledge about design and smart industry.

APPENDIX III MANUFACTURING INDUSTRY ISSUES

For each chain, the results from the interviews have been made comparable through an analysis model. The so-called PESTLE model was used, in which the statements from the interviews regarding the opportunities and obstacles, risks, preconditions and issues from the value chain are categorised under the headings politics, economical, socio-cultural, technical, legislation, and environment.

The chain interviews unearthed a large amount of issues. These issues have been tested based on specific criteria. It has been investigated whether these issues

- were present in multiple chains. Think of, for instance, making standards like norms or quality marks comparable and using them for quality instead of marketing.
- seem contradictory. Think of extension of lifespan versus focus on short lifespan or cheaper replacement.
- catch the eye otherwise. Think of a major focus on extending the lifespan with a limited number of R- strategies that are in the centre of PBL's ranking. These include, among others, the circular R- strategies that focus on smarter use and manufacturing a product6.

Using this test, a synthesis was made in accordance with the issues that have a relevant priority relevance to the manufacturing industry.

In order to tie activities to the issues, they have been ordered into 2 levels.

1. Position in the chain. The following links in the chain can be generally distinguished in the manufacturing industry: Market – Design – Resources – Production – Users – Discarding. Each link has its own characteristics, effect on the chain as a whole, and actors. Ordering based on the position in the chain gives focus to the activities.
2. PESTLE perspective. Issues can be viewed from different perspectives. This creates a deeper insight and can expose tensions or contradictions within an issue.

The issues have been arranged in a matrix that includes these two levels. We asked TNO to perform a literature review on the issue matrix. This resulted in additional and deeper issues that have been added to the matrix. Through this method, a complete inventory has been drawn up of the relevant issues based on the current insights of the manufacturing industry (interviews) and the scientific/practical field (literature review).

[6] *Circulaire economie: Innovatie meten in de keten, Jose Potting*

MANUFACTURING INDUSTRY ISSUE MATRICES

Issues	Political	Economic	Social	Technical	Legal	Environmental pressure
Market (systems elements that affect the entire production chain)	|1 – Good criteria and tools for CE/sustainable procurement are missing.	|2 – Procurement chains focused on initial costs instead of TCO. Budgets for maintenance and procurement usually have different managers				
		|3 – There is insufficient (unified) demand (pull) from the market. |4 – Critical mass through launching customer(s) is missing in many sectors. This means scale and costs are unbalanced.				

Issues	Political	Economic	Social	Technical	Legal	Environmental pressure
Design (product design design choice).	|6 – Reliable and accessible (environmental/LCA) data of products and processes are lacking. There is need for such data, a uniform understanding of it and the organisation of the availability, a materials passport is often stated as a tool.					|17 – Methodology and sources for determining circularity (LCA) are too broad (too little standardised) and too complex.
	|7 – Financial incentives are insufficiently aimed at high-grade utilisation of resources and circular principles.	|8 – In practice, components with rare metals are, because of the limited cost of components and/or the specific application (technical and application location) rather becoming disposables.	|10 – Making relevant information (risks, impact, etc.) available to the manufacturing industry is necessary (resources knowledge forum).	|12 – Technological innovations are still often focused on less critical materials, not the primary focus on actual reusability of employed materials.		
		|9 – Circularity is not (always) a design principle at the same level as cost price, availability, and manufacturability.	|11 – Cooperation between chain partners is still very limited, essential chain partners are often missing (lack of support in trade, for example).	|13 – Function-oriented CE system design is not mapped out. CE design focuses on own product, there is often no circular total solution for the system within which the product functions. |14 – Various identified developments are often sub-optimisations in the linear chain. |15 – Designers do not always have the right tools or all the tools to make a good choice regarding the correct materials for circularity and sustainability.		
				|16 – The development focus and circular strategies are primarily aimed at materials / components in products; in many products, integrated software is important and sometimes dominant. Focus on CE strategies for software is required.		

Issues	Political	Economic	Social	Technical	Legal	Environmental pressure
Resources (extraction primary, delivery secondary).	|18 – There is no idea of consumption vs use, there are no uniform methods to measure such material efficiency. |19 –Management aimed at high-grade use of materials is lacking.		|23 – Applications of materials are often socially/culturally determined.	|25 – There are losses in the chain (efficiency / technology).		|29 – Environmental pressure is not expressed in market forces / economic system.
	|20 – Long-term strategy for metals and minerals is required. (research, i-mvo covenants, etc.)			|26 – Knowledge about substitution is still insufficient.		
		|21 – Open market for secondary resources means that high-grade secondary materials are disappearing internationally. |22 – Matching of secondary streams and waste streams is not optimal (fragmented across multiple platforms)	|24 – Further professionalisation of secondary resources market / social effects regionally / nationally / globally.	|27 – Quality of secondary resources is not sufficiently constant and/or high-grade.	|28 – Waste legislation is still an obstacle for the application of secondary resources.	

Issues	Political	Economic	Social	Technical	Legal	Environmental pressure
Production process (NL manufacturing industry).		|31 – National industry is not (always) subject to the same rules for production (emission, safety, etc.) as internationally exporting industry. So lower costs, resulting in retention of 'bad' products.				
	|30 – Focus on the most high-grade use of materials is lacking.		|35 – Applications of materials are often socially/culturally determined.			|39 – Environmental pressure is not expressed in market forces/economic system.
		|32 – Financing is lacking.				
		|33 – Open market for secondary resources means that high-grade secondary materials are disappearing internationally. |34 – Matching of secondary streams and waste streams is not optimal (fragmented across multiple platforms).	|36 – Further professionalisation of secondary resources market / social effects regionally / nationally / globally.	|37 – Quality of secondary resources is not sufficiently constant and/or high-grade.	|38 – Waste legislation is still an obstacle for the application of secondary resources.	

Issues	Political	Economic	Social	Technical	Legal	Environmental pressure
Use phase (actual use of product, no market issues, Rs?).	|40 – For a large group of products, the functional lifespan is shorter than the technical lifespan. Set up a system to map out 'premature obsolescence'. (the politically correct term premature obsolescence is to replace the stigmatising term 'planned obsolescence').					
			|41 – Anticipating privacy aspects of IoT applications with a distinction between effect ('what kind of feeling does it give the user') and impact ('what demonstrable negative effects does a breach of privacy have on the life of a consumer').			
			|42 – Service concepts for returns are still lacking. |43 – Equipment owned by the client is the norm.	|44 – Standards for compliance and repairs/ refurbishment are lacking for a lot of products (from building to electronics).	|45 – EVOA. |46 – Local (environmental) licenses can have a limiting effect.	

