TFN

May 2025

Project Moonshot

Unlocking capital to scale up Green Chemistry companies

Commissioned by GCNE

Definition of Green Chemistry and problem statement

Green Chemistry[1]

Green Chemistry focuses on replacing fossil-based resources with renewable alternatives, ensuring that chemical processes are sustainable and resource-efficient. It involves the conversion of biobased feedstocks, carbon capture and utilization (CCU), and recycling technologies to develop materials in a way that minimizes environmental impact[2].

Focus Sectors

Biobased - focuses on converting biological and renewable raw materials (such as biomass, agricultural waste, and microorganisms) into chemicals, polymers, and materials that traditionally rely on fossil resources.

CCU - involves capturing CO_2 emissions from industrial sources and converting it into materials such as polymers, building materials, and specialty chemicals.

Recycling – chemical conversion and processing of waste materials (plastics, textiles, industrial byproducts) into new raw materials for chemical and material production.

Problem statement

Dutch Green Chemistry companies face challenges in securing the necessary investments to progress from TRL 5 to TRL 9 to be ready for real industrial scaling in order to become a viable alternative for traditional chemistry.

[1] In line with GCNE definition and focus
[2] Fuels are excluded from this analysis, except for when involving materials (i.e. pyrolysis)

Report objectives

Background

GCNE launched the moonshot ambition to unlock patient capital to support scaling of Green Chemistry companies.

As part of this ambition, Transition Finance Network ("TFN") has been assigned to conduct a research project focused on deepening the understanding of the funding gap and to establish where the gap is most pronounced.

Methodology

TFN applied a 4-pronged research methodology, comprising desktop research, deep dives[3] and an online survey[4] with in total 17 selected Dutch Green Chemistry companies, as well as 5 targeted investor interviews[5]. The Energy sector was used as a benchmark based on the higher maturity of the transition in this sector. The international context has been assessed on the basis of desktop research which was limited to one 'archetypal' country due to the limited timeframe of the assignment. For this purpose, France was selected together with the stakeholder group which consisted of representatives from:

KGG (https://www.rijksoverheid.nl/ministeries/ministerie-van-klimaat-en-groene-groei), RVO (https://www.rvo.nl), NFIA (https://www.rijksoverheid.nl/contact/contactgids/netherlands-foreign-investment-agency), NGF BBC (https://www.nationaalgroeifonds.nl/overzicht-lopende-projecten/thema-sleuteltechnologieen-en-valorisatie/biobased-circular), BioBTX (https://biobtx.com), InvestNL (https://www.invest-nl.nl), and ROM Nederland (https://www.rom-nederland.nl).

Report

The objective of the report is to define the funding gap and its root causes and provide recommendations for the direction of potential solutions which should be within the control of GCNE and its stakeholders. The report is the result of a 12-week study; subsequent phases will be required to work out action plans for the identified solution directions.

[3] Half day sessions (in-person or online) with founders and or management teams covering company development, product & technology, funding road map & challenges, public support and lessons learned
[4] Comprising 25 questions focused on data gathering and 25 'agree or disagree' hypotheses
[5] One-hour online interviews with senior representatives of these investment firms both active and not active in Green Chemistry investing (TRL 5-9)

Summary findings

Chemicals, a sector with specific challenges

The Chemicals sector is characterized by **complex and global value chains**, where both upstream and downstream markets are based on high volumes. This means that scaling up typically requires building significant capacity early on in a company's development journey, leading to high **capital intensity**. The **volume-driven** nature of chemicals markets also implies commoditization in many end-markets typically leading to transparent price setting, limiting room for 'new technology premiums.' In addition, competitiveness and availability of alternatives require high quality and on spec delivery from the outset. The position, typically high up the value chain (and as such away from end-customer demand), in combination with the global nature provides a **different dynamic** for the (base) chemical sector than seen in other sectors.

