Renewable Carbon Concept and Initiative

Webinar 27 October 2020

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nova Institute
for Ecology and Innovation

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SCIENCE-BASED CONSULTANCY ON RENEWABLE CARBON FOR CHEMICALS AND MATERIALS

We support your smart transition to renewable carbon

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Bio-based | CO_2-based | Recycling

Circular Economy

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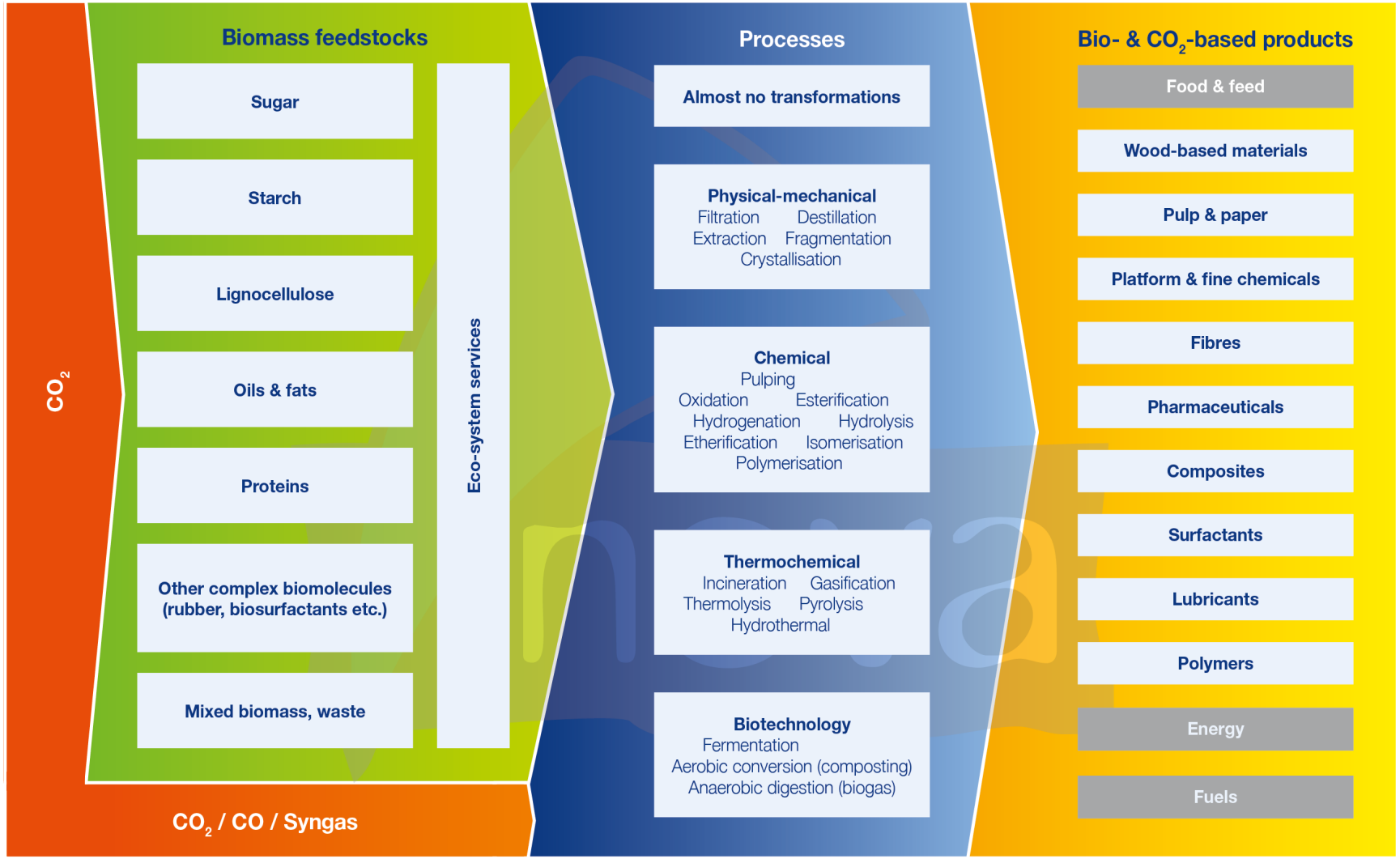
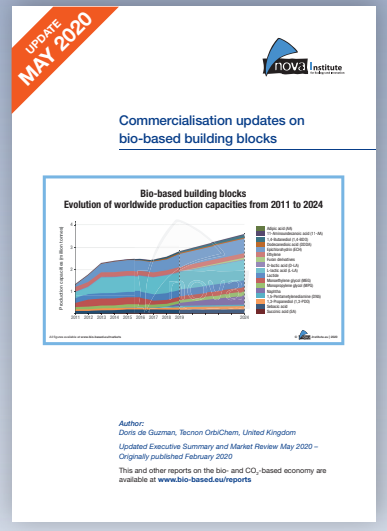
Bio- and CO_2-based Economy: feedstocks, processes and products

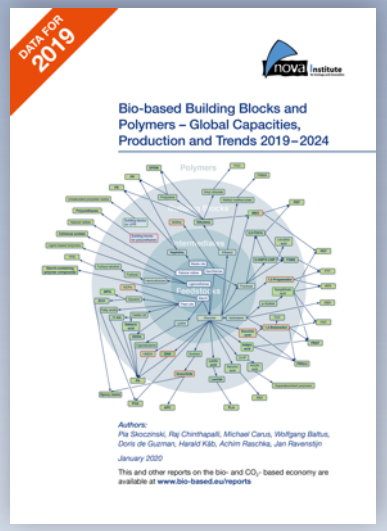


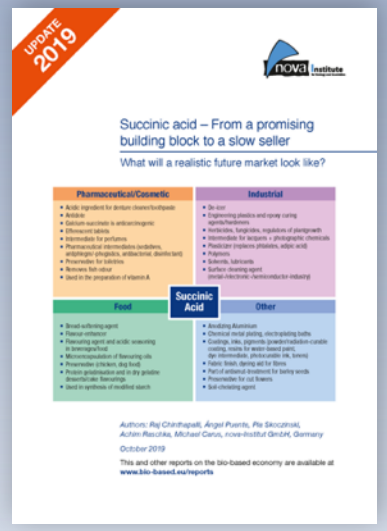
Selected Customers from all Industrial Sectors

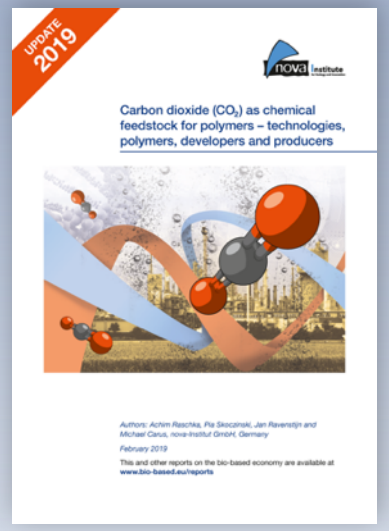
Selected Customers from Chemical Industry

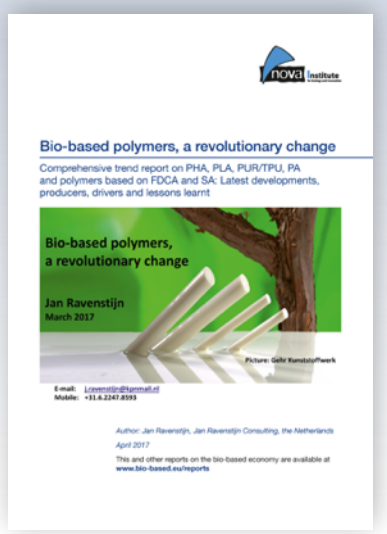
Bio-based Polymers & Building Blocks – the best market reports available

