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Proposition Paper | 2022

TRANSITION CENTRE
CIRCULAR PLASTICS

Regio Deal Zuid- en Oost-Drenthe

Gemeente Emmen

provincie Drenthe

university of groningen

NHL STENDEN hogeschool

Universiteit van het Noorden

1 A strong foundation

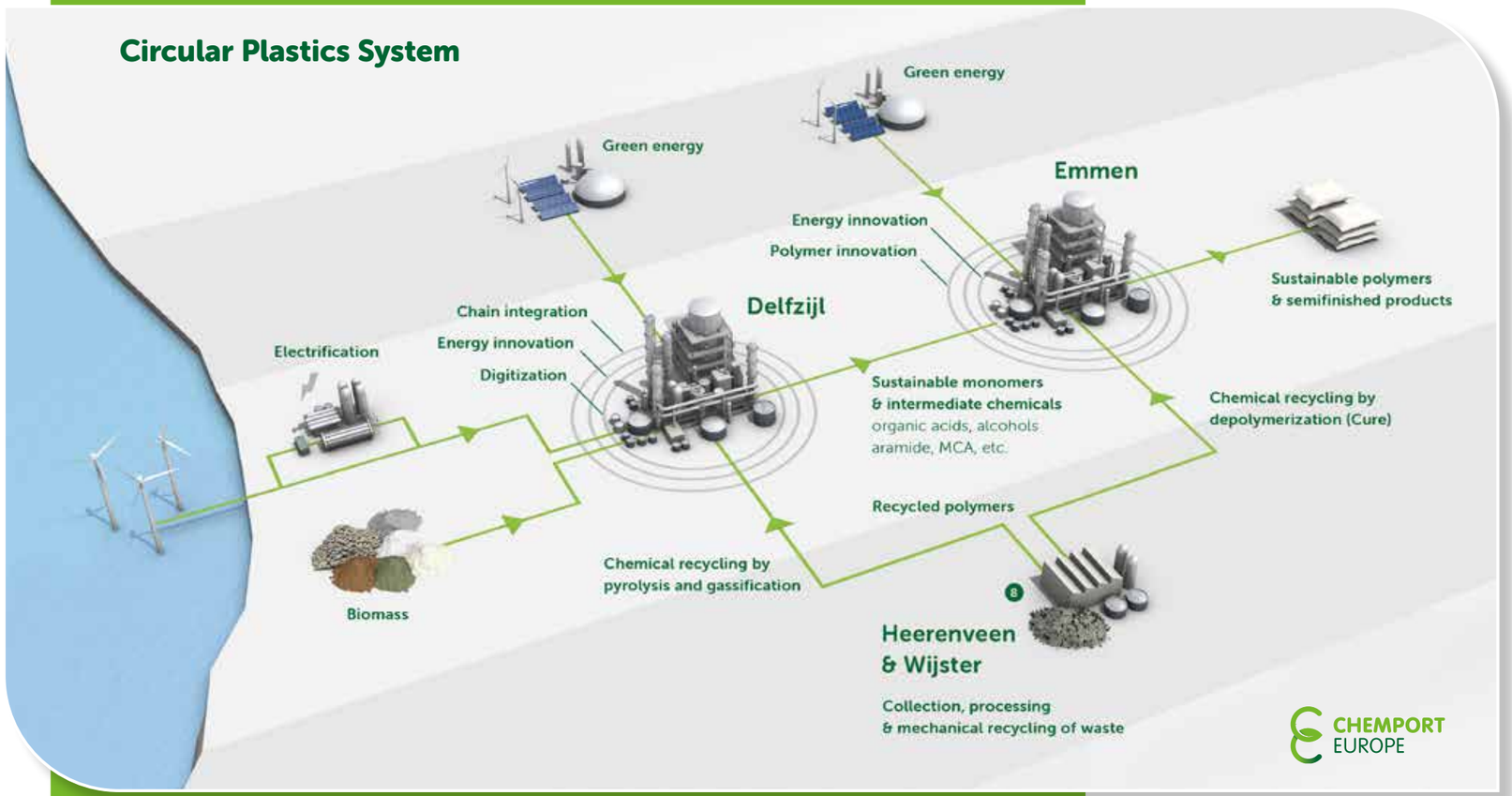
The Northern Netherlands has a unique ecosystem in place for circular plastics and aims to become the most established circular plastics region of Europe in 2030. The region has everything a circular economy needs. Its position on (bio)plastic materials and technology, combined with its substantial amount of large-scale green energy initiatives, makes it ideally suited to take the lead in the transition.