Issues	Political	Economic	Social	Technical	Legal	Environmental pressure
Discarding phase (collection, waste processing).				|51 – Further improve the recycling of plastics.		
		|47 – Open market for secondary resources means that high-grade secondary materials are disappearing internationally. |48 – Matching of secondary streams and waste streams is not optimal (fragmented across multiple platforms)	|49 – Further professionalisation of secondary resources market / social effects regionally / nationally / globally. |50 –Joint standards for the technical specifications, guarantees, qualities etc. of Refurbishing, Reuse, etc. are lacking. This limits scale increase/ development of initiatives.	|52 – Quality of secondary resources is not sufficiently constant and/or high-grade.	|54 – Waste legislation is still an obstacle for the application of secondary resources.	
				|53 – Chain of custody - traceability of materials and thus the composition and proper origin - is insufficiently standardised and technically not sufficiently possible		

APPENDIX IV ACTIVITIES PROGRAMME

Based on the issues, activities have been identified to draw up an activities programme. The activities have been assessed based on the goals and clustered in corresponding activities.

The team prioritised activities in the activities programme, providing a foundation for a rolling agenda in this way. New issues that will definitely form within the runtime of the agenda can be added to the issue matrix. These issues could result in elaboration of existing identified activities, or could lead to additional activities.

MARKET (system elements that affect the entire production chain)	**Political**	**Economic**	**Social**	**Technical**	**Legal**	**Environmental pressure**
Cluster 1 Circular procurement	MP1 – System criteria and structural policy for circular procurement by the government. {I1E, I3, I4}	ME1 – Create (tax) incentives to stimulate procurement based on TCO and/or tax environmental pressure throughout the life cycle. {I2, I4}	MS1 - Implementing design-oriented knowledge transfer (tools) for circular procurement. {I1E, I3, I4} MS2 - Social pressure on undesirable products: behaviour, what does a consumer/company buy? {I3}		MJ1 - Regulation and control of circular procurement by governments. {I1E, I3, I4} MJ2- Tailor the procurement legislation to circular products & services. {I2, I4}	

DESIGN (product design, design choices)	**Political**	**Economic**	**Social**	**Technical**	**Legal**	**Environmental pressure**
Cluster 2 Uniform basic principles and calculation method	OP1 – Policy viewpoint / ambition level for national environmental / circular database of materials and products.	OE1 – Including environmental/ discarding costs in product cost pric.	OS1 – Implementing design-oriented knowledge transfer (tools) for ecodesign.	Material / application knowledge tools.	Regulate/prescribe.	OM1- Central public database (national environmental database) with design criteria, high-grade application, environmental effects, substitutes etc. per material (with public input), in line with REACH, but authoritative instead of prohibitive.
Cluster 3 Circular design		OE2 – Develop procurement strategy based on TCO. OE3 – Make current tax incentives suitable for circular design and concepts.	OS3 – Implementing testing grounds for chain cooperation / business cases FOR EXAMPLE xx. OS4 – Training for circular design, education and additional training.	OTOT1 – Research programme for design for reuse – recycling. OT2 – Integrating system principles of CE in innovation programmes. OT3 – Circular (integrated) software research programme Maximising yield of materials.	OJ2 – Regulating (integrated) software.	

RESOURCES (extraction primary, delivery secondary)	Political	Economic	Social	Technical	Legal	Environmental pressure
Cluster 4 Material efficiency.	GP1 – Policy viewpoint on consumption vs use.	Effects for Dutch economy.	GS1 – Creating awareness among designers that specific resources/combinations can never be reclaimed and should therefore not be selected. GS2 –Develop standard for material efficiency (input and output criteria). GS3 – Implement monitoring system for material efficiency.		Pricing of material inefficiency.	GM1 – Include environmental/ discarding costs in the cost price of products.
Cluster 5 Facilitating reuse of resources.		GE1 – Organising a central market place for discarding and acquiring of secondary resource streams (according to e.g. tables JH Welink).		GT1 – Optimising recognisability of secondary materials (administrative in chain of custody, technical in markers).	GJ1 – Make waste legislation tailored to the circular economy. GJ2 – Regulation on secondary streams	
Cluster 6 Supply security of critical resources.	OP2 – Structural (economic) policy for urgent and promising resources/semi-finished products. GP2 – Long-term strategy for metals and minerals is required. (research, i-mvo covenants, etc.) FOR EXAMPLE Agreements/ standards/ norms for which materials it does/does not apply (e.g. titanium watch).	Risk analysis of economic effects. Preventing negative impact on labour market.	OS2 – Implementing resources knowledge forum.	GT2 – Research programme for substituting urgent/ promising resources and applications (semi-finished products). Resource scanner.	OJ1 – Regulating applications of urgent/ promising resources. i-mvo.	Contribution to climate goal.

PRODUCTION PROCESS (Dutch manufacturing industry)	Political	Economic	Social	Technical	Legal	Environmental pressure
Cluster 7 Facilitating circular business models and reuse		PE1 – Making current tax incentives suitable for circular innovations. PE2- Remodelling financing, coverage and ROI models for new products and production facilities at financiers for longer and more uncertain rate of return (think of Basel).	PS2 – Bringing designers of product and business model closer together, FOR EXAMPLE CIRCO programme PS3 – Developing technical (system) standards for Reuse, remanufacturing, refurbishment, etc.* PS1 – Making the usefulness/ necessity and consequences of circular (production) process clear to production personnel	PT1 – Improving separation techniques (automated).	PJ1 – Setting equal rules for production / material use for national and international (importing) industry FOR EXAMPLE Being able to change the waste status and emissions (e.g. higher CO2) of secondary resources in environmental permit (temporary and permanent) to product status for circular use elsewhere. Allowing higher emissions (e.g. higher CO2) in environmental permit when secondary resources are used (instead of discarded).	

USE PHASE (actual use of product, no market issues, Rs?)	Political	Economic	Social	Technical	Legal	Environmental pressure
Cluster 8 Business to consumer.	GP1 – Set up a system to map out 'premature obsolescence'.		GS1 – Discourage fashionable/short-cyclic use. Optimal use. GS3 – Addressing the privacy aspects of IoT applications.		MJ2 – Tailor the consumer legislation to circular products & services.	
Cluster 9 Business to business.			GS2 – Implementing testing grounds Service concepts for returns.	GT1 – Optimising/ introducing compliance standards for refurbishment (e.g. connections) and installation (e.g. in construction: standard dimensions and fixtures).		