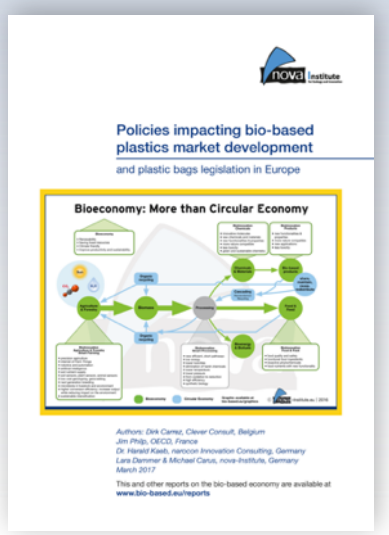


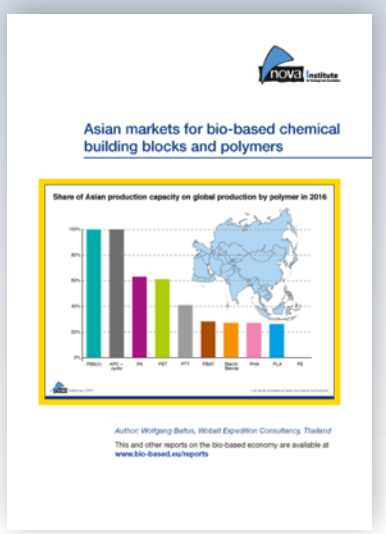












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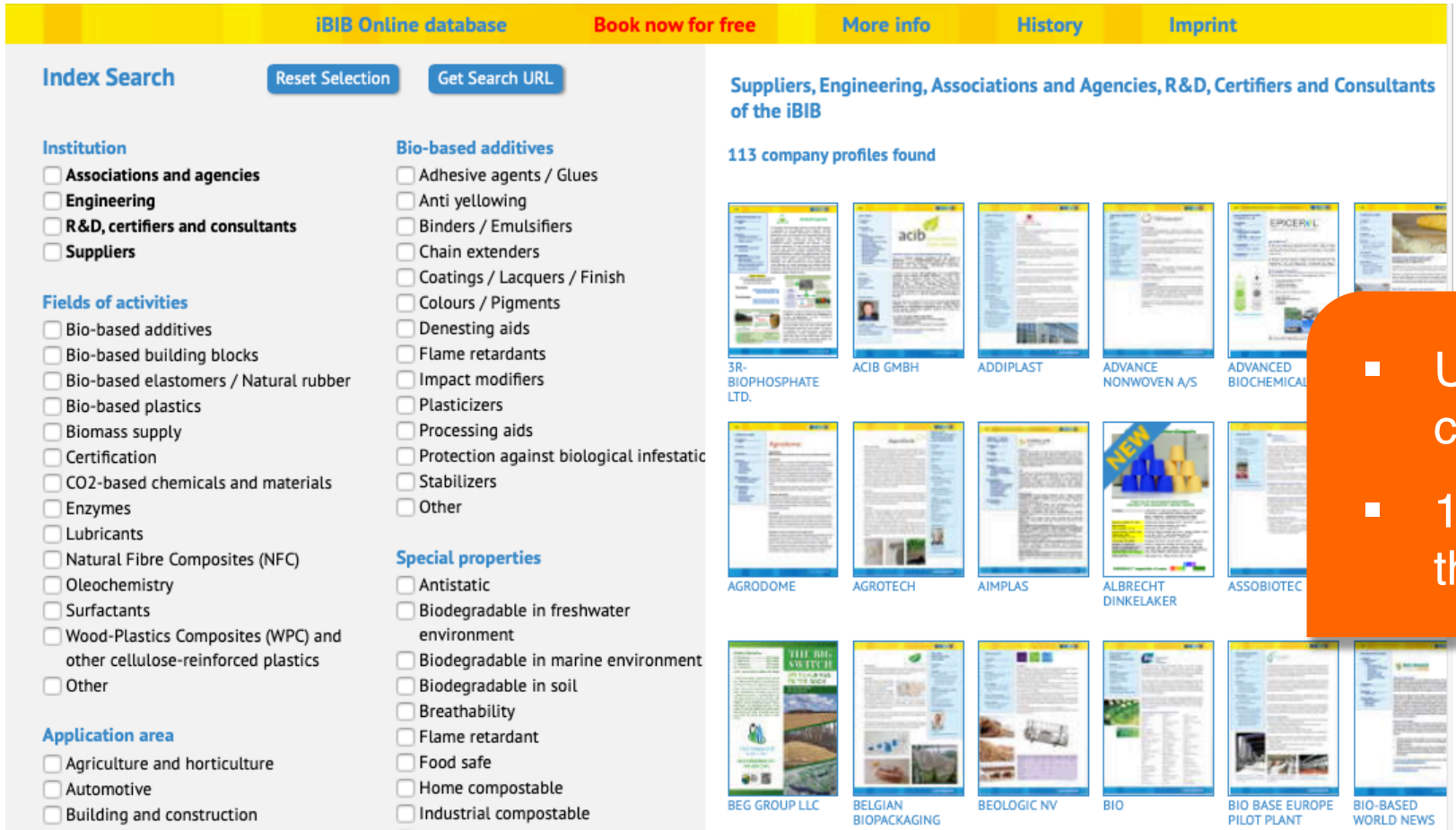

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nova Session
“EU Circular Economy and Plastic Policy”

29 October 2020, online

2nd International Conference on CELLULOSE FIBRES
2–3 February 2021, Cologne (Germany)

9th Conference on CO_2 Carbon Dioxide as Feedstock for Fuels, Chemistry and Polymers
23–24 March 2021, Maternushaus, Cologne (Germany)

Renewable Materials Conference

18–20 May 2021

Contact: Mr. Dominik Vogt, +49 (0) 2233 48 14 49, Dominik.vogt@nova-institut.de

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Renewable Carbon is the Key

Major threats and challenges to our planet are

- Climate change and
- Biodiversity loss

Key greenhouse gases (GHG) emitted by human activities

- Carbon Dioxide (CO_2): 76%
- Methane (CH_4): 16%
- Nitrous oxide (N_2O): 6%
- Fluorinated gases (F-gases): 2%

The percentages are given in relation to CO_2 equivalents in terms of global warming potential (GWP) (IPCC 2014)

- **About 94% of the GHG contain carbon.**
- **80 – 90% of the carbon containing GHG contain fossil carbon from the ground.**

The remaining carbon comes from forestry and agriculture and can be balanced by a sustainable circular bioeconomy, where the uptake and the release of carbon are the same, or by reforestation which could increase the uptake to even higher levels than the release.

As long as the existing carbon-containing GHG are kept in a circle, there is no damage done to the climate. The use of additional fossil carbon, however, is clearly the main cause of the greenhouse effect. The solution here can only be to take the problem by the roots and stop bringing more fossil carbon into circulation.

STOP Fossil Carbon Use

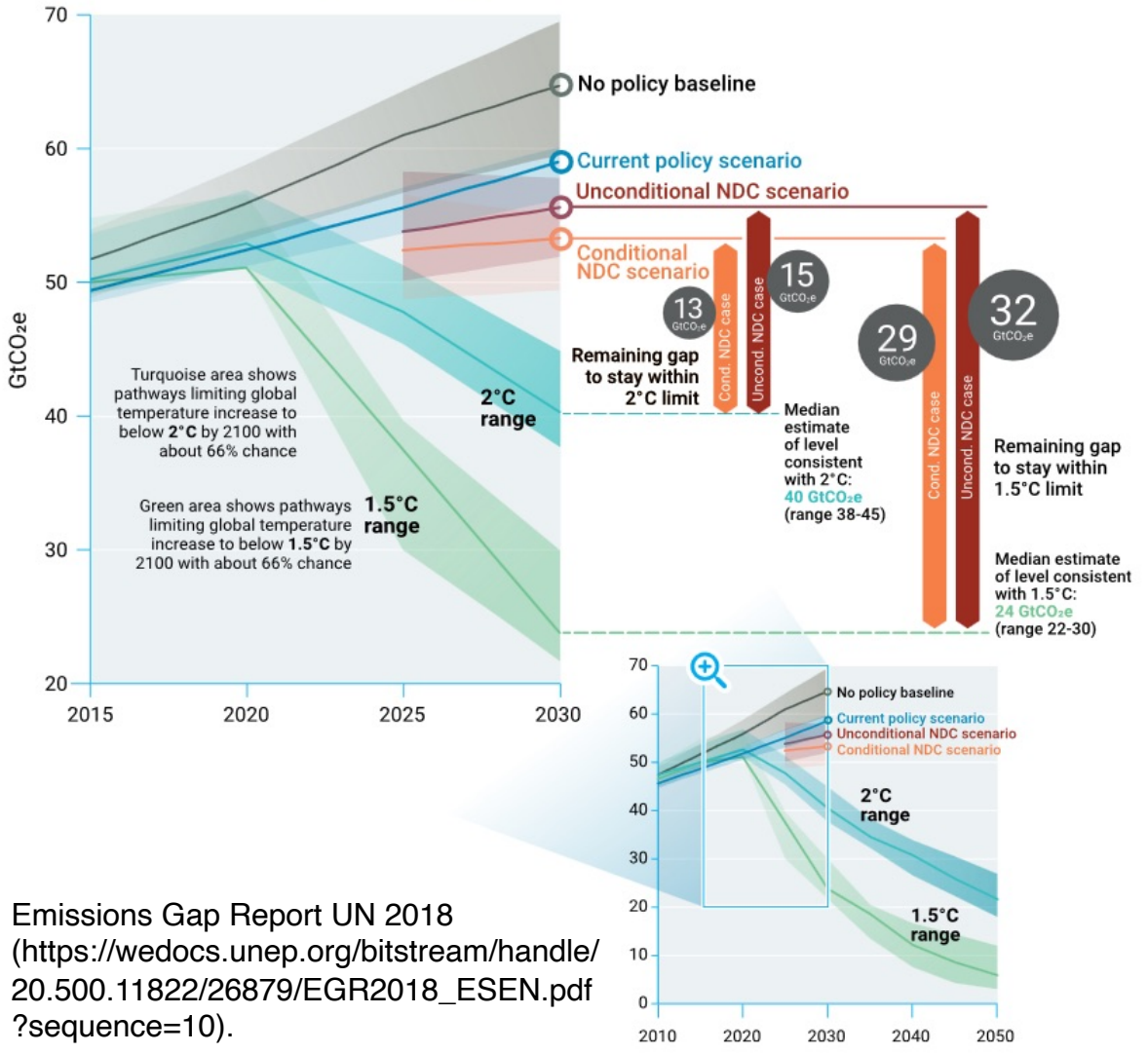
„It is not CO_2 that is at the core of the climate problem, but the additional fossil carbon that we take out of the ground and which gets released in the atmosphere as CO_2 or other emissions. If the inflow is prevented, the CO_2 content of the atmosphere will no longer increase.“

Michael Carus, May 2020

The main reasons for the biodiversity loss

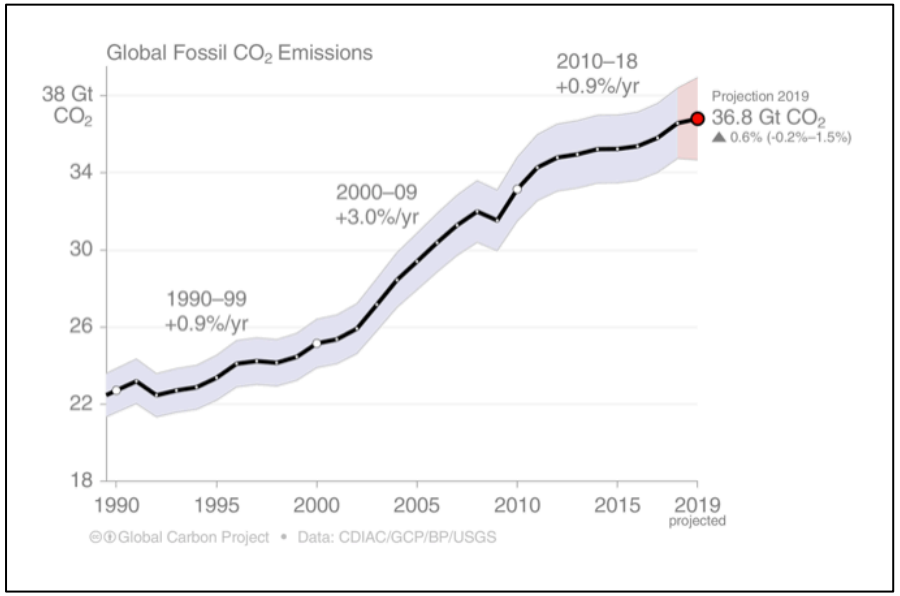
- **Climate change**, alongside factors like land degradation and habitat loss, is emerging as a top threat to wildlife around the globe. https://www.scientificamerican.com/article/climate-change-is-becoming-a-top-threat-to-biodiversity/
- According to the Millennium Ecosystem Assessment, **climate change is likely to become one of the most significant drivers of biodiversity loss by the end of the century**. Climate change is already forcing biodiversity to adapt either through shifting habitat, changing life cycles, or the development of new physical traits. https://www.cbd.int/climate/intro.shtml
- By the end of the century, **climate change** and its impacts may be the **dominant direct driver of biodiversity loss** and changes in ecosystem services globally. https://www.greenfacts.org/en/biodiversity/l-3/4-causes-desertification.htm