With the ever increasing demand for plastics worldwide we are working hard to use and develop new (chemical) recycling technologies, biobased and CO_2 based polymers.

At the Chemical Cluster in Emmen, CuRe is a pioneer in chemical recycling of the more difficult polyester streams. After recycling, this material can be used in food applications, which make it a prime example of up-cycling. Another company operating in the plastic recycling market is Morssinkhof, which produces various products from mechanically recycled polyester (rPET).

At the Chemical Cluster in Delfzijl, Avantium is developing methods to produce bio-based monomers for a new class of polyesters. Working together with partners along the value chain from start to finish, full circularity is the end goal. With developments in all parts of the value chain, achieving full circularity has now come within reach. Technology is not enough for the transition towards circular plastics. Knowledge is a key element in the transition. Currently the focus lies on technological innovation and business support from regional authorities. However, **the transition towards a circular economy depends not only on technological knowledge**, but more still on a combination of legal, economic and social sciences.

The Transition Centre Circular Plastics (TCCP) integrates knowledge via a multi-disciplinary and multilevel approach and combines this with business development to take the next step towards creating a truly circular plastics economy.



> The real changes are now taking place in the so-called innovation economy, in which besides capital, labour and knowledge **creativity** is the fourth principal factor of production. The emphasis on creativity makes the difference. In a knowledge economy logic is predominant, while in an innovation economy everything revolves around **imagination**.
>
> Berkhout et al. 2006

1 Our ambition

Ecosystem Northern Netherlands
Circular Plastics

Companies

+ 150 new small/medium and 5 new large companies

+ 6000 jobs

Regional authorities

Clusters & support

> 1 billion EUR new investment

Knowledge

Top 100 University
Science & Engineering
Natural & Social sciences
Applied & fundamental

TRANSITION CENTRE CIRCULAR PLASTICS

- Stratingh Institute for Chemistry
- Zernike Institute for Advanced Materials - ZIAM
- ENgineering and TEchnology institute Groningen – ENTEG
- Energy and Sustainability Research Institute Groningen – ESRIG
- Heymans Instituut
- SOM Institute
- Groningen Centre for Law and Governance
- RUG Campus Fryslân

- Research group Technology & Innovation
- Sustainable Plastics, Circular Plastics
- GreenPAC
- Research group Vital Economy
- Thorbecke Institute

- Institute for Engineering
- Institute for Life Science & Technology
- Knowledge Center Biobased Economy

This is a non exhausting overview

1 The Challenge
transitioning towards circular plastics

Current demand for plastics worldwide increases threefold

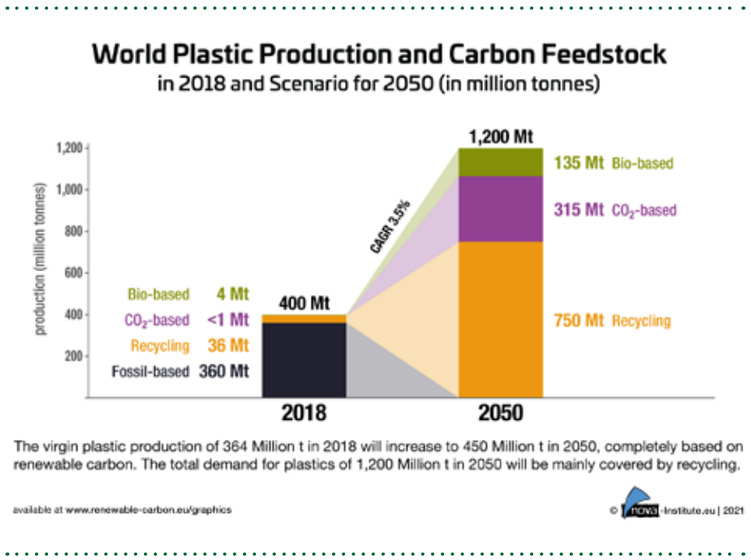
Plastic production is currently still entirely dependent on petroleum, a non-renewable fossil resource. Around 6% of global petroleum consumption goes to the production of plastic products, and as the European Nova-Institute's research predicts, global plastic production will triple from 400 Mt to 1200 Mt in the next 30 years (see figure). When nothing changes 10-13% of global CO_2 emissions in 2050 will result solely from plastic production.

