



Circular Economy

We speed up the transition with our
Circular Economy program





What we want to achieve

We want to be a thought and action leader in the area of sustainability.

We want to increase the role of sustainability in our business decisions.

We want to show how we add value to society along the value chain.

Key measures

Decouple our CO₂ emissions from organic growth through a Carbon Management program.

Speed up the transition to a circular economy through a Circular Economy program.

Further increase our sales from Accelerator products, which make a substantial sustainability contribution in the value chain.



Photo: BASF Project RecChain Brazil

1 million

tons of batteries of electric vehicles will reach their end of life in 2030¹

only

18%

of global plastic waste is recycled²

8 million

tons of plastic waste ends up in the oceans per annum³

Stakeholders are already driving the transformation to a Circular Economy

Markets




Various players across **all markets** have set **ambitious Circular Economy targets**

Legislators



Incoming EU **levy effective** as of January 2021: **€800 per ton** for **non-recycled plastic packaging waste**

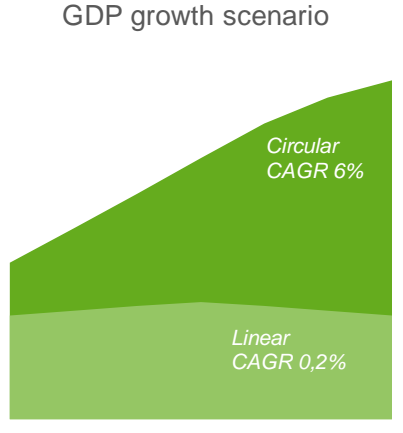
Investors



The BlackRock **Circular Economy Fund** has raised **€900 million** in its first year.