The **Energy sector** has been selected as an **'archetypal' sector** as its transition is ahead of other sectors and relatively successful. As such, lessons can be learned from effective regulation, subsidies, and other stimulus measures applied to drive the energy transition. However, when compared to the Energy sector, there are **fundamental differences** with the Chemicals sector. In the Energy sector the 'demand pull' is often clearer and easier to organize/legislate given the more local nature of energy generation. This is much harder for the Chemicals sector with **global product flows** easily crossing borders and easy access to **substitutes**. This means that to be effective, regulation needs to be organized globally, which is much harder to do than on a regional (EU) or national level. The same applies to subsidies as governments will need to be able to explain and defend where taxpayer money is going.

In addition to the above, there some other specific sectoral differences to take into account: **lead times** for new chemical technologies to come to market are generally longer and chemical sites, where the first facilities at scale need to arise, are typically **large, complex, and highly integrated,** further increasing capital intensity and uncertainty for 'first-of-a-kind' facilities at scale. Another key difference is the **importance of feedstock** which adds a vulnerable element to the viability of business cases, in addition to the more common focus on offtake.

Conducive backdrop for Green Chemistry technologies

The Dutch network of **high-quality technical universities** provides a breeding ground for innovative technologies and start-up activity in Green Chemistry. (Former) Dutch Chemical giants such as **Nobian, Nouryon, and DSM**, as well as the presence of foreign chemical companies, further support the eco-system. In addition, the **Dutch infrastructure** is deemed to be of the highest standard, with the port of Rotterdam area (being part of the Antwerp-

Rotterdam-Rhine-Ruhr Area, the ARRRA cluster) but also with connected clusters around Geleen and in Groningen. This provides an excellent foundation for **start-up activity** and should provide **competitive advantages**.

Also, in an **international context** the Dutch situation compares well. France is known for its development of successful start-up clusters and eco-systems as for instance seen in the Lyon area, but this is not leading to better conditions or necessarily yielding more start-up activity in Green Chemistry than seen in the Netherlands, on a relative basis.

Funding for early-stage Green Chemistry companies adequate

Out of a database[6] of more than 350 early-stage Dutch Green Chemistry companies, around **75 companies** raised more than €4 million in funding from inception to date, which totals close to **€3 billion in funding**. The amounts include subsidies and grants as well as private and public investments but with an estimated 60% it is skewed towards **public funding**. On the private funding side, almost without exception, **angel funding** has been instrumental, also way beyond seed stage. Out of the companies that raised more than €4 million, only a limited number of companies have gone through a full-blown fundraising process led by professional investment funds. Even the largest, successful fundraisings have typically been **patchworks of funding sources** with still a significant role for **public funding**.

Overall, the conclusion is that for the early-stages, substantial funding is available. Looking at the high number of companies that obtained significant (public) funding it indicates that this funding is applied in a **dispersed manner**.

Public sector support crucial

In general, **public support** and **government policy** play an important role in driving the transition of sectors. In the Chemicals sector this is equally if not more important. Given the global nature and resulting broad availability of alternatives in combination with a focus on price, **unclear and uncertain regulation** is detrimental for developing viable business cases, as recently seen in specific sub sectors (e.g. plastics recycling). This means that coordination is key, at a **national level** but preferably also **internationally**, to the extent possible. Anecdotal and beyond Green Chemistry companies; some (European) laws are particularly counterintuitive or even counterproductive such as, for instance, the EU regulation pertaining to 'an undertaking in difficulty' (*onderneming in moeilijkheden*), which effectively prevents certain subsidy programs from supporting any early-stage company as required tests cannot be passed by default.

[6] Longlist gamechangers Groene Chemie (GCNE)

On a more micro level, **lack of coordination** between government bodies is also recognized as an issue. Many companies could benefit from better guidance and speedier **application processes** for grants and subsidies. These companies often also struggle with **practical matters** like finding appropriate plots to develop production facilities, getting a grid connection or obtaining required permits.