DISCARDING PHASE (collection, waste processing)	Political	Economic	Social	Technical	Legal	Environmental pressure
Cluster 5 Facilitating reuse of resources.		AE1 – Organising central market place for discarding and acquisition of secondary resource streams (according to e.g. tables JH Welink).		AT1 – Optimising recognisability of secondary materials (administrative in chain of custody, technical in markers).	AJ1 – Tailor waste legislation to the circular economy. AJ2 – Regulation on secondary streams.	
Cluster 7 Facilitating circular business models and reuse.			AS1 – Developing technical (system) standards for Reuse, remanufacturing, refurbishment, etc.*	AT2 – Improving separation techniques (automated).		
Cluster 10 Recycling technology Closing chain / closed loop / functionality.				AT3 – Research programme for high-grade collection & recycling technology.		

APPENDIX V TIS ANALYSIS

BACKGROUND

Important expertise concerns transition management7. Knowledge of transition management teaches us that transition is a movement from one socio-technological system to another. Such a system consists of institutes, regulations and routines of companies and governments. Transition is not about one product or one company, but about the entire established order. An existing system continues to optimise within a specific landscape of geopolitical and climatological circumstances. A dominant design is produced at a large scale, production costs go down, the production is more and more streamlined, and the consumer has a reference framework with specific expectations for the product. Standards form and financiers have more faith, because the risk decreases ever more, education focuses on it and business lobbies maintain the rules by framing then according to established interests.
The influence of exogenous and autonomous developments and trends may lead to pressure to change the current regime. The question then is how to get out of the lock caused by the system. How to change this regime, which in a changing world will no longer be socially optimal? This can be achieved if added up, experimental alternatives (from technological research and practice) are powerful enough at some point to replace the old regime. The old will discontinue, while innovation will eventually take hold and lead to a new regime gaining the upper hand.
This can also be managed and sped up if the contours of change are already visible, in which case a strong government can immediately build key technology around niches that can compete with the old system.

A technologically innovative system is put in place based on seven points.
1. Experimenting by entrepreneurs (find niche players that link up with social interests and trends);
2. Knowledge development about the R-strategies;
3. Knowledge exchange (about technology, market, rules);
4. Directing the search process (with ambitious goal, final picture(s) of the new regime, and making a choice for what needs to be sped up exactly, identifying key technology);
5. Market formation (policy buttons vary from obliging, pricing and levying taxes to creating awareness);
6. Mobilising means (investment budget, financing, good people and educational programmes);
7. Countering resistance (who represent the new regime, which regime actors will move alongside the transition, organise a lobby with arguments in favour of the new technology).

This list is a board with dials the government can turn to speed up the transition.

Without government interference, the above-mentioned dynamics will take place in regimes. As gatekeeper of the public interest, the government needs to provide an answer to the important social challenges. The government would need to continue develop the vision in broad outlines in a creative process with different social actors. Such as knowledge institutes, business community, citizens, and financiers. But also:
- support experiments that explore the new system. Frontrunners and experiments need room to manoeuvre outside of a conservationist majority of players who, based on the current system, want maximum return. An important criterion in the choice of which experiments to support is the extent to which an experiment offers an answer to social challenges.
- conservationists need to link up with frontrunners and their experiments in consortia and clusters. Entrepreneurship and the economic strength of major players form the strength to start a new system while scaling up and mainstreaming the innovation.

Moreover, the tool of sustainable procurement provides the government as a private party with an important stimulating and steering role. Finally, with its regulatory role the government possesses an important tool in legislation and regulation to facilitate transition.

[7] Source: transition management course Marco Hekkert UU 28 June and 5 July 2017 RvO.

ANALYSES OF THE MANUFACTURING INDUSTRY

UNIFORM BASIC PRINCIPLES AND CALCULATION METHODS

CURRENT SITUATION

Experimentation takes place, but it takes place in many ways and is subjective. Major parties, such as the construction industry, GBB RWS and the EU are currently looking into standards. Knowledge exchange currently takes place on islands, each with their own interpretation. As yet, the search lacks every direction. Some methods even contradict each other. What exactly is the market? Global? What is the starting point in terms of geopolitical circumstances or level playing field? The distribution of roles between the market (developing technology, sharing data) and the government (prescribing standards and enforcement) is unknown. As soon as a party acts firmly to draw up independent calculation rules, resistance from parties that argue that their material deviates and should therefore deviate from the standard will increase.

AMBITION

Experiments by entrepreneurs with standards need to focus on assessment and acquiring experience. The major parties can boost the development of knowledge using focus and direction. Exchanging knowledge is important to gain more uniform understanding.
Search direction: Standards need to be independent from the material. The material itself is not sustainable. It needs to be about the material choice. This requires a process that prevents a competition about materials and in which value judgements are not given any credit. This value-free process should lead to system requirements and functional standards. Role distribution: prescription of standards by authorities, provision of transparent technology data and development of technology by companies. In terms of market formation, the dialogue should be about the preconditions of the transition. The market or society pays: variation from CO2 taxation to legislation. Resources are necessary for the search process, the assessment, and the distribution of experience and knowledge.

CIRCULAR DESIGN

CURRENT SITUATION

MNEs: at an elite, CE design at corporate level is part of the policy, but not sufficiently incorporated in the operation and development protocols. A small part of the SMEs experiment with CE design. Starters conduct a lot of CE design experiments. Solving a social challenge is often the cause. There is a lot of positive attention for CE design, but the number of experimenting companies is still limited and the experiments are not sufficiently in-depth.

The level of knowledge on circular design is still very limited and CE assessment is often based on attractiveness instead of actual CE performance. Circular design requires more cooperation in the entire chain, because the knowledge domain is becoming too big for individuals. Moreover, there is a lot of discussion about the tools that could help give direction to the CE evaluation of new products and services. Knowledge exchange between partners is at a reasonable level in the Netherlands. Chain cooperation projects are reasonably simple to get off the ground. A circular economy in the Netherlands in 2050 is an ambitious and clear goal. The dissemination of knowledge is key. Currently there is a limited set of available policy tools, such as sustainable procurement, but they are still at an experimental stage and do not yet work properly. The investment for the development of CE Design tools is limited. Finances for implementation in companies (CIRCO) require external facilitation and in-kind contribution from the entrepreneur. Financing for implementation in education requires prioritisation. There is currently no resistance, because CE is an entirely positive label. There are no consequences yet, and individuals/companies are not yet forced to make a choice.

The moment specific CE legislation is implemented to achieve the CE goals that will limit both consumer and companies and force them to make choices, e.g. through a personal CO2 budget, air miles budget, or waste tax, resistance from society will increase significantly. The same happened when road pricing was introduced.