Technological knowledge is not the limiting factor

Technological innovation alone is never enough to suddenly make the wheel turn. This requires an interplay with and between legal, economic and social innovations in which the individual innovative elements interact perfectly.

A need for systemic solutions & governance

The region already has a working ecosystem in place. There have been many projects, developments and activities, but not yet in an orchestrated manner. What is lacking is an integral structure to bring all activities, projects, networks, knowledge and developments together. Where new projects are developed, building onwards from the knowledge gained, speeding up the transition.



The virgin plastic production of 364 Million t in 2018 will increase to 450 Million t in 2050, completely based on renewable carbon. The total demand for plastics of 1,200 Million t in 2050 will be mainly covered by recycling.

available at www.renewable-carbon.eu/graphics

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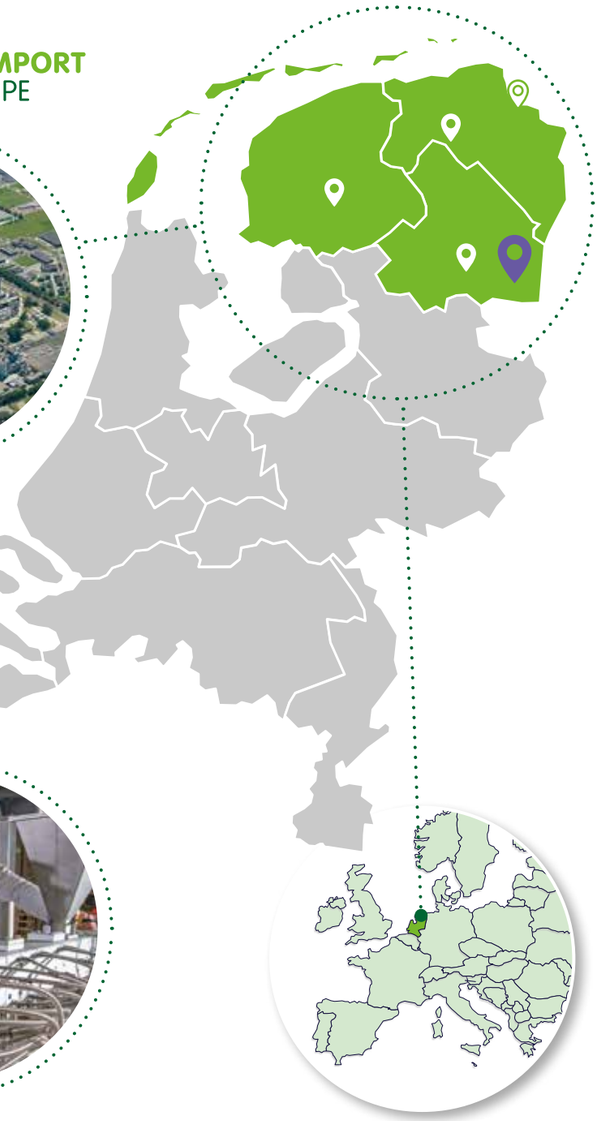


1 Northern Netherlands
leading in circular plastics

Chemport Europe

Chemport is the ecosystem for sustainable chemistry in the Northern Netherlands. Within Chemport Europe, businesses, government bodies and knowledge institutions work together to establish a fully circular industrial ecosystem. Chemports ambition is to be the first chemical cluster in the Netherlands (and perhaps in Europe!) with zero CO_2 emissions and minimum environmental impact. Main themes within Chemport are Circular Plastics, Biomass, Hydrogen and Carbon Dioxide. The Greenwise campus and Transition Centre are set up to further accelerate the regional lead in Circular Plastics.