Specific regulation and public tools used in the energy transition provide valuable insights and show that central and focused **EU directives** like the **Renewable Energy Directives** supported the roll-out of renewable energy and the required infrastructure by forcing governments to designate specific areas for this purpose and at the same time facilitating quicker permitting procedures. On a national level, subsidy schemes focused on creating a **level-playing field (CfD's[7])** also worked well and stimulated supply.

That a lot can be achieved on a national level is demonstrated in **France** where a number of targeted initiatives have been applied to address some of the aforementioned issues. Desktop research shows that in France legislation works effectively because it is focused on the demand side (for instance through **legally binding targets** to phase out fossil-based or virgin products[8]) and at the same time on the industry itself (by mandating reuse, repairability, and packaging). Additionally, France has been successful in developing public-private-partnerships as well as getting the required EU support for sizable **public investment mandates** like the recently approved €500 million chemical recycling aid scheme[9], or the €100 billion **France Relance** economic stimulus initiative approved in 2020, which included €30 billion specifically for ecological transition, including Green Chemistry.

In summary, **consistency, transparency,** and **accessibility** are prerequisites for effective public sector support, ranging from regulation and policy to public funding.

Virtually no operations at scale in Green Chemistry

As a result – and despite of – what is discussed above, only a few Green Chemistry companies have been successful in raising funds for building **plants at (industrial) scale** in the Netherlands and, at the moment, very few of these plants have actually been built or are operational at serious scale (with some exceptions in specific industries). Whereas raising funds to get to pilot and or demo scale (TRL 4-6) is achievable, raising the required funds to develop to industrial scale **(TRL9)** is extremely difficult for Green Chemistry companies, let alone achieving commercial scale **('market readiness')**. Capital intensity (including regularly seen substantial Devex and Capex overruns) in combination with long lead times do not fit the **average ticket size (<€5m), investment horizon (7-10 yrs)** and related **return requirements (>30%)** of traditional **venture capital** investors. On the other end of the spectrum the risk

[7] Contract-for-difference: guaranteed strike price with top-up payments in case wholesale price is below this strike price and vice versa

[8] Mandate to phase out single-use plastics by 2040

[9] First country to get funding approved under section 4.4 of the CEEAG rules of the European Commission

profile of this development stage does not yet fit the **investment mandates** of bigger ticket, longer term, **infra-like (institutional) investors**. This leaves Green Chemistry companies falling between the cracks **('the funding gap').**

Recommended direction for solutions

Public focus should be on creating de-risked projects at scale

The government should play a key role in unlocking more investments in the sector as well as in creating circumstances for companies to scale to commercially viable alternatives to fossil-based chemistry. Without **government orchestration** Green Chemistry companies will struggle to seriously scale. As the **Green Chemistry sector** is behind other sectors in transition and **fundamentally different** in nature, the private investor community is less developed and less active in this space. However (perceived) lack of private capital is also driven by unfavorable conditions, as a result there is a bigger role to play for public investors. TFN identified four levers to pull for both **government policy** and **public investments** which should work **in tandem**.

Government policy

- **Focus:** Define a strategy and prioritize subsectors within Green Chemistry based on strategic priorities around circularity, industrial independence, innovation power and employment. Focus support on a limited number of technologies and solutions;
- **De-risk:** Create clarity with smart and effective regulation. The overarching goal should be to have long term transparency and stability;
- **Create:** Develop mechanisms that support demand (take out the green premium) and use government offtake to drive actual demand where relevant and possible;
- **Solve:** Remove hurdles around permitting procedures, grid connections, plot selection etc. Coordinate non-dilutive funding (national vs regional).

Public investments

- **Align:** Align the investment strategy with government policy. Make choices about which subsector, technology, or companies to back;
- **Adapt:** Adapt investment criteria to sector characteristics (long investment cycles, capital intensity, complexity). Centralize efforts;
- **Bridge:** Specifically target funding rounds for demo to industrial scale (from TRL 6 to TRL 9). Be prepared to underwrite larger tickets (€50m+) and accept a longer investment horizon;
- **Lead:** Accept the role of lead investor in these funding rounds. Develop alternative ways to obtain required market validation of terms (if there is no private investor interest (yet) there are no 'market terms' to benchmark against nor matching private investor tickets available).