AMBITION

Entrepreneurs will take action the moment there is a prospect of a business case. Comprehensive development of new propositions consisting of products, services and business models is the incentive that will get businesses moving. The aforementioned factors are conditions for experimenting in new partnerships. This requires an incentive for the development of awareness and stimulating measures.
The industry still focuses too much on applying plasters, repairing the current proposition and too little on entirely new propositions in which CE is viewed as a whole. This also requires new chains with an order of cooperation partners that differs from the established order. Moreover, current stimulating tools, such as an MIT scheme for SMEs, focus too much on technological innovation while the required innovation lies more in the field of non-technological innovation, such as social and design-driven innovation. There is a lot of basic knowledge, and there is a lot of ongoing research into the required elements. However, not a lot has been integrated and focused on application yet. These things require design studies, the application and simultaneous reinforcement of the knowledge base. Cooperation is essential for CE design, and free exchange of knowledge with the entire change is required. The Netherlands can also have an economic advantage, because the Dutch are working together well. In branding the Netherlands CE as an economic initiative, we need to include everyone. Also see 1: Providing direction is the starting point

for new proposition development. This requires overarching visions from the sectors; scenarios for an industry in 10 years' time, embedded in society. Including CE thinking in the Curriculum and stimulating and improving awareness are essential. This means CE design needs to be included in all creative vocational education programmes, and broad additional programmes for CE design need to be initiated. Informing society/customers/consumers about CE thinking is also vital. The standard sluggishness when curricula are changed will follow, and the golden triangle will need to stimulate this in a realistic way.

PRACTICES

'CIRCO, chain cooperation projects, Pilot RVO with service design vouchers: even though the result has not been evaluated yet, I think, and might not be entirely positive'. 'Products that last book' and MOOC. KIEM VANG scheme SIA, partnership university of applied sciences for implementing new knowledge. Companies experiment with 'design reviews'. 'NRK chain partnership projects of DAF, VanderLande and Groothuisbouw'. CIRCO tracks. BAD: plugging the own professional group as redeemer.'

SUPPLY SECURITY OF CRITICAL RESOURCES

CURRENT SITUATION

At SME level only few business cases are being developed that focus on supply security. It is viewed mostly as the responsibility of a specific public authority or the domain of multinationals. The procurement processes and monitoring thereof are probably highly developed among a number of major manufacturing industry multinationals. This is a world that sticks to the protection that is part of business-sensitive information.
Since 2008 (Raw Material Initiative at EU level), there has been a visible development of knowledge in Europe and the Netherlands. However, there are many more improvements that can be made to further develop the publicly available knowledge and make it more accessible. The knowledge covered by the Intellectual Property of companies is not taken into consideration in this. Branch organisations and national or EU authorities in particular have a clear organised exchange. At corporate level, this exchange has not yet been organised, while, even with taking confidentiality into account, this exchange is expected to be valuable for professionals, such as designers, procurers, and managers. Both vision and strategy are already well-developed in the Netherlands and the EU, from the 2008 RMI up to the Raw Materials Agreement. A lot of knowledge is available, but market information on the basis of which professionals can make day-to-day decisions is not yet always available. Significant impact on labour and the environment is not systematically expressed in price in many resource-dominated parts of the chain. Globally, the investments in resource deliveries are systematically relatively small with respect to the investments in knowledge, other capital goods, etc. This is due to the limited influence of resources in the production costs currently. The biggest resistance with respect to supply security of resources in the manufacturing industry is the latent resistance. Often, the idea is that supply security in the short, medium and long term will not have a permanent major influence on companies' right to play. There are still only few options of countering this resistance.

The described situation regarding the current level is expected not have changed significantly due to the Transition Agenda. The profit is clearly formulated and socially desired. Examples of matters that are required and desired are linking value chain data, assessing the increase of supply and demand shifts in the future, improving the link between LCI information and macro-economic data, allowing many parties to organise themselves and actually share knowledge, e.g. in the Knowledge Forum, and to institutionalise websites, connecting environmental impact with the energy and circular transition used to support decisions at a business level, etc. Expanding network/cluster formation within branch organisations, regional stages, chain cooperation and international NGOs is a predictable, but very vital action. What exactly is the Knowledge Forum?
The importance of resources in the manufacturing industry requires leadership. Examples include the implications of CE for the energy transition, the competitive strength of the manufacturing industry in the Netherlands, the robustness of globalised supply chains, the impact of resource extraction on vulnerable national economies and societies in the third world, and the necessity of using a relatively high amount of available resources, the elements of hope. The Transition Agenda can only cover the choices in fora, such as the WTO, OECD, World Bank, G8, etc. to a limited extent. The supply security of the manufacturing industries can, with respect to market information, only be increased at this level. The factual estimates regarding resource use in the 21st century show that investments will be required. For the Netherlands, the CE Transition Agenda is a first step in putting this on the agenda with private parties. The extent to which action can be taken with respect to markets and market prices needs to be carefully looked into. The correct level of urgency regarding supply security for the manufacturing industry is still unclear. What is clear, is that the urgency is currently not understood and, thus, not felt.

MATERIAL EFFICIENCY

CURRENT SITUATION

Entrepreneurs have little to no LCA approach and little to no yield optimisation across the entire value chain. There is knowledge development, but little sharing. There is no systemic thinking yet. Knowledge exchange is required, because there is no uniform understanding yet. Providing direction is necessary, because there is a lack of a controlling vision from a circular economic perspective. Now even matters that are not designed for CE, such as ETS, are too much of an assumed foundation. There are no incentives that steer the market. This calls for the means for an enormous innovation push: it is not recognisable and not consolidated around circularity. However, society does understand that something has to change.

AMBITION

Experiments by entrepreneurs need to increase in number. Important in this are the vision, accumulation and exchange of knowledge combined with incentives (market demand and/or pricing of resource loss). The experiments could focus on how pricing works in the market, but also especially on design, to increase material efficiency. However, experimentation always follows. Knowledge development is one of two true seeds for change with a uniform understanding of how the system (globally) works with key terms being: material choice, material efficiency, recycling, and end of life. Knowledge exchange is a channel/accelerator for change. It is important that knowledge about a truly circular system is widely shared. Giving direction is the second true seed for change. It is about understanding the CE system in the EU and around the world, and gaining support and designing policies for it.
Entrepreneurs do business based on market opportunities. They will truly act once there are circular incentives. That is why material efficiency needs to be introduced in the economic system through pricing, for example. Means for an investment agenda in innovation and knowledge are crucial; resistance will increase through measuring material efficiency of a sector, governments want to measure nationally (such as EU agreements about CO2 reduction).