Greenwise campus

The latest step within the ecosystem is the development of the Greenwise Campus in Emmen. A full-fledged knowledge campus to foster innovation in biobased and green chemistry. The campus provides a platform for expanding the green industry in the North of the Netherlands in the context of circularity, and will attract talent, staff, students and business activity to the region. The Campus will work on the topics of Smart and Circular and knowledge will also be applied to the sectors of Hydrogen and Healthcare. The Greenwise campus is made possible by Drenthe College, NHL Stenden, University of Groningen, Municipality of Emmen and the Province of Drenthe.

Transition Centre Circular Plastics

The ambition of the Northern Netherlands is to become leading in circular plastics. After elaborate research we now see that if we want to reach our ambition we need to adopt a more systemic approach and connect the non-technological issues within the entire plastics value chain. We need to add topics on law and regulations, societal adaptation and behaviour, green logistics and supply chains, economics and business strategy, environment and ecology. That is why we are now developing the TCCP, within the Greenwise Campus, in which multidisciplinary and multilevel research on circular plastics is combined and converged as the final systemic solution to create a true circular plastics ecosystem.

In 2030 the Northern Netherlands is one of the most knowledge- and experience rich regions in Europe on multidisciplinary and multilevel innovation for circular plastics.

1 Systemic solution
transition centre circular plastics

To address the challenge and realise our ambition we need to adopt a more systemic approach. That is why we are now developing the TCCP, within the Greenwise Campus, in which multidisciplinary and multilevel research on circular plastics is combined and converged as the final systemic solution to create a true circular plastics ecosystem. The organization structure and strategic agenda of the TCCP are being developed over the coming years. Both the TCCP and the Greenwise campus are to be operational in 2023.

As systemic solution we regionally develop and implement knowledge in a living lab setting. Learnings will be extrapolated and exchanged on a national and European level. We aim to speed up capacity building and project development in a structured multiannual approach. To push systemic change in a swifter, evidence based and systemic approach, we could greatly benefit from the learnings from peers in the European network.

Human capital/Skilled workforce

Human capital is pivotal in becoming a lighthouse circular economy region. This is why it is our top priority, to attract and keep young talent in our region, and to provide the right education that fits flawlessly in the circular economy.

Expanding the focus, regional approach with European impact

We have thus far focused on the regional ecosystem development and want to broaden our perspective and elaborate our scale towards other regions nationally and within Europe to have a greater impact.

Main focus

The main focus of the Transition Centre is to combine the non-technological issues within the entire plastics value chain. We need to add topics on law and regulations, societal adaptation and behaviour, green logistics and supply chains, economics and business strategy, environment and ecology. These knowledge themes provide the foundation of the Transition Centre, as illustrated in the figure on the next page.

Transition Centre Circular Plastics

6 Themes

Technology (incl. product design)
- Chemical-fysical processes
- Seperating waste
- Circular product design

Logistics
- Waste streams
- Optimisation
- End-of-life & Circularity

Economy & business
- Operations
- Business cases
- Circular businessmodels

Policy & Legislation
- Waste vs resource (REACH)
- Regional differences
- Ownership waste streams

Environment & Impact
- Environmental impacts (CO_2, Energy use)
- Microplastics

Society & behaviour
- Public awareness
- Behavioural change (use of alternatives)

3 Pillars

Pillar 1: **Knowledge**

Pillar 2: **Companies**

Pillar 3: **Supporting infrastructure**

Law & Regulations
- Laws impede the advancement of circular practises in the name of safety and health. The challenge is to innovate our laws such that they incorporate and facilitate circularity.
- The process of innovation is restricted by the regulations-machinery. E.g labelling a potential plastic resource as ‘waste’ makes it difficult to build a circular industry around this resource.
- Support (SME) organisations to find their way through growing and changing complexity of laws.

Society and behavioural aspects & systemic change
- Business and management strategy: The chosen path of investment (into projects) often falls on the less innovative/low-risk solutions.
- Consumer support in making the most circular choices.