Toolbox

1. Tailor Support Mechanisms

- Develop specific subsidy/support arrangements for Green Chemistry;
- Look at other sectors, most notably the energy sector, to copy and tailor successful subsidy schemes;
- Create guarantee structures to support demand / offtake.

2. Develop One Access Point

- Create a knowledge & support platform to actively help Green Chemistry companies with the groundwork, preferably on a centralized, national level;
- Guidance & support throughout application processes;
- Help to secure plots, grid connections, and other practical matters.

3. Appoint an Industry Veteran[10]

- Provide a mandate to define a holistic strategy for the (Green) Chemical sector including a transition plan and associated regulation;
- Include the requirement to apply focus, make choices based on the extensive research done to date and create a transition path to a circular industry;
- Drive incumbent knowledge and sector expertise transfer towards the start- and scale-ups in Green Chemistry.

4. Set-up a Dedicated Investment Fund

- Structure a Circular/Green Chemistry (semi)-public investment fund with the sole purpose to bridge the gap towards industrial scale (TRL 9);
- Define investment criteria that focus on funding rounds for scaling demo to industrial scale;
- Consider backing and involvement of the incumbents as the traditional industry should preferably be part of the set-up.

[10] Could be considered as a next step following the recently published "Concept visie duurzaam koolstofgebruik in de chemische industry" by I&W and KGG which is still subject to consultation

Possible next steps

1. **Tailor Support Mechanisms**

Thorough assessment of existing schemes and arrangements, also explore support mechanisms beyond subsidies:

- Appoint a government 'Sponsor';
- Focus on the successful SDE arrangement(s) to see how that can be adapted to better apply to Green Chemistry propositions;
- Look at other existing arrangements in the energy sector such as EIA and MIA/VAMIL to see if these can be tailored or provide a blueprint for stimulating Green Chemistry development;
- Support offtake by actual government demand for circular / bio-based products where possible;
- Ensure tender procedures align with strategic goals for industry circularity and are focused on supporting offtake;
- Assess successful schemes focused on creating 'demand pull' developed internationally.

2. **Develop One Access Point**

Coordination and centralization of efforts, effectively a 'help desk' should be created:

- Develop a 'one-stop shop' for Green Chemistry companies focused on:
  - speedier applications processes ranging from permit to subsidy applications;
  - securing plots for demo scale development (and beyond) including grid connections and other basic requirements.
- Create a platform for knowledge transfer between start / scale-ups as well between start/scale-ups and existing industry focused on:
  - coaching and support for founders both operationally as well as commercially;
  - creating buy-in from the existing industry for innovative technologies and solutions (front row principle).

3. Appoint an Industry Veteran

Create a long-term view for the Dutch (Green) Chemistry sector and get buy in from the public as well as the private sector:

- Find someone with credibility and network in the sector (both with incumbents and Green Chemistry companies), sufficient backing as well as distance from the government and with the required gravitas;
- Set strategic goals for the Netherlands by taking into account:
  - industrial resilience and independence;
  - decarbonization and circularity targets;
  - innovative power;
  - employment.
- Obtain well-articulated input from both new Green Chemistry companies and incumbents on what is required to be(come) successful;
- Translate into choices, policy, and effective regulation.

4. Set-up a Dedicated Investment Fund

Develop public investment capacity with appropriate risk tolerance, representing a new vehicle dedicated to support a circular / biobased industry:

- Define investment criteria, acceptable risk profile, and the appropriate fund size, which should be in line with strategic priorities set for the Netherlands and fully focused on scaling circular / bio-based technologies;
- Compare to similar initiatives in France and other (European) countries and ensure compliance with European State Aid rules;
- Obtain input from private investors to ensure a pathway to the necessary private investments for further commercial scaling;
- Assess whether the fund mandate would fit existing structures and investment mandates or if it requires a new set-up to ensure proper focus;
- Explore appetite within the incumbent industry for co-funding of the vehicle.

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