FACILITATING CIRCULAR BUSINESS MODELS

CURRENT SITUATION

Entrepreneurs experiment here and there, but it is not a mainstream activity. Knowledge development is required, because more detailed knowledge about circular business models and everything that goes with it is needed. Contracting, tax affairs, guarantees, sharing value, forms of financing, etc. Sharing knowledge is also necessary because there is no uniform understanding. This is a sign that not enough knowledge is shared. Providing direction in the search process is required, because thinking is too narrow currently. There is no steering vision from a circular economic perspective. Market formation: Moreover, there are no incentives that steer the market. Making an enormous innovation push calls for resources. This push is not recognisable and not consolidated around circularity. However, society does understand something has to change.

AMBITION

Entrepreneurs need to experiment more. Important in this are the vision, accumulation and exchange of knowledge combined with incentives (market demand and/or pricing resource loss). Knowledge development is one of two true seeds for change. Knowledge exchange is a channel and accelerator for change. Giving direction in the search process is the second true seed for change. Entrepreneurs do business based on market opportunities. They will truly act once there are circular incentives. An investment agenda with resources in innovation and knowledge is crucial. There is not a lot of resistance, there is a lack of knowledge and incentives.

CIRCULAR PROCUREMENT

CURRENT SITUATION

Entrepreneurs do experiment, but can do so much more. There is development and exchange of knowledge, but the competitive advantage is only shared to a limited extent, because it represents money and market position. The search direction in the process has been scored relatively low, but does contain the potential motor for improvement. If the new procurement method leads to a retention of value, cost considerations will be viewed in a different light. There is also a link between this issue and the standards issue. Market formation still is limited, but the mobilisation of means is required. The willingness to spend money on circular products is limited, however. Sustainable procurement takes a lot of effort and money. And it will be worth it if there is an incentive for a successful business case focused on retention of value. Resistance is countered only to a limited extent. The linear economy's interests are great. The exemplary role from the government, for example, is not played to the fullest extent.

AMBITION

Experimentation needs to take place on the basis of knowledge development. Developing and sharing knowledge is a foundation. Making desires, needs and expectations explicit emits a clear signal. Under the right conditions (knowledge, direction, means) market formation will start to take shape partly by itself. A transition will be more difficult without financial incentives. This could be funding for research and/or development, but also tax measures, such as a reduced VAT rate for refurbished products and/or the repair of products, for example. Countering resistance is relevant. The linear economy's financial interests are great.

APPENDIX VI OVERVIEW OF PROJECTS

Name of Project/Initiative	CRMs from solar panels and screens (FPDs)
Name of declarant	Arjen Wittekoek, Coolrec / Jan Vlak, WeCycle
Brief description	Increasing the scale of Indium recycling from flat screens (FPD) and Indium/Gallium from solar cells (CIGS) through chemical recycling and hydrometallurgy processes. The currently recycling infrastructure linked to the 'Waste Electrical and Electronic Equipment (WEEE) Directive' is based on reclaiming bulk metals, such as ferro, aluminium, copper and from engineering synthetics. Moreover, the more toxic metals, such as mercury, cadmium, lead are separated and the valuable metals, such as gold, silver and precious metals will be recycled. The critical, rare metals such as indium, gallium, rare earth metals are lost in snails, ashes and other residues during the processing activities. The results of the EU KP7 RECLAIM project show that using a coordinated process of dismantling, reducing, sorting, separating and concentrating steps, the critical metals indium and gallium that are used in low concentrations can be reclaimed in an economically feasible manner.
Duration	Long-term
Requested contribution	• Financing further research, testing and scaling up. • Possibly attuning regulations regarding testing location(s).
Comment	
Fits in with issue	Recycling technology/Closing cycles, Supply security, Material efficiency

Name of Project/Initiative	Circular production of IT hardware with modular design, application of renewable materials and new business models that are all focused on extending the lifespan.
Name of declarant	Matthieu Sueters, Infotheek
Brief description	Changing the industrial production process to such an extent that long lifespan and complete recycling is possible. Choosing non-toxic and easily recyclable mono-materials is important. Key points of the design: • Draw up lifespan-extending criteria for design aided by standards currently being drawn up by CEN, CENELEC, and ETSI. • Development of resources for efficient products. • Adjustment of commercial supply and commercial strategies, such as product leasing. • Reinforcement of producer responsibility. • Improvement of modular designing. • Use of environmentally-friendly materials. The development of new business models, such as internet services, new marketing forms, department stores that sell only used goods, and the wider availability of informal repair services (repair cafes, workshops where people can repair their own products themselves) contribute to a longer lifespan of products and, at the same time, will increase the knowledge and trust of consumers in products with a long lifespan. Efforts should focus on developing a use-oriented sales model that provides benefits to everyone by • improving the functional economy's development and making the lease, trading in and loaning of items more attractive. • encouraging local and regional authorities to actively improve development of economic models, such as the sharing economy and the barter economy that encourage a more efficient use of means and the sustainability of goods. Furthermore, they stimulate repair, reuse, and recycling. IT hardware 'as a service' and the lease of IT hardware needs to be stimulated. Organisations such as the government are insufficiently prepared to procure this due to unfamiliarity or obstructing accounting / financing / periodical payment or legal rules.
Duration	
Requested contribution	
Comment	See the IT hardware transition plan, also specifically for (subsequent) activities for repairability, reuse & refurbishment, subplatforms and recycling.
Fits in with issue	• Functional design • Circular business models

Name of Project/Initiative	Circular inside wall systems
Name of declarant	NEBIFA Leo Oosterveen, oosterveen@metaalunie.nl
Brief description	Changing the industrial production process to such an extent that long lifespan and complete recycling is possible. Choosing non-toxic and easily recyclable mono-materials is important. Key points of the design: • Draw up lifespan-extending criteria for design aided by standards currently being drawn up by CEN, CENELEC, and ETSI. • Development of resources for efficient products • Adjustment of commercial supply and commercial strategies, such as product leasing. • Reinforcement of producer responsibility. • Improvement of modular designing. • Use of environmentally-friendly materials. The development of new business models, such as internet services, new marketing forms, department stores that sell only used goods, and the wider availability of informal repair services (repair cafes, workshops where people can repair their own products themselves) contribute to a longer lifespan of products and, at the same time, will increase the knowledge and trust of consumers in products with a long lifespan. Efforts should focus on developing a use-oriented sales model that provides benefits to everyone by • improving the functional economy's development and making the lease, trading in and loaning of items more attractive. • encouraging local and regional authorities to actively improve development of economic models, such as the sharing economy and the barter economy that encourage a more efficient use of means and the sustainability of goods. Furthermore, they stimulate repair, reuse and recycling. IT hardware 'as a service' and the lease of IT hardware needs to be stimulated. Organisations such as the government are insufficiently prepared to procure this due to unfamiliarity or obstructing accounting / financing / periodical payment or legal rules.
Duration	Multi-year
Requested contribution	Multi-year subsidy
Comment	In a way it is a spin-off of the CIRCO track that is currently ongoing with NEBIFA and the Central Government Real Estate Agency.
Fits in with issue	Standards? (Relevant for further design of hull construction?)