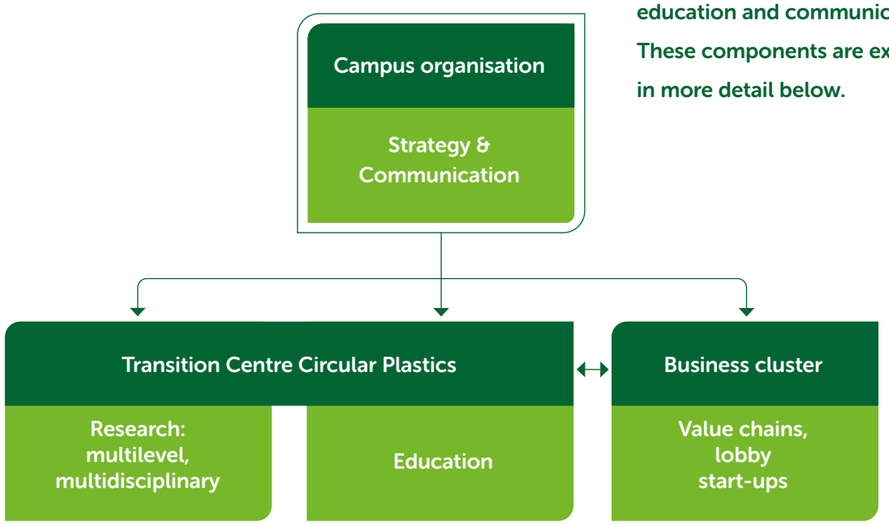
Ecology & Environment
- Impacts need to become more measurable and objective, and less lobby-sensitive.

Economical & Political Aspects
- The true price of products (including costs that are indirectly imposed on (local) society) is not accounted for, making more circular and sustainable products less competitive.

Logistics and supply chain management
- Secure the availability of (urban and bio) resources, which is also a challenge within ownership law; building (especially SME’s) resilience towards a changing market.
- The logistic infrastructure needs to be innovated (locally and internationally) to facilitate the priorities of the R-ladder/circularity.

Organisation

The transition from linear to circular is shaped across several lines. These therefore also form a logical part of the work of the transition centre: knowledge & research, economy & business development, strategy development, education and communication. These components are explained in more detail below.



R, D & I Agenda

We are initially working on three programme lines, two of which are a further development of the focus applied in recent years. Here we are adding a third programme line, set up from an interdisciplinary perspective.

Here, different time horizons come into play side by side. At a more fundamental level, these are issues based on case histories provided by practitioners. These often have a longer lead time and could be less relevant to individual parties, but the underlying factors can be identified and alternative routes examined. This can lead to input/underpinning for new policies and regulations, at a more macro/strategic level.

There is currently no process in place to connect the knowledge areas both internally and externally around this topic. At the same time, there is a need to explore this, from concrete cases and calls. An important role is to start this process and to cast it in a workable form. In the implementation phase, it is preferable to link the interdisciplinary knowledge fields to the transition centre for a long time. A larger interdisciplinary project can serve this purpose.

Economy & Business development

In addition to a knowledge agenda, business development is also being addressed within the transition. This is partly the result of our own knowledge and research (valorization) and partly by attracting new business to the region.

- Access to the network of companies in the region helps to collect case studies for strategic questions and for applied research.
- Funding for R&D agenda: set up financial ecosystem with investment fund, venture capital
- Innovation across all TRL levels: start-up guidance, business development region, pilot facilities

Strategy development & lobby

From the innovation line, knowledge is gained, bottlenecks and opportunities identified. From this knowledge, new programme lines can be proposed. The knowledge can also lead to strategic lobbying, with a view to new policy.

- Advising and agenda-setting
- Cooperation with other hubs, programmes and ecosystems
- Steering on regulations, timely information on new policy

Education & Human Capital

Education in chemistry and chemical engineering is offered by all applied science institutes and the university in the Northern Netherlands. In addition opportunities for interdisciplinary training will be investigated and implemented. All with the goal of setting up a lifelong learning programme around the theme at various levels.