Figure ES.3: Global greenhouse gas emissions under different scenarios and the emissions gap in 2030 (median estimate and tenth to ninetieth percentile range)

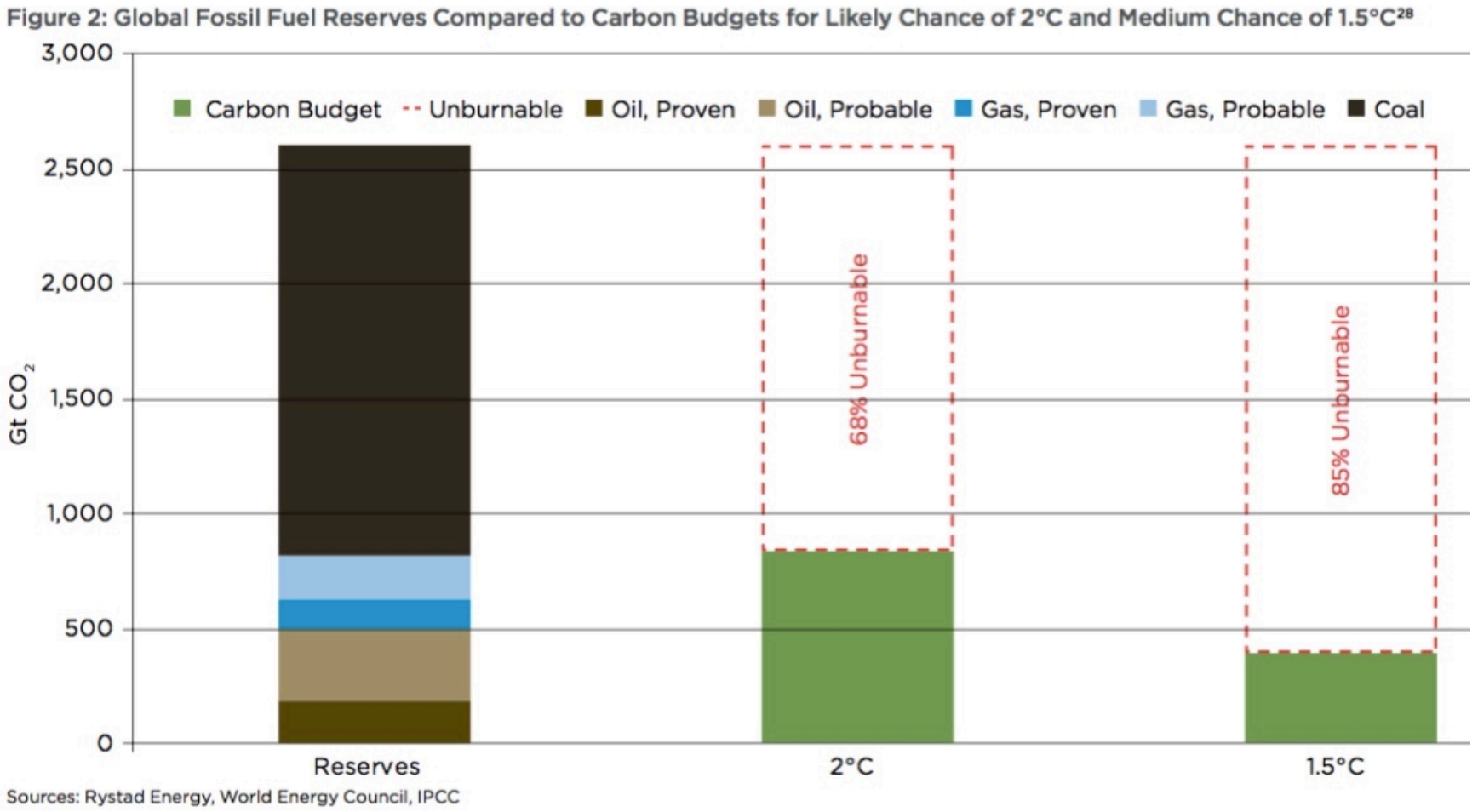


Emissions Gap Report UN 2018 (https://wedocs.unep.org/bitstream/handle/20.500.11822/26879/EGR2018_ESEN.pdf?sequence=10).

- All time record: 36.8 Gt fossil CO_2 emissions in 2019 (below)
- More than CO_2: 55 Gt CO_2e in 2019
- In 2030 (1.5 Grad C range): about 24 Gt CO_2e are allowed (left)



STOP Fossil Carbon Use



Source: Oil Change International, 16-09

- Globally, **a third of oil**, **half of gas** and **over 80 per cent of coal reserves** should remain unused in order to meet the target of 2°C.
  (McGlade & Ekins 2015)

- Only a **full phase-out of fossil carbon** will help prevent a further increase in CO_2 concentrations.

- All of the **fossil carbon extracted from the ground** will sooner or later be **released into the atmosphere**

“Renewable Energy”
Decarbonisation of the Energy Sector

There is a clear and more or less consistent Energy Policy to a 100% renewable energy system based on **solar, wind, hydro** and other renewable energies.

Apart from bioenergy, bio- and CO_2-based fuels, all of these deserve the term **“decarbonisation”**.

Green electricity and **green hydrogen** for the **energy** and **fuel sector**.

"Renewable Carbon" for a Sustainable Chemical and Plastic Industry

There is no corresponding policy or strategy for the material sector, especially for the chemical and plastic industry.

The term **decarbonisation** is simply **inaccurate** for organic chemistry, which is based on carbon. It is used out of lack of knowledge and as a direct analogue to the energy sector, but absolutely not applicable to the chemical, plastics or biomass sectors.

The term is not only inaccurate, but also potentially harmful because it avoids the **question of the "right" carbon sources.**

And this is exactly what we have to provide. We need a future oriented renewable carbon strategy. And there are only three sources of renewable carbon.

Chemical Industry and Climate Change

Global Efficiency Intelligence 2018: The global chemical industry is responsible for approx. **7% of the global anthropogenic GHG emissions** or around 20% of industrial GHG emissions.

Source: www.globalefficiencyintel.com/new-blog/2018/chemical-industrys-energy-use-emissions?rq=Chemical%20Industry

This share of 7% could rise to 15% in 2030 and **25% in 2050**.

IEA 2020: Petrochemical feedstock accounts for 12% of global oil demand, a share that is expected to increase driven by increasing demand for plastics, fertilisers, detergents and other products.
Petrochemicals are rapidly becoming the **largest driver of global oil demand**. The growth in demand for petrochemical products means that petrochemicals are set to account for over a third of the growth in oil demand to 2030, and **nearly half to 2050**, ahead of trucks, aviation and shipping.

Why?

- Higher CAGR for chemistry (7%) compared to energy (1-2%) in the next decades
- Ongoing decarbonisation of the energy sector

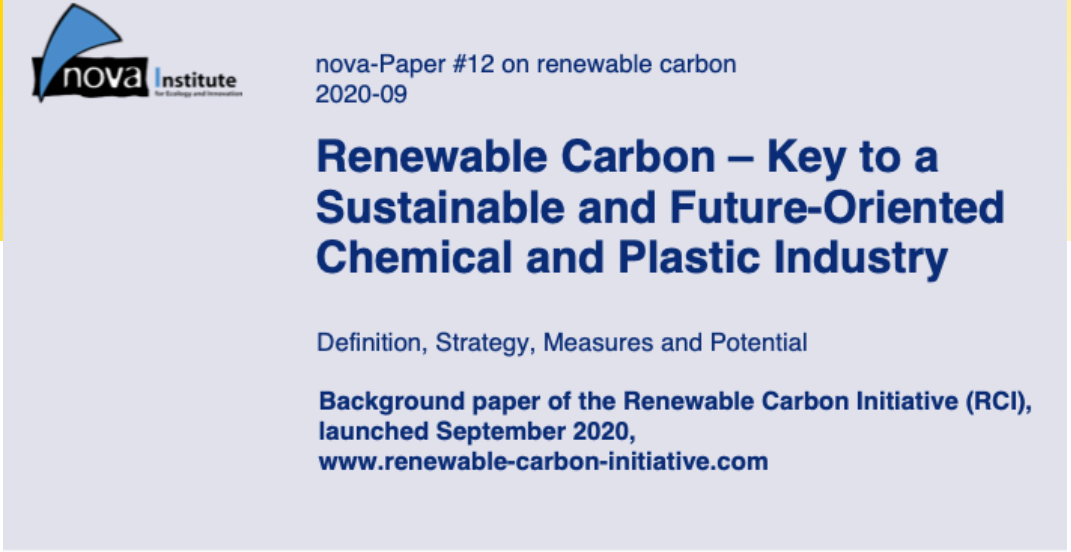
The chemical industry could become one of the main GHG emitter in the future.

Summary:
Key points of the renewable carbon strategy

- Decarbonisation is a **good strategy for the energy sector**, but no issue for chemicals and materials, because most of them are based on carbon (just like humans ☺).
- There is a **lasting need for carbon** for chemicals and materials.
- 80% from the **GHG emissions** are **directly related to additional fossil carbon** from the ground.
- The key challenge is to **replace demand** for fossil carbon by alternative carbon sources.
- Those alternative carbon sources are **biomass**, **CO_2** and **recycling** of carbon containing waste streams (bio and plastic waste).
- We call them “**renewable carbon**”.

The Renewable Carbon Concept

Renewable Carbon is the Key to a Sustainable and Future-Oriented Chemical and Plastic Industry



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Authors: Michael Carus, Lara Dammer, Achim Raschka, Pia Skoczinski and Christopher vom Berg
nova-Institute, Hürth (Germany)

nova-Papers are proposals to stimulate the discussion on current topics of the renewable carbon economy, by creating new perceptions based on scientific facts and by inviting relevant stakeholders to participate in decision-making processes and debates.

This paper is the background paper of the “Renewable Carbon Initiative (RCI)”, which was launched in September 2020.