GDP growth scenario

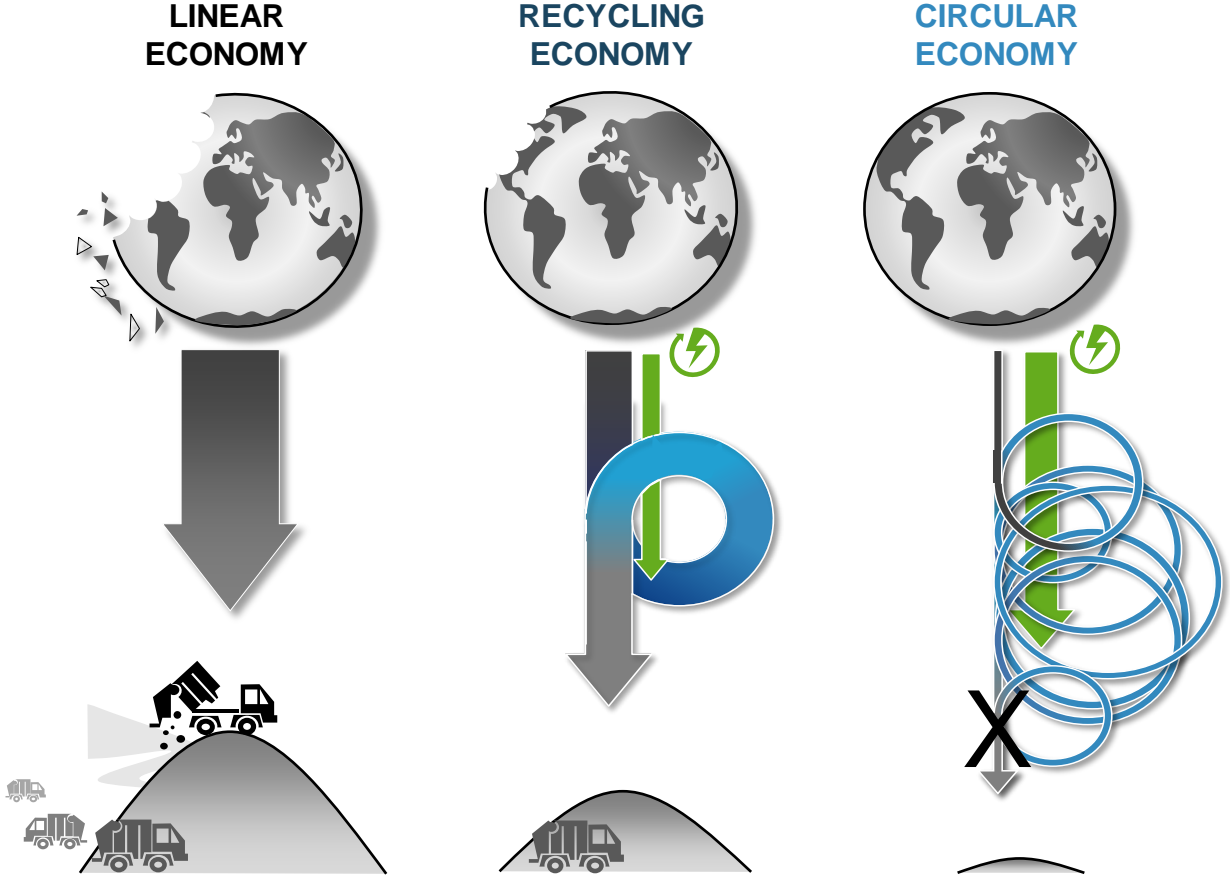


| Scenario | CAGR |
|----------|------|
| Linear | 0.2% |
| Circular | 6% |

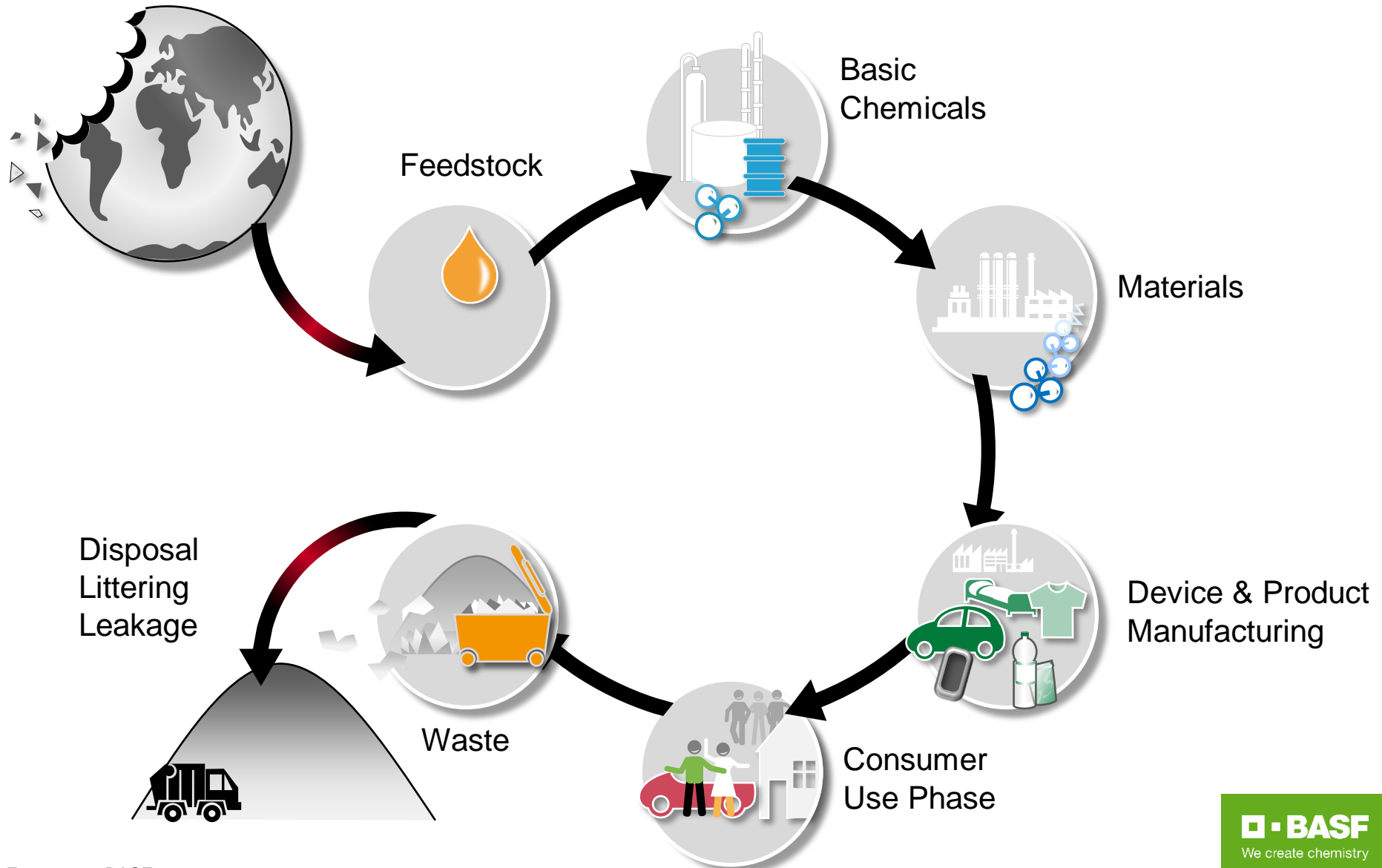
Circular Economy business models grow significantly stronger than linear ones.