Name of Project/Initiative	Sustainable guide rails
Name of declarant	Fred van Hest, Arosso
Brief description	Replacing degalvanised and regalvanised guide rails along the road means that steel plates do not need to be molten down and shaped. This will lead to major savings in terms of material and CO2. Currently, processes and product have already been registered in the National Environmental Database and DuboCalc, but large-scale adoption by contractors is lagging. The causes for this need to be looked into further before they can be removed: too low benefits in ECI, too many operational consequences, unfamiliarity/risks or other causes. Moreover, a testing facility will need to be set up to process the degalvanised material in a circular manner.
Duration	Unknown
Requested contribution	
Comment	Runs as a Green Deal
Fits in with issue	Circular procurement, Material efficiency

Name of Project/Initiative	Filter dust exchange
Name of declarant	Hans van Dugteren, LDM
Brief description	Humidify zinc (and other metal-containing) filter dust into granules that can be used directly in the production of zinc. The addition of this relatively cheap humidifier means less risk and the option of locally reusing the metals in the filters. In the short term this application can also be implemented with other smelters, foundries and galvanising plants.
Duration	Short-term
Requested contribution	Communication and inclusion of unit on MIA/VAMIL list
Comment	
Fits in with issue	Material efficiency

Name of Project/Initiative	Circular projects with the East NL installation industry
Name of declarant	Martijn Kerssen, Province of Overijssel/IPO
Brief description	• Developments realisation of concrete product & process innovations. • Cooperation between Education, Research, Government, Entrepreneurs upon realisation. Circular plant, the project is prepared, developed and executed together with a launching customer. Circular apartment building. First create blueprint in work sessions and master classes with HTSM companies and the installation industry. Then execution of blueprint in materialisation and design and calculation of performance of building and installations and finally building it and sharing knowledge with the industry.
Duration	
Requested contribution	€ 171,000 budgeted for the plant and € 69,000 for the building, for blueprint and development phases with facilitators/teachers, construction-related companies and installation industry.
Comment	This builds on the work of a number of running initiatives in the province of Overijssel that should be scaled up. • Also brought up at the construction table. • One specific HTSM Workshop seems to lead the project. Joke Bults is workshop chief, j.bults@pioneering.nl • Project appears to be for members of Pioneering, a network for frontrunners in construction that stimulates innovation, sharing of knowledge and knowledge development in the construction and infrastructure industries and provides guidance in realising new innovations and business models.
Fits in with issue	Standards? (Relevant for further design of hull construction?)

Name of Project/Initiative	Experimentation space at the 3D Makers Zone
Name of declarant	Herman van Bolhuis, co-founder of 3D Makers Zone, via Herm van Beek (Economic Affairs) and Arnoud Passenier (Infrastructure and Environment)
Brief description	Continue at a location that is already a field lab at a former dump site in the Amsterdam region. The combination of Smart Industry and Circular Economy is very promising. A place like the 3D Makers Zone could be expanded into a place where not just digital manufacturing technology is given room, but which is primarily in service to a circular economy. A number of our current partners (Spaarnelanden waste processing), Province of North Holland, PWN (drinking water company), HHNK (Water Board) will certainly want to join such an agenda.
Duration	
Requested contribution	
Comment	Coordination with Smart Industry agenda
Fits in with issue	

Name of Project/Initiative	Blockchain, an initial coin offering as an incentive for stakeholders, companies/producers, consumers, government.
Name of declarant	Herman van Bolhuis, co-founder of 3D Makers Zone, via Herm van Beek (Economic Affairs).
Brief description	A challenging and innovative idea is an initial coin offering, from the government or other institute, for a circucoin (new cryptocurrency). For instance, you could impose homogeneous resource streams through regulations, but you can also regulate it with blockchain initiatives. This will create a market in which all stakeholders can earn, spend or trade in cryptocurrency. The Dutch government could mark a new era for the stock exchange or tulip trade ;)
Duration	
Requested contribution	Suggestion
Comment	Coordination with Smart Industry agenda
Fits in with issue	

Name of Project/Initiative	Circular design and construction of (super)yachts/pleasure craft
Name of declarant	HISWA, Geert Dijks g.dijks@hiswa.nl via Timo Staal (Economic Affairs)
Brief description	Pleasure crafts from the 1970s and 1980s are much less in use. These need to be dismantled and reused if possible. In the first phase, the market will need to adjust the construction method in such a way that vessels can be dismantled easier at a later time and that the materials can be reused. This means that technical requirements need to be drawn up. In the second phase, a solution will need to be found for the collection and dismantling of discarded (pleasure) craft, financing thereof and the possibilities for reuse.
Duration	Expected output after 2 - 4 years: • Technical Guidelines (and draft amendments). • Developed business and financing method for recycling.
Requested contribution	• Design to recycle project. • Adjustment of regulations, development of standards system. • Mutual coordination of private and public problem owners (about technical requirements in the Pleasure Craft Act/Inland Navigation Act and about tight national and international/European regulations). • Research business and financing model for the recycle collection structure.
Comment	Coordination with Maritime strategy
Fits in with issue	• Standards • National programme, link with Maritime

Name of Project/Initiative	Actively involving education with campus, research, make-a-thons, etc. scenario-thinking for SMEs
Name of declarant	Herman van Bolhuis, co-founder of 3D Makers Zone
Brief description	• What should education look like in the future? New generations will almost certainly think and act differently. Dematerialisation is already ongoing among twenty-year-olds. XXX-as-a-service will take place more and more. Spotify is circular because CDs no longer need to be made and distributed. • Coming up with multiple scenarios for small companies especially. From incremental change to exponential changes. Also reason from an autonomous economy where people do not matter much from an economic point of view. Use retrognostics technology (not prognosis) to work back. Shell and Rabobank, for instance, do this, but there still is a lot to be gained from a target group that normally does not do this and needs to act in the short term, but does have the mentality of stewardship.
Duration	
Contribution	Suggestion: include younger generations in the agenda
Comment	Coordination with Smart Industry agenda via Herm van Beek (Economic Affairs)
Fits in with issue	Social agenda