Free download: www.bio-based.eu/nova-papers

RENEWABLE CARBON

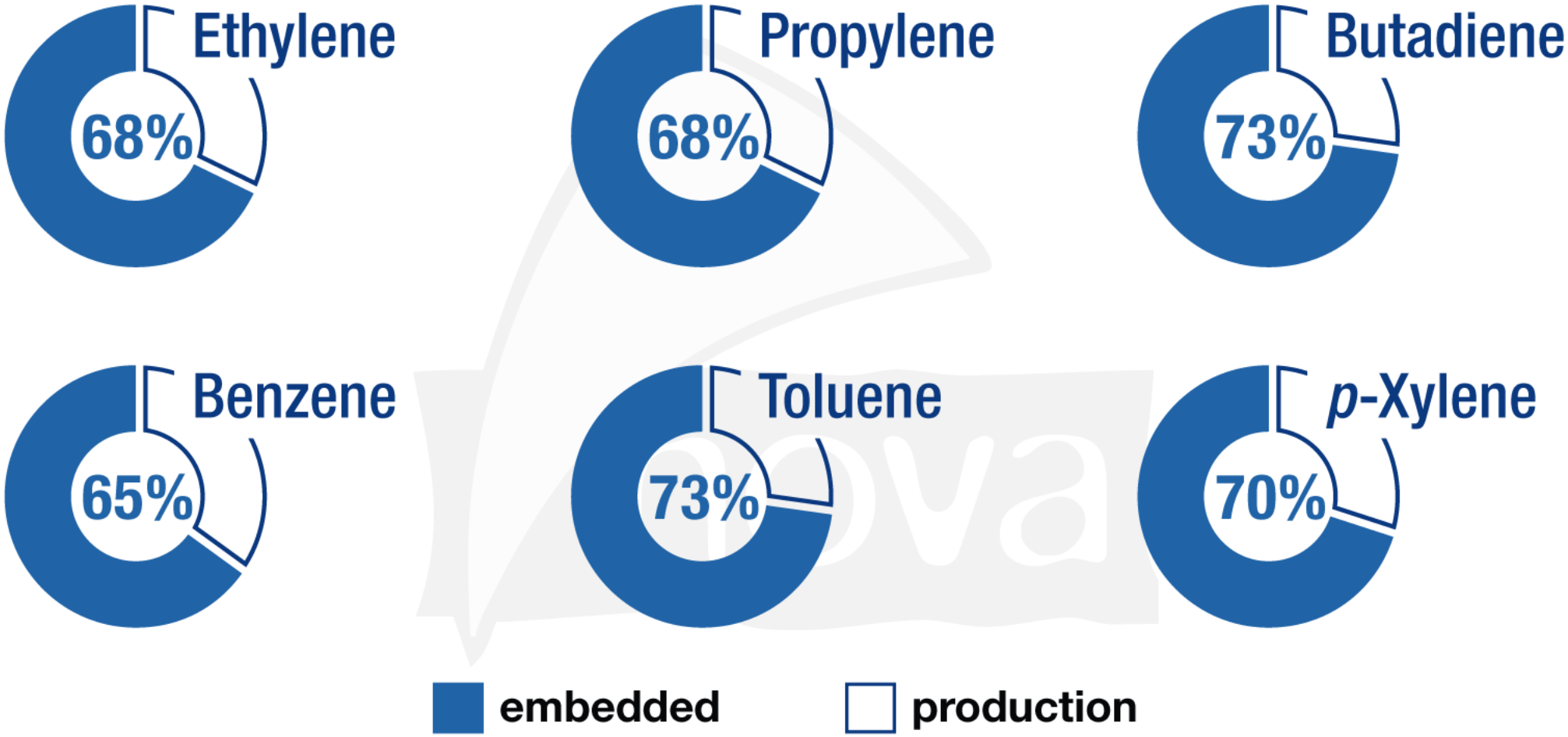
entails all carbon sources that avoid or substitute the use of any additional fossil carbon from the geosphere.

Renewable carbon can come from the atmosphere, biosphere or technosphere – but not from the geosphere. Renewable carbon circulates between biosphere, atmosphere or technosphere, creating a carbon circular economy.

Fossil carbon shall be completely substituted by renewable carbon, which is carbon from alternative sources: biomass, CO_2 and recycling. This is the only way for chemicals and plastics to become sustainable, climate-friendly and part of the circular economy – part of the future!

#renewablecarbon

The invisible carbon footprint

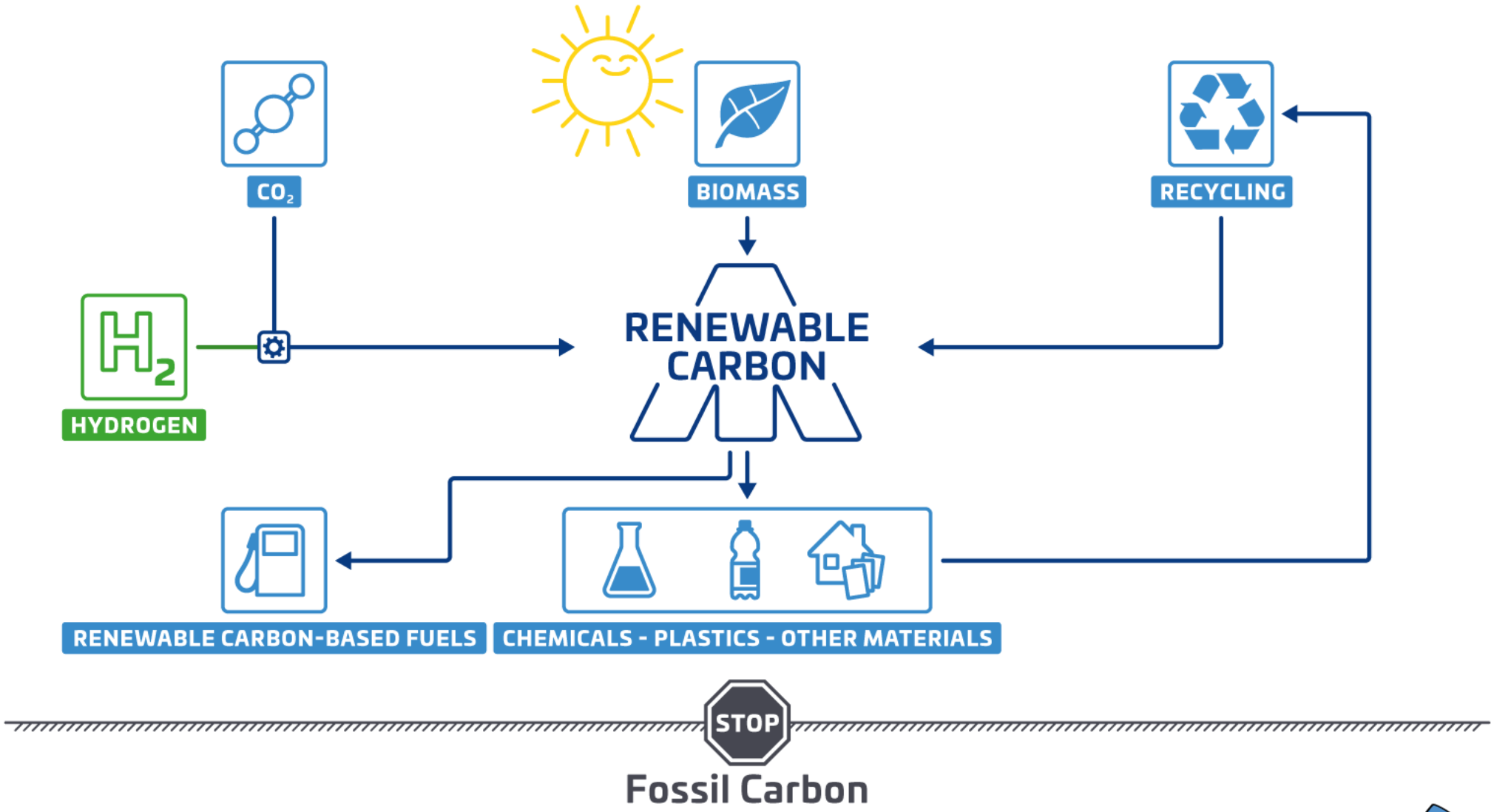


All figures available at **www.bio-based.eu/markets**

Ethylene, propylene, butadiene – Calculations by nova-Institute
Benzene, toluene, *p*-xylene – Source: BioBTX

RENEWABLE CARBON INITIATIVE

Renewable Carbon



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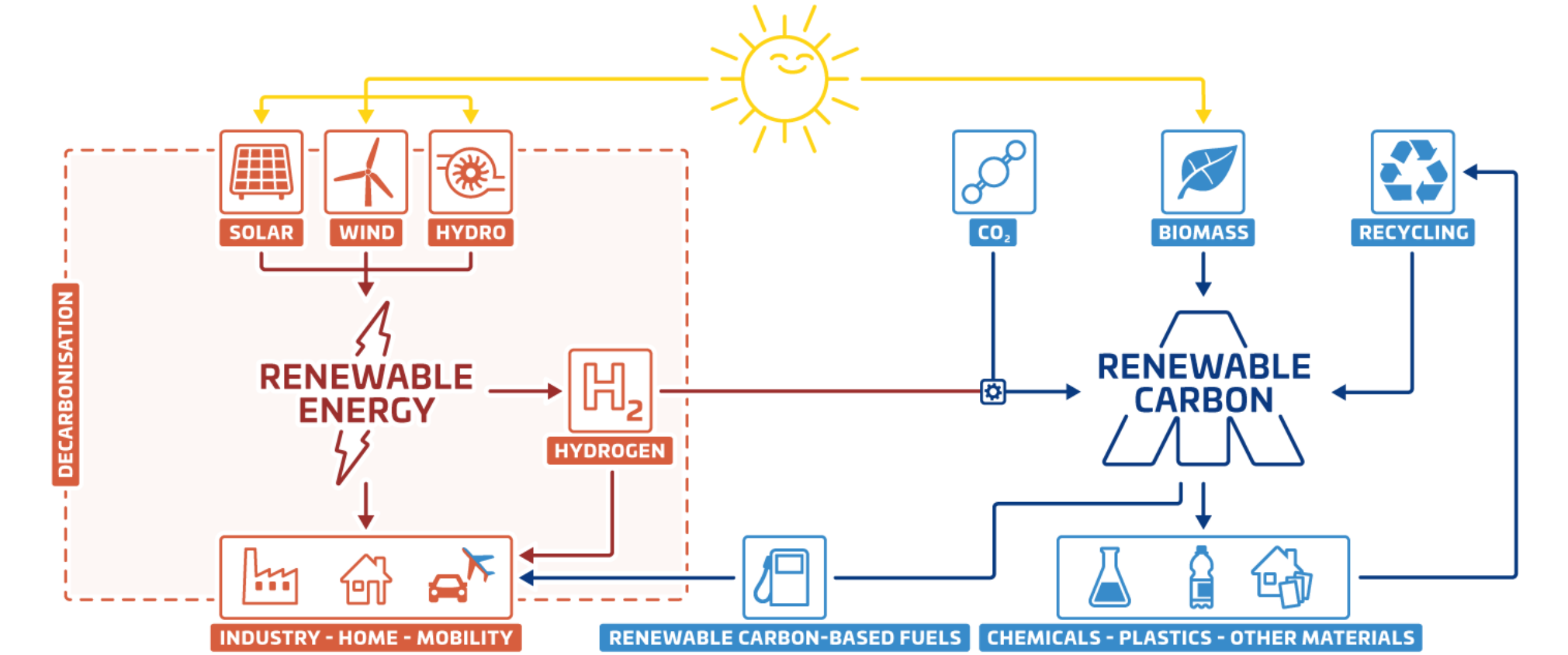
Renewable Energy and Renewable Carbon for a Sustainable Future