A Circular Economy aims to decouple growth from resource consumption and is regenerative by design

- **Rethink design** and use of resources and **keep** them in **use as long as possible**
- **Recover and recycle** products and materials
- **Avoid waste and pollution** and **protect natural systems**



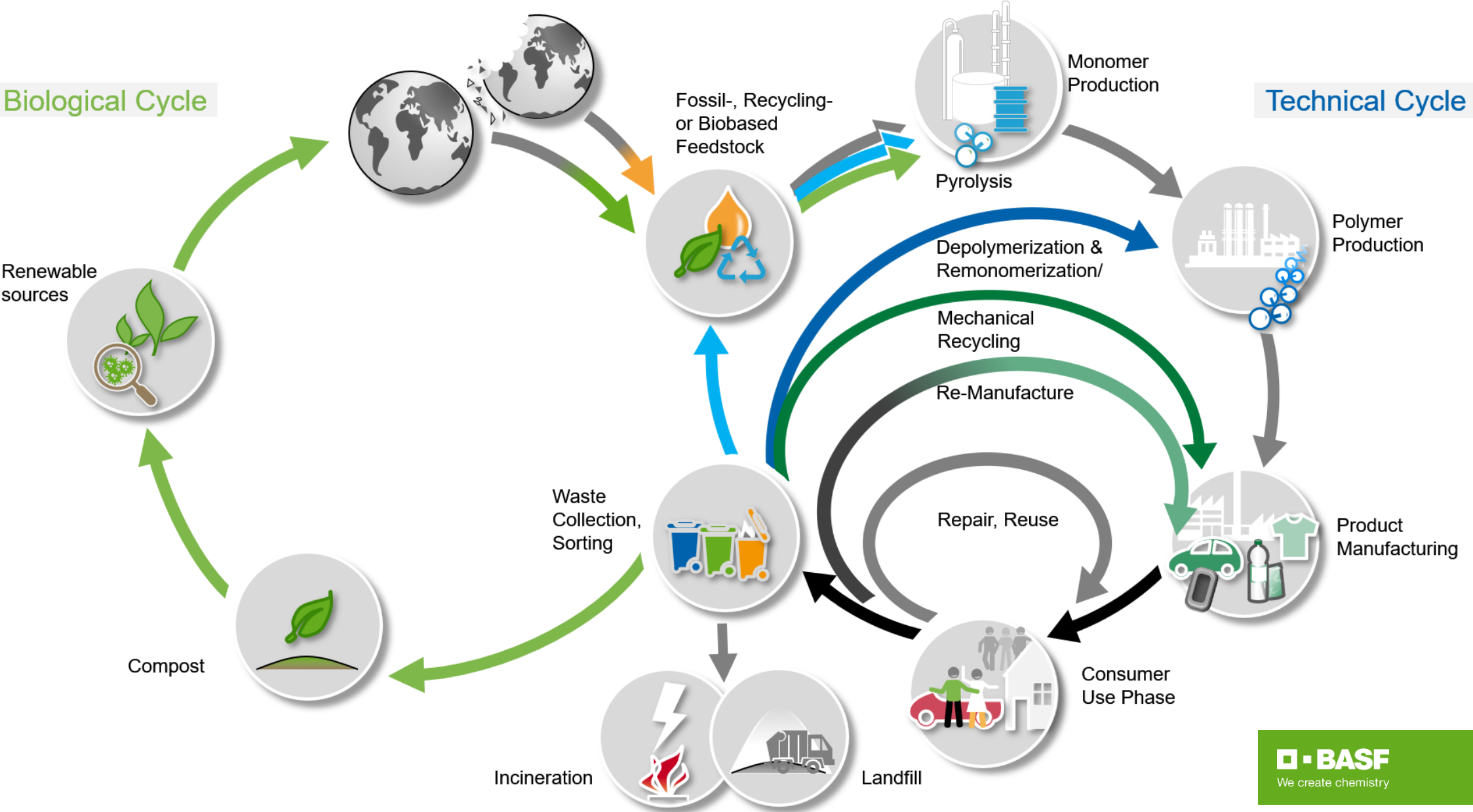
The linear economy: Take – make – dispose