Name of Project/Initiative	PowerWindow collected value chain.
Name of declarant	TBP Electronics Frans Geerts business development executive fgeerts@tbp.nl, 06-50252708
Brief description	Client (and start-up) PowerWindow B.V. (PHYSEE), established in one of the YES! buildings in Delft, puts in a lot of work under the supervision of CEO Ferdinand Grapperhaus. PHYSEE CFO Willem Kesteloo sets up initiatives to further develop their PowerWindows by joining forces with PHYSEE, Pilkington Nederland B.V. (Enschede), and tbp electronics. Willem Kesteloo's idea is that using the product development of PHYSEE, the electronics manufacturing service expertise of TBP electronics and the glass/window expertise of Pilkington, the entire value chain regarding the production of PowerWindows is brought together.
Duration	
Requested contribution	Under the supervision of PNO consultants, attempts are made to acquire TKI subsidy for this. If you can be of service to PHYSEE in any way, then you know where to find us
Comment	TBP electronics is an electronics assembly company. They provide services in the field of electronics: from design and supply chain management to assembly and distribution of the end product. Design and/or production of an electronic circuit, a redesign, creation of prototypes, small series or complex high runners. Clients in many industries: telecom, defence, IT, media and entertainment, petrochemicals, medical and offshore industry, construction, and semiconductors. For info about PHYSEE see www.physee.eu
Fits in with issue	• Knowledge agenda • Coordination with HTSM top sector

Name of Project/Initiative	Concrete CE business cases with financing problems
Name of declarant	Infrastructure and Environment and RVO (Erik.vanderwerf@rvo.nl 06 5129 2033)
Brief description	In general, it is often brought up that there are problems regarding the feasibility of financing of circular business cases. That is why it is important to gain a clearer and more distinctive idea of the reasons why CE business cases are not/insufficiently financed based on practical cases. RVO.nl was ordered by Infrastructure and Environment and Economic Affairs to conduct research based on 25-50 concrete business cases (from the five priority sectors). The business cases will be treated with strict confidentiality. Company names and business-sensitive information will not be shared. This research will lead to a report consisting of analyses and conclusions that create a better insight into the limitations and causes of problems when creating a business case that can be financed. Based on this report, the policy boards of Infrastructure and Environment and Economic Affairs can make proposals for policy interventions that contribute to speeding up the transition to a circular economy.
Duration	Register before 1 October!
Contribution	Knowledge exchange. It is important that no expectations are created for the CE entrepreneur that this research will increase the chances of financing for his/her business case.
Comment	To be provided per case to caspar.bijleveld@rvo.nl - 06 2765 2583 or Walter.vandenwittenboer@rvo.nl - 06 2723 9661 • A business case with the entrepreneur, the company, the market, the marketing mix, SWOT analysis and a financial plan https://qredits.nl/assets/media/files/pdf/Ondernemingsplan_Roos.pdf • The relevant social effects of the business case.• The entrepreneur's vision as to why the market does not want to meet the need for financing and what the entrepreneur needs to make his business case a success.
Fits in with issue	• Investment agenda • National Programme: financing as one of the tools for speeding up the transition towards the circular economy.

Name of Project/Initiative	Message about electrical transportation
Name of declarant	Found by Bea
Brief description	Recycling precious metals from the control electronics of electrical vehicles will not only result in a better environmental score, but is also economically more beneficial than the usual processing in car shredder systems. A study by the Öko-Institut shows that currently three-quarters of these metals are lost in this process. If these components are removed from the car before they are shredded further, tin and precious metals like gold, silver and palladium can be reclaimed for more than 90% in recycling companies.
Duration	
Requested contribution	
Comment	Source: Euwid 11.2017, Öko-Institut adviser at ARN does see a difference between science and reality. 'In the next decade, I think that the collection volumes will be low (logistics costs!), that substitutions will be applied for expensive metals, and that manual labour will be more expensive. Especially with respect to the latter, I think the government can play a crucial role in the field of circular economy.' GertJan.vanderHave@arn.nl (ARN is the recycling expert in the mobility industry. Together with the chain, we ensure that over 95% of the car is recycled and applied usefully.)
Fits in with issue	National Action Programme: link between manufacturing industry and electrical transportation

Name of Project/Initiative	Metals in the circular economy: substitution and recycling Masterclass. TU Delft, Friday afternoon 24 November, with presentations regarding: • 'geen lood om oud ijzer', prof. Jilt Sietsma. • replacing niobium with vanadium in NANO steel, dr. Erik Offerman. • new challenges to materials recycling: quality matters more than quantity, dr. Yongxiang Yang u.
Name of declarant	TU Delft Knowledge Platform The speakers come from the Materials Science and Engineering department of TU Delft in the focus field Metals Processing, Microstructure and Properties (MPMP).
Brief description	I in the past years, problems in the supply chain of metals and price shifts of metals influenced not only the production of electronics, but also the production of components that consist of metal alloys for (high-tech) applications required for a healthy economy. The remedy for these recent developments can be found in substitution and recycling while maintaining the quality of the metal alloys.
Duration	
Contribution	Network and knowledge
Comment	http:www.mse.tudelft.nl informatie@duurzaamgrondstoffenbeheer.nl organiser: Jan-Henk Welink 06-42132614
Fits in with issue	Substitution

Name of Project/Initiative	KPN strives to only work with equipment for which the components and resources can almost fully be reused or recycled in 2025.
Name of declarant	Marten Hamelink (Economic Affairs)
Brief description	KPN made new agreements with seven of its major suppliers to ensure that new equipment will soon have a longer lifespan and will be produced with less new resources. It is about a manifesto that is part of the sustainability ambitions of the telecom agency. Companies that signed the manifesto are network and hardware manufacturers, such as Ericsson and Hewlett Packard Enterprise, and repair specialists, such as Teleplan. The announcement concerns about 20% of KPN's expenses for network and fixed line services to customers. This percentage is expected to increase as more suppliers will cooperate.
Duration	
Contribution	Example
Comment	https://www.nu.nl/duurzaam/4957238/kpn-maakt-afspraken-met-leveranciers-recycling-apparatuur.html
Fits in with issue	