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Similar concepts and strategies

"In the **carbon reuse economy** fossil carbon is left in the ground while aboveground carbon circulates without accumulating to the atmosphere. … we believe that the carbon reuse economy can have a significant role in mitigating climate change and creating new business based on sustainable carbon." (**VTT 2019**)

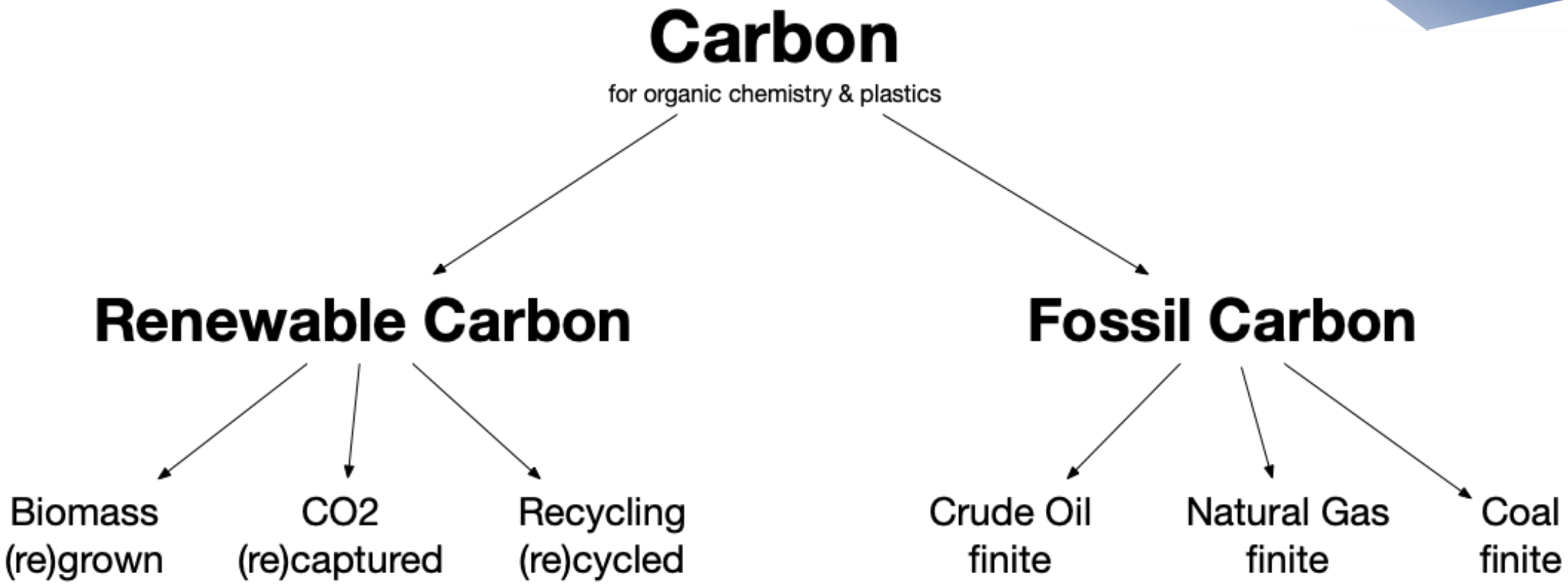
Already in 2016, the Finnish consulting firm **Pöyry** used the term **"recarbonisation"** in a similar way, but with limitation to biogenic carbon. (Pöyry 2016)

In the roadmap for the Dutch Chemical Industry towards 2050, the authors use the term **"Circular & Biobased"**, not including the carbon utilisation, which is mentioned as an additional area. (**VNCI 2018**)

Similar concepts and strategies

The **German Association of the Chemical Industry VCI** talks about "**carbon cycle management**" in its 2018 position paper (VCI 2018): „The potential in the reuse or mechanical **recycling** of waste is limited for carbon-containing products. But there are other options for carbon cycles, such as feed-stock recycling or energy recovery of waste. The latter can also help close the carbon cycle through the **material use of CO_2 and the bioeconomy**."

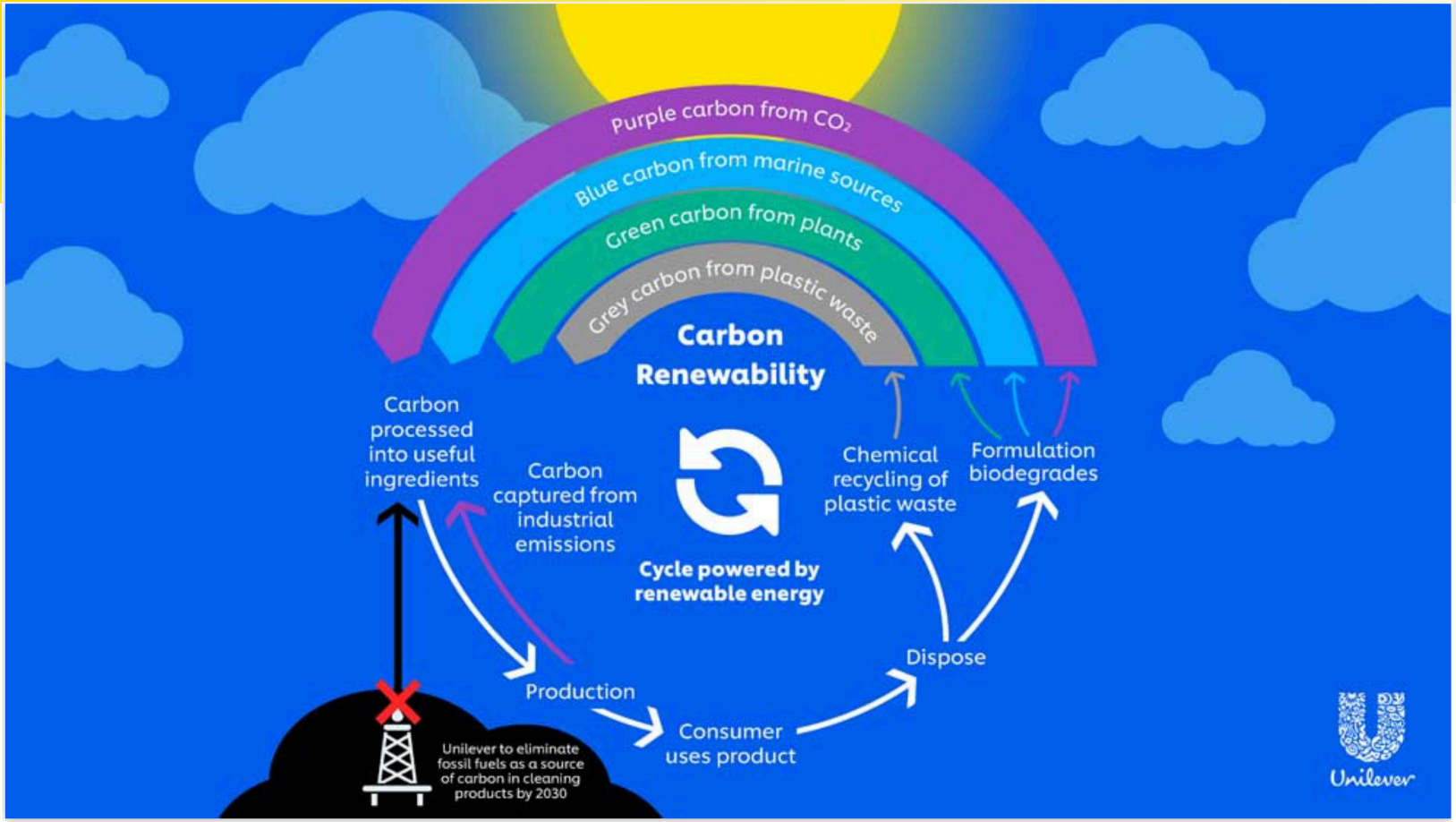
The **European Commission** includes the **three non-fossil carbon sources** in its Plastics Strategy (EC 2019): „Using more **recycled** plastics can reduce dependence on the extraction of fossil fuels […]. **Alternative feedstocks**, including bio-based feedstocks and gaseous effluents (e.g. carbon dioxide or methane) can also be developed to avoid using fossil resources."


Carbon
for organic chemistry & plastics
Renewable Carbon
Fossil Carbon
Biomass
(re)grown
CO2
(re)captured
Recycling
(re)cycled
Crude Oil
finite
Natural Gas
finite
Coal
finite

Is Renewable Carbon the right term?

- Definitions of **renewable**
  - *capable of being renewed (*Merriam-Webster)
  - *able to be renewed* (Collins)
  - *capable of being replaced by natural ecological cycles or sound management practices*" (Merriam-Webster)
  - *not depleted when used* (Oxford dictionary)
- **Renew:** *to restore or replenish* (Merriam-Webster)
- **Renewable substances** *can be used and easily replaced* (Cambridge Dictionary)

>> fits well to bio-based, CO_2-based and recycling!



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In practice, it is also not easy to make a clear distinction between the terms bio-based, CO_2-based and recycling.

And one simple, attractive and positively associated and integrated term is needed for successful marketing.