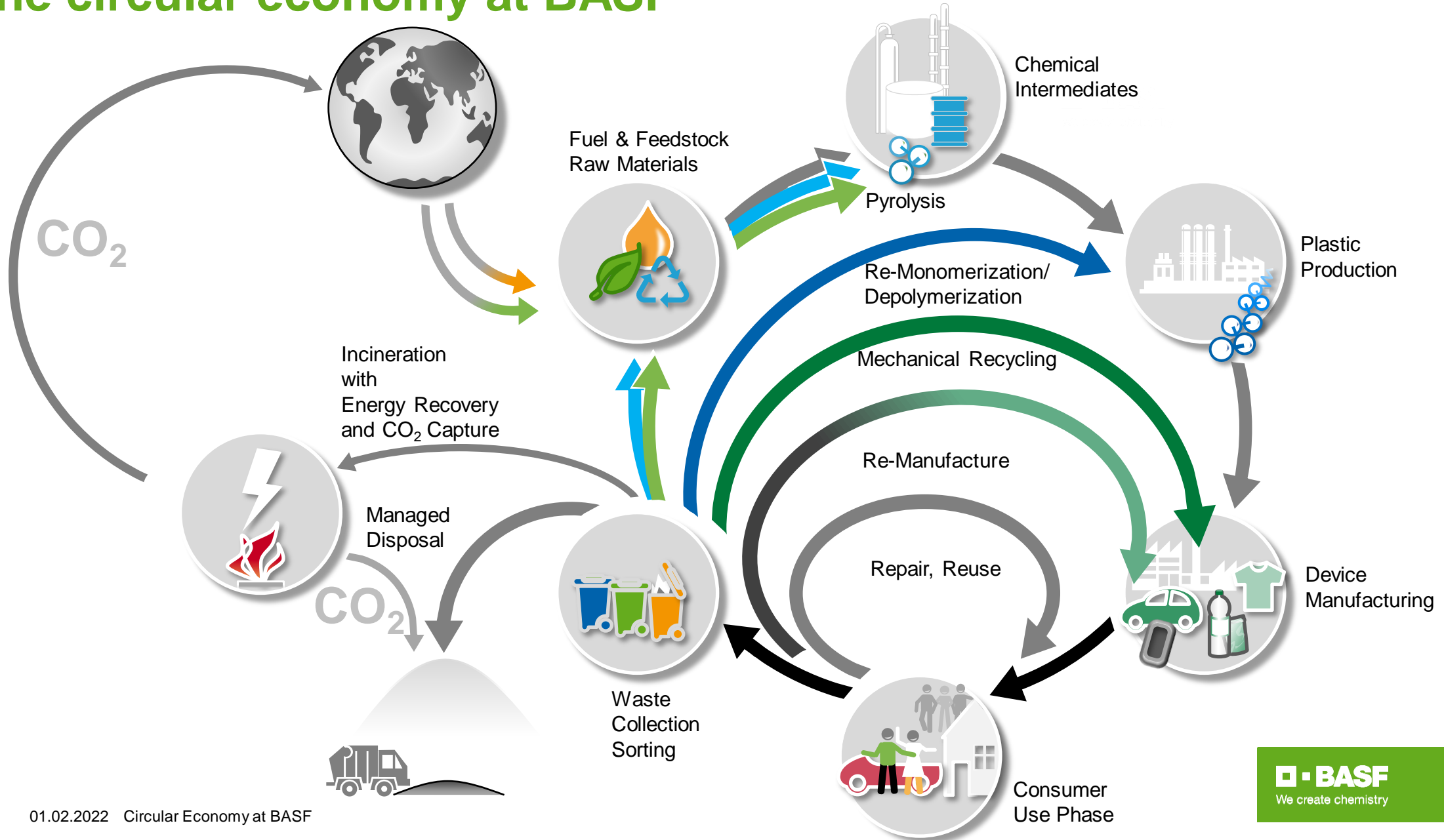
The circular economy at BASF: Reduce – reuse – recycle

Biological Cycle

Technical Cycle



The circular economy at BASF



On the way to a circular economy, we are tackling several challenges

Collaboration

Cross value chain collaboration for **new partnerships**



Mindset

Shift **mindset** from “take – make – dispose” to circular models



Technological

Development of **recycling techniques** and insuring **purity of materials** to be recycled



Certification / Regulations

Use of accepted claims, etc.



Waste as Raw Materials

Sourcing **waste with suitable quality, price** and **volume** and **overcoming regulatory challenges**



Infrastructure

Develop suitable **systems** for end-of-life waste streams



Circular economy networks

Circular Economy requires dialogue and partnership with stakeholders

We engage in networks

- to better **understand trends** in society as the drivers of our business
- to help **shape** measurement and performance **standards**
- to **partner for** joint **contributions** to Circular Economy

Examples



Circular Economy Program

How do we drive Circular Economy?