Name of Project/Initiative	TVS substitution project
Name of declarant	Robert van Beek, FME / Gerard Wyfker, Metaalunie
Brief description	The project can work towards various goals. 1. Goal 1 aims to study X substances at Y companies and to find replacements. The focus lies on REACH. The starting point for the approach is the 'Replacement of Substances of Very High Concern (SVHC) Guidelines' by Royal Haskoning DHV. It is actually a practical test of the guidelines. Of course a positive result will be the actual substitution of SVHC. But even if this turns out not to be possible, the project will provide valuable information (why was it unsuccessful?) and the guidelines can be improved. An important component is the dialogue with the (end) customer and closing the business case. After all, this is the primary precondition for success. 2. Goal 2. The same, but with a focus on rare earth metals. 3. Goal 3. Which substances are obstructing recycling? This part of the project is about substituting the undesired substance in a product. The focus lies on Ecodesign / design for recycling and, as such, the circular economy. A combination of goals is possible, of course. This is a matter of choosing smart combinations of substances, products, and companies.
Duration	Due to the complexity of the matter and involving multiple players in a complex product and (international) supplier chain, a duration of two to three years seems necessary. The assessment of the first three substances in year 1 will require the most time. The required time will be halved in year 2 and the number of substances will increase. In year 3, the experience will result in profit. The table below is just an indication.
Requested contribution	The Circular Metal Chain would like to discuss matters to see what the options are and draw up a formal project proposal. European possibilities will also be considered. Europe announced the investment of 650 million via the Horizon 2020 programme, the formation of a European Resource Efficiency Excellence Centre, and the start of a programme via the European Investment Bank (EIB). Cost indication* Period / Companies / Substances / Hours/substance / Hourly rate / Costs year 1 / X / 3 / 1600 / € 100 / € 480,000 year 2 / X / 10 / 1200 / € 100 / € 1,200,000 year 3 / X / 20 / 800 / € 100 / € 1,600,000 year 4 / X / 100 / 200 / € 100 / € 2,000,000 € 5,280,000
Comment	It is possible that these sums are to be increased by a factor of 10. This is actually more of an indication / mindset.
Fits in with issue	

Name of Project/Initiative	Standards for construction dimensions and confirmation
Name of declarant	Leo Oosterveen, Metaalunie / Johan Bakker, CBRE
Brief description	The optimum reusability and exchangeability of inside walls and ceilings requires standards and agreements regarding the dimensions (classes) of ceiling-floor dimensions and fixing methods. Currently, the possibilities for movable walls are limited because of these two points.
Duration	Long-term
Requested contribution	
Comment	
Fits in with issue	Circular design, Uniform basic principles and calculation methods

Name of Project/Initiative	Setting standards for repairability of electronics (refurbishment/upgrade)
Name of declarant	Mathieu Sueters, Infotheek
Brief description	A lot of electronics are not designed to be repaired or upgraded. Changing this requires the presence of standards for the dimensions and connection of components. This includes a large diversity of appliances, from toasters to mobile telephones.
Duration	Long-term
Requested contribution	• NEN: writing standards (possibly internationally). • In due course: guaranteeing regulations for the Dutch or European market.
Comment	
Fits in with issue	Circular design, Uniform basic principles and calculation methods

Name of Project/Initiative	Exemplary projects regarding circular national products and materials
Name of declarant	Rob van Beek, FME
Brief description	Starting exemplary projects regarding nationally produced and distributed products. One example is a central heating boiler that is made in the Netherlands and sold within a 300-500 km radius. For these products a service model is conceivable that makes producing high-quality, high-grade products and controlling the materials profitable. A business model based on function can be applied.
Duration	Medium-term
Requested contribution	Financial contribution, Sustainable procurement
Comment	
Fits in with issue	Circular business models

Name of Project/Initiative	Scaling up practical research design for recycling AVANS and MRF.
Name of declarant	Jules Wilhelmus, MRF
Brief description	Bringing designers and other stakeholders together to achieve closing of the chain and for creating new insights for design for recycling. Project already ran at a small scale, a new scaling-up phase is desired.
Duration	Medium-term
Requested contribution	Financial and research institutes (research capacity of students)
Comment	Small successful pilot performed in the context of SIA-RAAK
Fits in with issue	Circular design, Recycling technology, and Closing cycles

Name of Project/Initiative	Industrial battery from lorry batteries
Name of declarant	Menno Kleingeld, VDL ETS
Brief description	VDL ETS develops electrical lorries that will appear on the market within a number of years. After several years, the batteries in these lorries will not have the required quality anymore to meet the high demand of this application. As these batteries function perfectly fine, the idea is to bundle multiple batteries together and use them as an 'industrial battery' that can serve as a buffer between a plant and the grid. This can cover power spikes in the grid and in any local sustainable generation. Resources will be in use for a longer time, and VDL continues to keep track of the supply of secondary batteries (and, as a result, materials).
Duration	Medium-term
Requested contribution	None
Comment	
Fits in with issue	Circular design, Recycling technology and Closing cycles, Circular business models

Name of Project/Initiative	KPN suppliers of circular products manifesto
Name of declarant	Mathieu Sueters, Infotheek
Brief description	Based on a procurement manifesto, KPN entered into a covenant with seven of its main hardware suppliers to ensure that these suppliers manufacture their products in a circular, repairable and upgradeable manner as much as possible. KPN thus shows that a relatively minor party on the telecom market can definitely influence the products of global manufacturers.
Duration	Short-term
Requested contribution	None
Comment	
Fits in with issue	Circular design, Circular procurement

Name of Project/Initiative	Design of climate-neutral machines with zero toxic substances
Name of declarant	Rob van Beek, FME
Brief description	Working together with the Dutch business community on machines with zero toxic substances and optimum circularity. With a circular business model if possible. Machine engineering is lagging behind, but can become a frontrunner if the Netherlands invests quickly in this.
Duration	Medium-term
Requested contribution	Unknown
Comment	Iconic VNO- NCW project Involve top sector HTSM, link up with TEQNOW and Resourze efficienz Circular design, Circular procurement
Fits in with issue	Circular design, Circular business models

Name of Project/Initiative	Urban mining of rare metals from magnets for wind turbines
Name of declarant	Arjen Wittekoek, Coolrec
Brief description	Metal and renewable energy: shaping Urban mining for the metals in permanent magnets for wind turbines. These are easy to trace and, as a result, to recycle. The best solution is to find compact replacements for the rare earth metals. A smarter arrangement of atoms from everyday materials may result in the development of a replacement for dysprosium magnets.
Duration	Short-term
Requested contribution	Link with IMVO covenant
Comment	Iconic VNO- NCW project Taking the initiative and involving recyclers and producers
Fits in with issue	Material efficiency

Name of Project/Initiative	Sustainable batteries/fuel for cars pilot
Name of declarant	Rob van Beek, FME
Brief description	Transition to elements of hope, circular cars by 2030: electric car battery pilots, sustainable fuel such as formic acid or hydrogen, reduction of SVHC in car components. Various actions: Research, Application, Scaling up, Infrastructure, Standards.
Duration	Long-term
Requested contribution	Unknown
Comment	Iconic VNO- NCW project Taking the initiative and involving recyclers and producers
Past in issue	Circular design, Recycling technology, and Closing cycles