„3G **biorefineries** offer an opportunity to harvest and **recycle CO_2**“

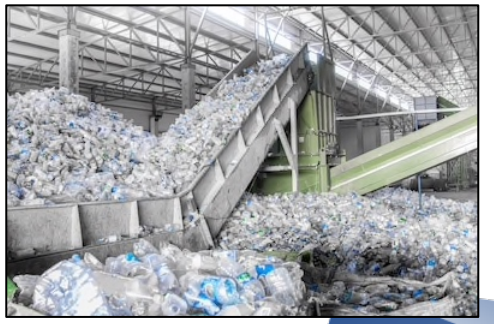
“**Renewable methanol** can be produced from a wide range of **renewable feedstocks** available worldwide. This section considers the availability of five main sources of feedstocks: **municipal solid waste (MSW), agricultural waste, forestry residues, carbon dioxide (CO_2) and renewable hydrogen**.” (Methanol Institute)

The Renewable Carbon Family
the three sources of renewable carbon

- Renewable carbon gained from all types of **biomass** (first and second generation, side stream, biowaste), from the *Biosphere*

- Renewable carbon from **direct CO_2 utilisation**, from the *Technosphere* and *Atmosphere*

- Renewable carbon from mechanical and chemical **recycling** of already existing plastics and other organic chemistry products, from the *Technosphere*



Summer survey 2020 by nova and COWI

First survey on the existing of renewable carbon in the chemical industry and sent a questionnaire to the 50 largest chemical companies producing in Europe. About 20% of the companies returned the completed questionnaire. **"What is the share of the different carbon sources in the total carbon use in your European production?"**

The results of the survey clustered chemical companies by their branch and share of renewable carbon into the following four groups:

- **Traditional petrochemical companies show renewable carbon shares of 1-5%**
- **Several wood-based chemical companies show renewable shares of 80-90%**
- **In between is a group of mainly chemical companies with a traditional focus on plant oils and animal fats showing 40-50% renewable carbon shares**
- **Notably, a small number of petrochemical companies, which had renewable carbon shares of <1% in the past, already developed to shares around 20%**

Currently, the largest share of renewable carbon is provided via **biomass** from agriculture and forestry, but **recycling** shares are increasing and the **utilisation of CO_2** begins in a serious way. Most of the chemical companies have already or are currently developing concepts and strategies to increase the share of renewable carbon.

nova-Institute and COWI estimate that the **current average renewable carbon share in the European chemical and plastic industry lies between 20 and 25% – 15% from biomass and 5-10% from recycling**.

Sustainability in the renewable carbon concept

A three-level approach to sustainable materials

First level: Is carbon needed in the application or can the application be decarbonised?

NO -> Decarbonisation

YES: Go to next level

Second level: What carbon should be used in the future?

NO: Fossil carbon STOP

YES: Renewable carbon, go to next level

Third level: What is the most sustainable carbon from the **renewable carbon family**?

Which renewable carbon source is the most sustainable, most efficient and socially acceptable solution for a certain application and process in a given region?
Biomass, CO2 or recycling? Biomass from wood, sugar beet or metropolitan biogenic waste? Captured CO2 from fossil power plants, from fermentation or from the atmosphere (direct air capture)? Or recycled carbon from old plastics via mechanical, chemical or enzymatic recycling?

Renewable Carbon from Biomass

Pros in a nutshell

- Food crops:
  - Commodities, established in high volume, good logistics
  - Food crops: Protein-rich by-products
- Wide range of non-food feedstocks – no direct food competition, positive image
  - wood and lignocellulosic by-products and side streams
  - biogenic waste from industry and households
- Low GHG footprint compared with fossil resources
- New green chemical pathways
- Biotechnology as sustainable process technology

Cons in a nutshell

- Limited total volume
- Low land-efficiency
- Potential pressure on land and biodiversity
- Potential competition with food crops and a possible threat to food security

Renewable Carbon from CO_2

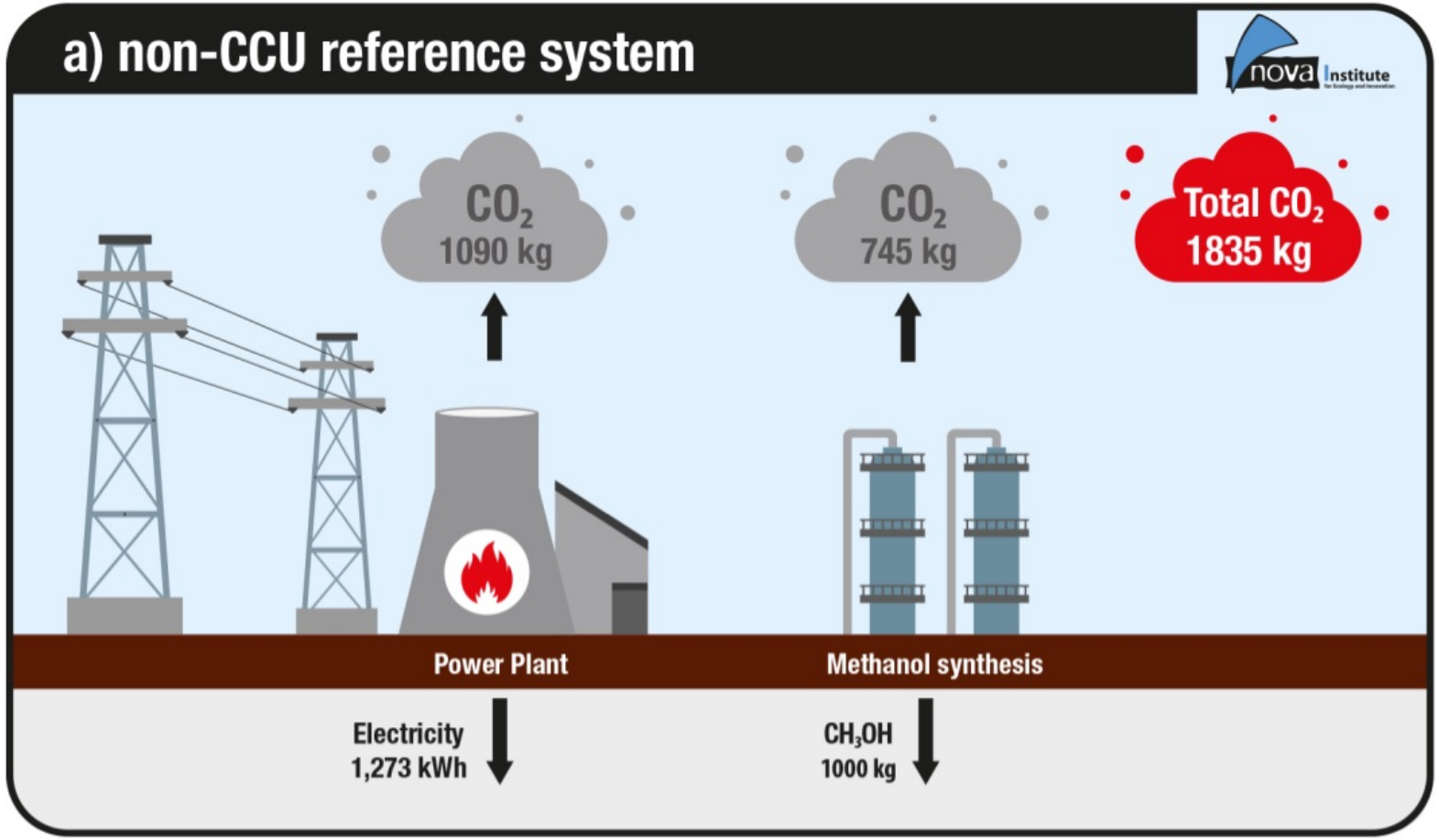
Pros in a nutshell

- Very high potential in volume (almost unlimited)
- Low demand for land and water, low carbon footprint
- High TRL technologies available
- Almost all chemicals and plastics can be produced from CO_2
- High employment potential
- Inexhaustible source of carbon for the next millennia
- Even “black” CO_2 carbon utilisation lead to relevant GHG reduction (see next slide)

Cons in a nutshell

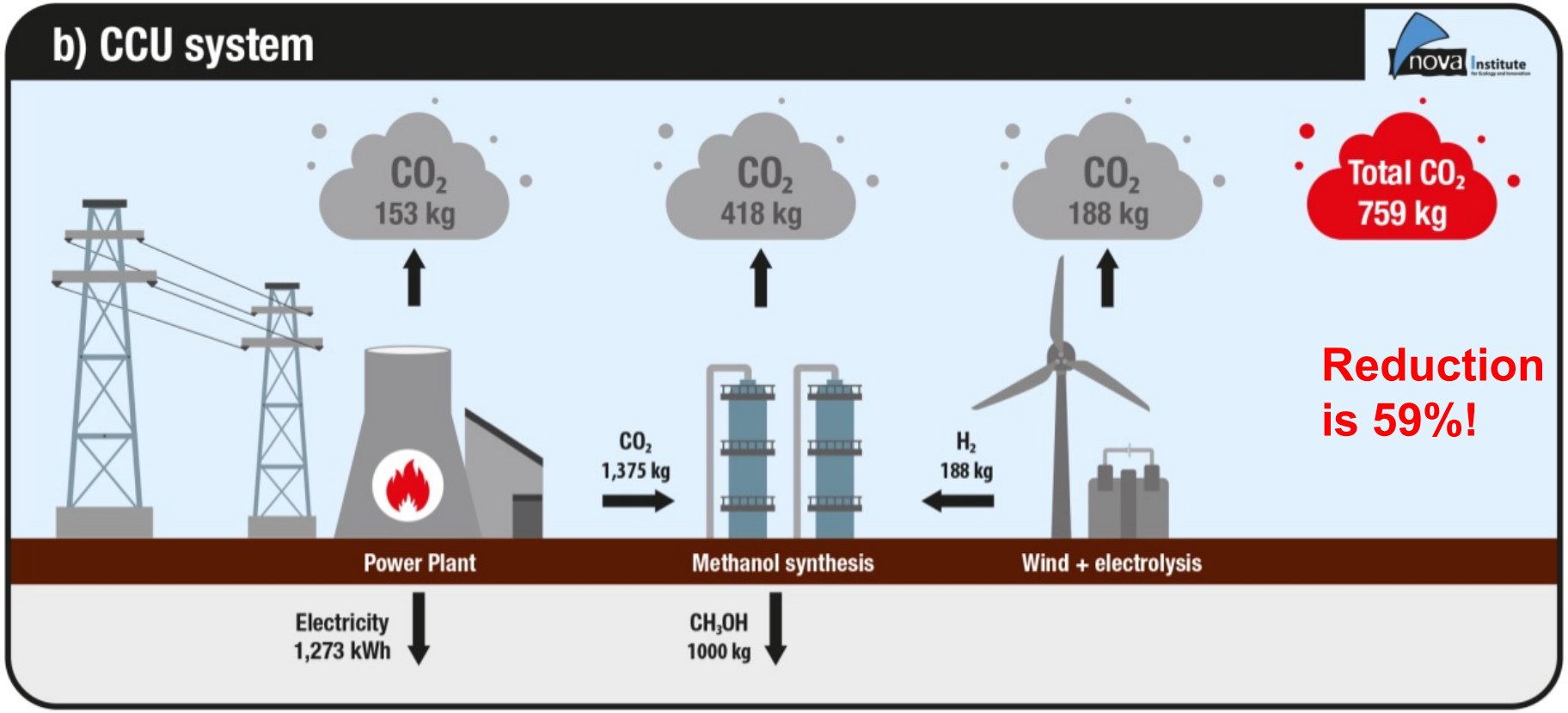
- Potential lock in effects using fossil point sources
- Competition on limited renewable electricity
- High investment necessary

Separate production of electricity and methanol (based on real data)



Source: Von der Assen, N., Voll, P., Peters, M. and Andre´ Bardow, A.: Life cycle assessment of CO2 capture and utilization: a tutorial review. Chem. Soc. Rev. 2014-01-20.