- Joint minors/master programme
- PDEng
- Training courses

Communication

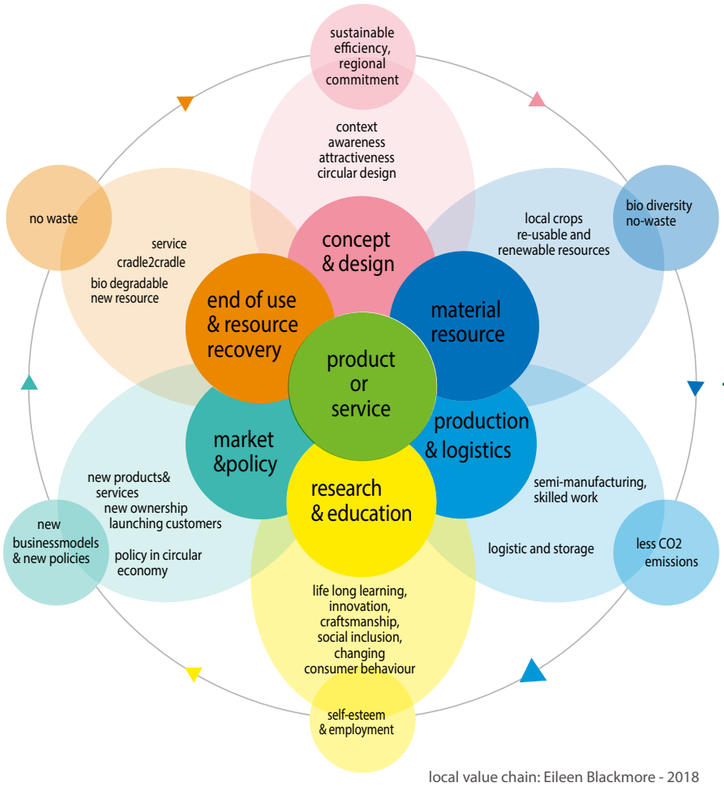
There is a desire to work on public engagement in addition to research and business development. This can be done by opening up (part of) the facilities in and around the regional campus. A possible focal point for this could be the Greenwise Campus. Consider setting up an exhibition about the importance of the transition, the techniques and knowledge fields that can be involved and where possible also interactively get to work as a visitor. Think of 3D printing/additive manufacturing (fablabs).

1 Research, development & innovation

Design for Circularity

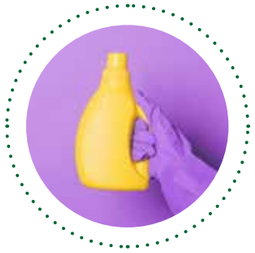
Besides the existing (technological) expertise, we are developing a new multidisciplinary and multilevel research approach based on 'Design for Circularity'.

To create a truly circular plastics ecosystem we need to look further than just the technical aspects of designing, producing, reusing and recycling plastics.
The companies currently active in our ecosystem are running into bottlenecks concerning laws and regulations e.g. the safety of using recycled plastics or the biodegradability of biobased plastics. Bottlenecks in human capital and resources, having a skilled workforce. Challenges in the supply chain and logistic effects of adopting a new business model (return logistics) or resources. Changes needed within e.g. our waste collection policies or procurement policies. The willingness of consumers to buy circular plastic products, changing the way we see, use and thus design plastics, and the effects of taking a different approach on plastic production can have on a business model.



local value chain: Eileen Blackmore - 2018

These are all non-technological issues that need our utmost attention if we want to create a circular economy with truly circular designed plastics. Therefore a multidisciplinary and multilevel approach is imperative.



(Bio) polymers & polyesters

In addition to the recycling of conventional (oil-based) plastics, research in the field of bio-based polymers is necessary. Biopolymers, whether biodegradable or not, currently make up a small part of the total plastics production, but the market is growing. Polyesters are examples of plastics that can be well bio-synthesised. Polyesters are also easy to recycle. Research topics lie in the field of process optimisation, mechanism degradation and applicability.