Joint production of electricity and methanol via CCU & wind energy (real data)



Source: Von der Assen, N., Voll, P., Peters, M. and Andre´ Bardow, A.: Life cycle assessment of CO2 capture and utilization: a tutorial review. Chem. Soc. Rev. 2014-01-20.

Renewable Carbon from Recycling

Pros in a nutshell

- Most important end-of-life option for plastics in the future circular economy
- Strong recycling targets in the European Union will guarantee access to renewable carbon from recycling
- Chemical recycling: Basically no loss of quality compared to virgin feedstock

Cons in a nutshell

- Mechanical recycling: Limitation in quality, not allowed in many food applications
- Energy intensive processes
- Chemical recycling: early stage, no solid assessment on economic and environmental impacts

Strategy in detail

- All three carbon sources are essential for a complete transition to renewable carbon, and
- all of them should be similarly used by the industry and supported by politics.
- **Don't fight a brother war!** There'd only be one winner: Fossil carbon.
- **Share to win!**
- To replace all the additional fossil carbon, we need the smartest mix of all three.
- We need a future materials policy – a policy on renewable carbon.
- **Which of the renewable carbon options come into play should be decided by technology and market forces and not by politics**. This depends on regional factors and concrete applications.

Renewable Carbon is the key

The **chemical and plastics industry** may only develop into a sustainable sector once it bids farewell to fossil raw materials such as crude oil, natural gas and coal for good and **uses nothing but renewable carbon as a raw material in organic chemistry**.

The equivalent to decarbonisation in the energy sector is a transition to renewable carbon in the chemical and plastics industries.

Non-energetic demand from the Chemical Industry

Our calculation shows that a range of 15 to 20 PWh would be required to cover the entire carbon demand of the chemical industry today by CO_2 utilisation with renewable energy, depending on the efficiency of electrolysis and further processes. **For the production of 20 PWh solar power, only 0.9% of the Sahara region is needed for PV**.

The PV yield in the Sahara is typically about 250 GWh/km²/y (Breyer 2019, LUT University). That means: To produce 20 PWh from PV an area of 80,000 km² is needed. Compared to the total area of the Sahara of 9,200,000 km² this is only 0.9% of the Sahara region.

The energy won from this area could cover the global non-energetic carbon demand of the chemical and plastics industry as it was in 2018 when applying it to carbon capture and utilisation (CCU) processes.

The total area of deserts is even 30,000,000 km².

Crude oil $200/barrel for Cost Parity

The "**ROAD MAP CHEMIE 2050 - Towards a Greenhouse Gas Neutral Chemical Industry in Germany**" published by DECHEMA and FutureCamp in 2019 develops three possible scenarios for the German chemical industry, the scenario "greenhouse gas neutral path 2050" shows:

“The new, electricity-based processes will increase the electricity demand of the German chemical industry to **685 TWh per year** from the mid-2030s, which is more than the total electricity production in Germany of 2018. ... Companies would have to invest around 68 billion euros more between 2020 and 2050, most of it from 2040 onwards. The conversion of the basic chemical processes examined in the roadmap alone entails additional investments of up to around 45 billion euros.”

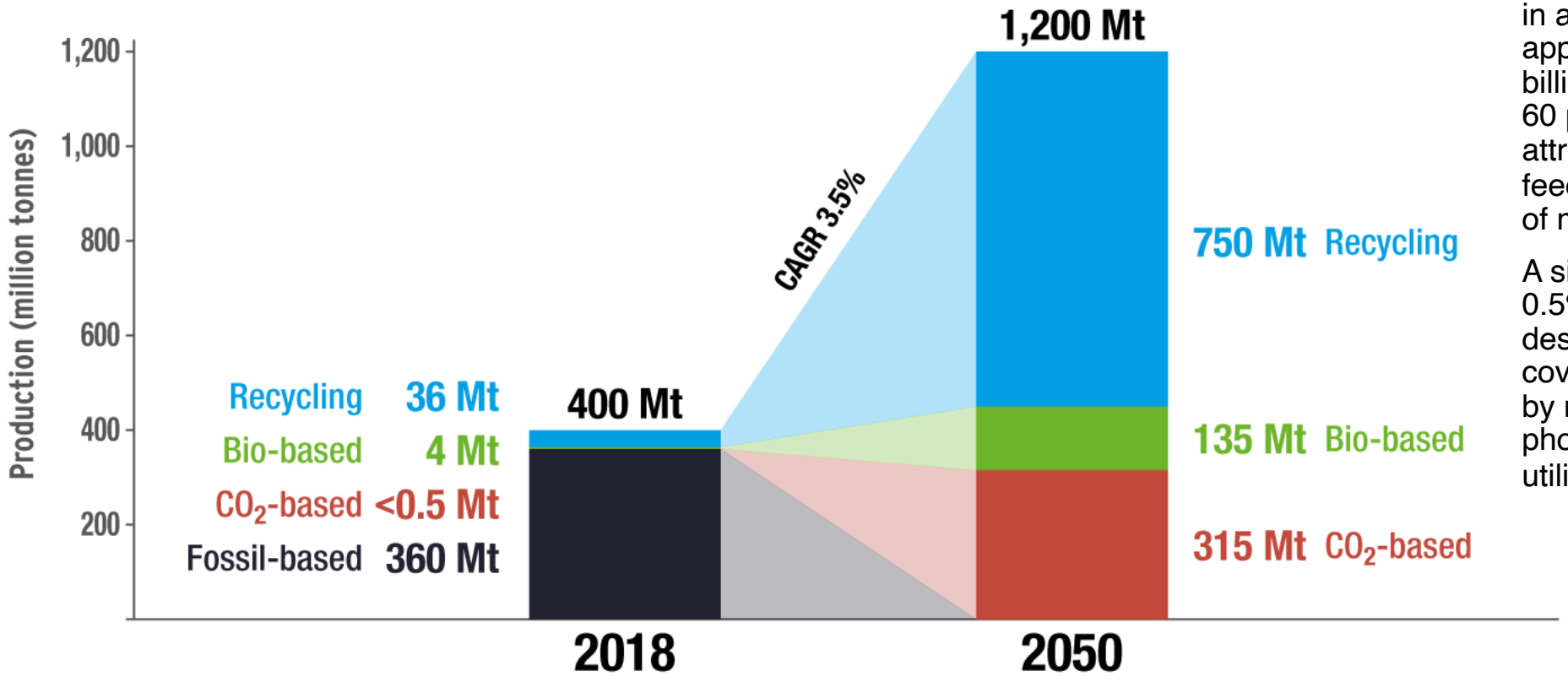
Based on the data of this study, we have calculated which oil price would be necessary, so that the complete switch to CO_2 would be cost neutral. The result is $200 per barrel, more than three times compared with today crude oil price.

Plastic production today (world)

We need all alternatives!

	Fossil-Based Plastics	Bio-Based Plastics	Recycled Plastics	CO_2-based Plastics
Production in 2019	360 – 380 Million tonnes	4 Million tonnes	20 – 40 Million tonnes	< 500,000 tonnes
CAGR 2020-2025	3 – 4%	3%	> 6%	?

World Plastic Production and Carbon Feedstock in 2018 and Scenario for 2050 (in Million Tonnes)



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.

The total of biomass required to do so would amount to roughly 1% of biomass currently used around the globe in all fields of application (13 – 14 billion tonnes, of which 60 per cent alone are attributable to animal feed for the production of milk and meat).

A size of less than 0.5% of the Sahara desert would suffice to cover this 70 per cent by means of photovoltaics and CO_2 utilisation.

All figures available at **www.bio-based.eu/graphics**

Ways to Use CO_2 for Polymers

Renewable energy

- Several educts
- Epoxides: Propylene oxide, Ethylene oxide, Limonene-based epoxide; Alcohol: Glycerol, others
- Olefins: Ethylene
- CO_2
- Water -> Hydrogen

Chemo-catalytic reaction → Different intermediates → Polyesters, Polyureas, Non-isocyanate polyurethanes (NIPU), others

Chemo-catalytic reaction → Cyclic/acyclic carbonates: Glycerol carbonate, others → Aliphatic polycarbonates or Polyalkylene carbonates (PAC): Polypropylene carbonate (PPC), Polyethylene carbonate (PEC); Cycloaliphatic polycarbonates: Polylimonene carbonate

Chemo-catalytic reaction → Bisphenol A → Aromatic polycarbonates

Chemo-catalytic reaction → Isocyanates → Polyurethanes (PUR), others

Chemo-catalytic reaction → Polyols → Polyurethanes (PUR), others

Chemo-catalytic reaction → Sodium acrylate → Polyacrylates

Syngas production → Fischer-Tropsch → Naphtha → Polyolefins: Polyethylene (PE), Polypropylene (PP), others

Methanol production → MTO → Olefins: Ethylene, Propylene → Polyolefins: Polyethylene (PE), Polypropylene (PP), others

Fermentation, Electrofermentation → Lactic acid, Succinic acid, Adipic acid → Polyhydroxyalkanoates (PHA); Polylactic acid (PLA), Polybutylene succinate (PBS(X))

Fermentation, Electrofermentation → Ethanol, Butanol, Isobutanol, others → Polyethylene terephthalate (PET), Polyethylene furanoate (PEF), Polyethylene (PE), others

Electro-chemistry → Monoethylene glycol (MEG), Ethylene, others → Polyethylene terephthalate (PET), Polyethylene furanoate (PEF), Polyethylene (PE), others

All figures available at **www.bio-based.eu/graphics**

Winners of the Innovation Award

"Best CO_2 Utilisation 2020"

8th Conference on CO_2 Carbon Dioxide as Feedstock for Fuels, Chemistry and Polymers

RENEWABLE CARBON
renewable-carbon.eu

Air Co. (US)
Air Vodka from CO_2 and renewable energy

Electrochaea GmbH (DE)
Electrochaea Power-to-Gas Technology with Biological Methanation – a grid-scale energy storage solution

Climeworks AG (CH/DE)
First commercial direct air capture (DAC) technology

Elected by the 100 participants of the online "8th Conference on Carbon Dioxide as Feedstock for Fuels, Chemistry and Polymers", 24 March 2020

Organiser | Co-organiser | Sponsored by

nova Institute for Ecology and Innovation
CO_2 VALUE EUROPE
covestro

www.co2-chemistry.eu

Political Measures to Support a Quick Transition to Renewable Carbon (see nova paper #12)

- **CO_2 emission tax (heavily discussed in public – e.g. carbon border adjustment EU)**
- **Taxation of fossil carbon** used in chemicals and plastics
  - A raw materials tax is much easier to handle than an emissions tax.
  - We are not allowed to use any more additional fossil carbon – and that is exactly what makes the tax effective and important.
  - The tax only has to be charged in a few points (extraction and import).
  - Automatically captures all sectors and applications that use fossil carbon – without exceptions
  - Recycling, biomass and CO_2 are automatically exempt from the tax.
- **Discontinuation of any funding** programmes in the **fossil** domain (estimate 20 billion US$ in the US alone
- **Higher costs for fossil CO_2 emissions** in the emissions trading system (ETS).
- Development of **certificates and labels** which indicate the **share of renewable carbon.**
- Establishing **quotas of renewable carbon** for “drop in” chemicals and plastics and a **quota for CO_2-based kerosene**.
- **Report about the percentage of renewable carbon** used in the production processes of the chemical and plastic industry (**Ranking**)

The Renewable Carbon Initiative

Renewable Carbon is the Key to a Sustainable and Future-Oriented Chemical and Plastic Industry

THE RENEWABLE CARBON INITIATIVE

lead by nova-Institute is launched in September 2020.

The aim of the initiative is to support and speed up the transition from fossil carbon to renewable carbon for all organic chemicals and materials.

The Renewable Carbon Initiative addresses the core problem of climate change, which is extracting and using additional fossil carbon from the ground that will eventually end up in the atmosphere. Companies are encouraged to focus on phasing out fossil resources and to use renewable carbon instead.

The initiative wants to drive this message, initiating further actions by bringing stakeholders together, providing information and shaping policy to strive for a climate-neutral circular economy.

PERSONAL SUPPORTERS

Personal supporters

- Personal Supporters are **experts** in bioeconomy, circular economy, CO_2 utilisation, chemical recycling or related sectors.
- They **understand the need for a fundamental change** in the chemical industry and endorse the Renewable Carbon Initiative.

Why become a personal supporter?

- become **visible** on the RCI website
- have the chance to **find like-minded** experts.
- **Stay informed** about the RCI's webinars, general activities
- **Get involved** in working groups, survey and provide feedback and opinions.

BOARD MEMBERS OF THE INITIATIVE

Beiersdorf
Cosun Beet COMPANY
covestro
Henkel
NESTE
nova
Lenzing Innovative by nature
LanzaTech
SHV ENERGY
stahl
Unilever
UPM BIOFORE BEYOND FOSSILS

More than 150 personal supporters from the industrial and research sectors back the initiative! Please join the initiative as member, partner or personal supporter.

Ongoing and future activities of the RCI

ONGOING

- Aimed at **setting up and advertising** the RCI
- Some ongoing activities:
  - This **webinar**
  - **Cartoon**
  - **FAQ**
  - **Member area**
  - **Press releases** (next one on Renewable Carbon and Green Deal)

FUTURE

- Aiming to **support and speed up the transition**
- Some loose ideas for future activities
  - Renewable Carbon **label**
  - **Advocacy** and **lobbying** work to create supportive regulatory and economic frameworks
  - Placing renewable carbon on the **European agenda** (e.g. the New Green Deal)
  - **Task forces** and **working groups** on specific topics
- Members can actively suggest ideas and discuss pros and cons of activities
- Board members decide on activities

Membership in the Renewable Carbon Initiative

WHO CAN JOIN?

- **Companies** of all sizes, **start-ups**, **research institutes** and **independent consultants** can become members of the RCI.
  - Membership fees depend on size and type of the applicant.
  - Annual Fees (moderate fees aiming to many members):
    - Large Enterprises: 10,000 €
    - SMEs, Cluster: 5,000 €
    - Start-Ups: 2,000 €
    - Research Institutes, Independent consultants: 1,000 €

- **Associations** interested in a partnership are welcome to contact Dominik Vogt (Dominik.vogt@nova-institut.de) for further information.

Membership in the Renewable Carbon Initiative

WHY JOIN?

- RCI members profit from a **unique network** of pioneers in the sustainable chemical industry.
  - actively **shape** the RCI
  - increased **visibility** of their individual renewable carbon solutions
  - **support** in finding specific solutions on the way to your renewable carbon goals.
  - a **common voice** to plant the topic in relevant areas
  - form a **community** with renewable carbon as common goal
  - can **apply** to become board member

Benefits of joining the Renewable Carbon Initiative

MEMBER ACTIVITIES

SHAPING THE INITIATIVE

Members actively shape the direction of the initiative and the renewable carbon landscape.
Members can apply to become part of the RCI advisory board.

VISIBILITY

Members are part of the RCI communication activities and therefore highly visible in the context of renewable carbon.
Get recognised as a pioneer in sustainable chemistry.

WORKING GROUPS

Members form working groups on specific topics. When research and development project consortia are formed, suitable candidates – if available – are first identified from among the association's members.

ACCESS

Members receive advance information about RCI activities and budget allocations.

NETWORKING

Members profit from the experience of other pioneers. RCI gets you in contact with leading scientists and experts and helps you to find the right partner for your project.
RCI members meet twice a year, once in person, once online.

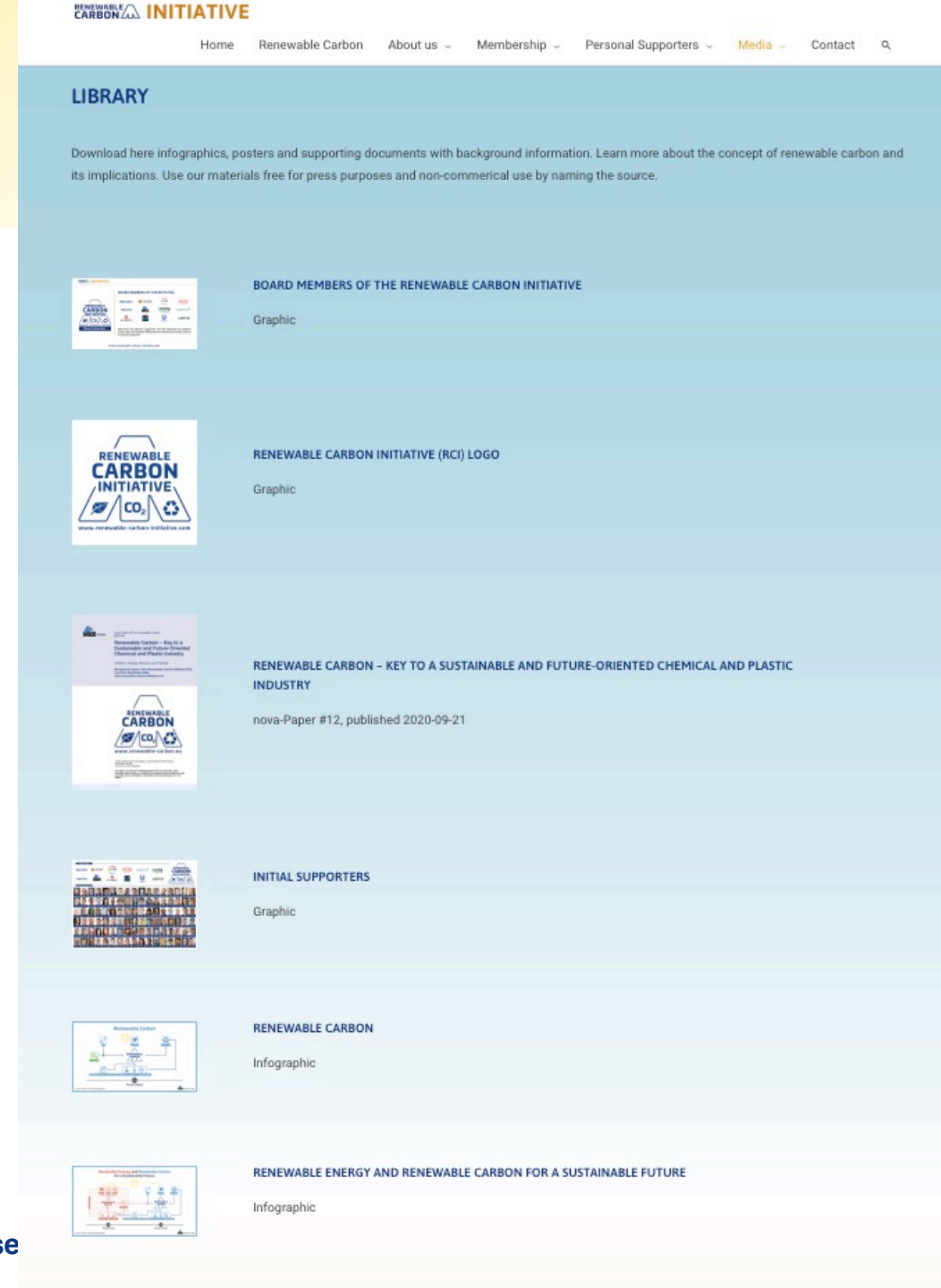
DISCOUNT ADVANTAGE

Members get discounts for selected partner events.

More information

Available at www.renewable-carbon-initiative.com

- Press releases
- Infographics
- Board member information
- Background paper on renewable carbon
- List of personal supporters
- Membership application



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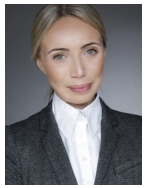
Member & Supporter



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Thank you for your participation!