Sustainable yarns

Synthetic sustainable yarns are obtained from bio-plastics on the one hand, and from plastic regranulates on the other hand. These new yarns are being developed with the knowledge and available spinning machines in Emmen. This mainly concerns the development of new synthetic yarns that are compostable or biodegradable, with applications in horticulture, (e.g. PLA binding yarns), carpet industry, technical yarns or flame-resistant rPET yarns for indoor applications.

3D printing – additive manufacturing

Despite the current innovations, the materials available for various 3D printing techniques (i.e. FFF, SLA/DLP, SLS) are still limited. We focus on the development of new sustainable materials to print high-quality products. A crucial theme here is the circularity of 3D printing materials. We focus on completely closing the plastic loop via 3D printing of recycled plastics and recyclability of printed products.

Biocomposites

Composite materials are very sustainable, but not in terms of CO_2 footprint. Under the theme Biocomposites we develop materials with a lower footprint that are composed of (bio-based) plastics in combination with a natural fibre such as flax, hemp and jute. Research themes are: process optimisation, optimisation of properties, applicability in housing and infrastructure. We make use of test site MCE (Milling Company Europe), combined with the knowledge platform Compose-It to look at extrusion technology, granulation and large-scale availability and processability of very diverse bio raw materials.

Quality analysis

Washing procedures and separation techniques for plastic streams are improving all the time, which means that the quality of recycled plastic regranulates is getting better and better. Research to this end can be conducted in the National Test Centre Circular Plastics (NTCP) located in Heerenveen. We conduct research into the quality and applicability of the regranulate plastic streams obtained, by combining knowledge and skills within NHL Stenden University of Applied Sciences, EMMTEC Services and Senbis.

Life long learning

Human capital & resource availability

One of the main bottlenecks is the human capital & resource availability. Within the TCCP, specific international educational programmes (minors, masters, elective courses, PhD's and PD Eng etc) will be developed within the next few years until on the topic of circular plastics, expanding on the existing educational framework towards life long learning. All to attract and educate highly skilled professionals in the field of Circular Plastics.

Primary education	Secondary education	Vocational education	Applied sciences	Master	PhD	Business education
To be developed with RCE Spark the movement	To be developed with RCE Spark the Movement	Training sustainable plastics technology	Minors, chemistry, chemical engineering, polymer engineering	Circular Plastics	Hybrid research group biopolymers	PDEng, MBA programme, elective courses

Collaboration with RCE SPARK the Movement

Spark the Movement inspires schools to learn for and to work towards a circular economy and a sustainable society. In this movement young people, teachers and staff of all schools in all levels, from primary schools to university level, are involved. In 2021 SPARK was acknowledged by the United Nations as a RCE, a regional community-centre of expertise on education for sustainable development.

… so what now?

Development

The proposed Transition Centre is already taking shape and will be launched officially in 2023. This gives time to set up the organisation properly, but also provides an opportunity to be involved from the start. We hope together with you to:

- expand our horizon towards the EU by building long-term alliances with 10 to 15 dedicated partners in 2030 and more than 50 to 100 project related partners
- to connect to complementary knowledge institutes and share our experiences, networks and knowledge
- develop demonstration projects and project development assistance. On the short term we are looking for EU partners to develop a EU scale (e.g. Horizon) project on Design for Circularity, to be submitted start in 2023
- get access to the tools available to autonomously collect and monitor data and to follow the progress and impact of our circular systemic solution(s)

Call to action

We welcome all parties who wish to be involved in the development, research programmes, education or otherwise to get in touch.

Organisation form	External analysis	Change maker(s) with support (office, communication)	Scientific director Business director Theme coordinators Business developers Project manager Office management
Phase	**Plan Development & Positioning**	**Building Transition Centre**	**Growth and development**
Activities	• Regional strengths • Positioning compared to other regions • Vision • Organizational form • Business plan	• Funding • Commitment of parties • National lobby and positioning • Recruitment & Selection • Research themes • Business model & participation • Integration with Greenwise Campus	• R&D agenda • Business development • Marketing • Lobby • Education
Financing	Regiodeal	JTF + Regiodeal	JTF + Regiodeal EDRF Project funds

TRANSITION CENTRE
CIRCULAR PLASTICS

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