We aim at **doubling** our **circular sales to reach €17 billion** by 2030.



We commit to use **250,000 metric tons of recycled feedstock by 2025** globally.



We run a **Circular Economy Program** to accelerate the transition.

We aim to achieve our circular sales target based on two portfolio concepts



We aim at **doubling** our circular sales to reach **€17 billion** by 2030.

Close the loops

Products which enable the closing of the recycling loop and/or are based on recycled or renewable feedstocks



Renewable-based feedstocks



Recycled-based feedstocks



Enable recyclability and/or biodegradability

Extend the loops

Products that perform best with less, and thus help to decouple growth from material consumption

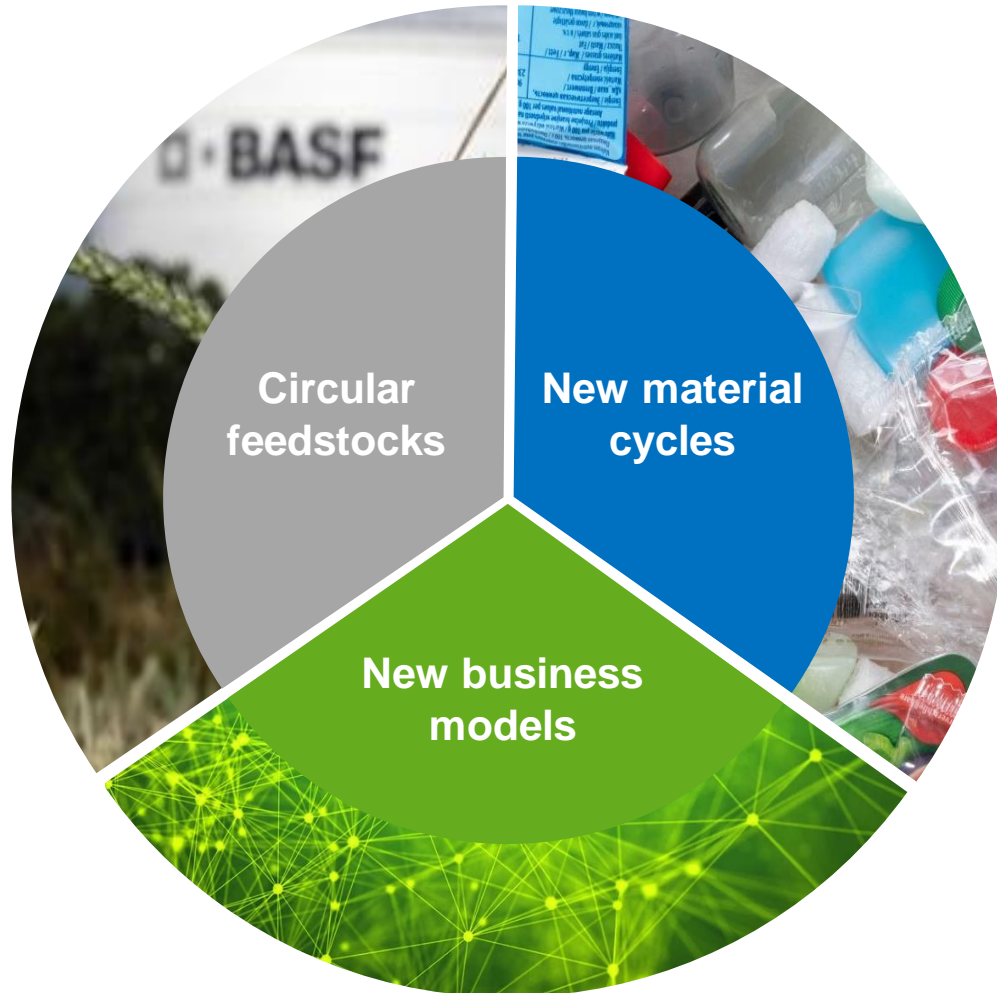


Save resources and reduce waste along the value chain



Higher durability to enable product sharing and reduce maintenance

We act in three areas: circular feedstocks, new material cycles and new business models



Circular feedstocks

We will increase the volume of renewable and recycled feedstocks from sustainable sources, also via the certified mass balance approach.

New material cycles

We design materials for circularity, develop solutions which improve or enable recycling and establish product-specific recycling loops.

New business models

We enter new markets, create smart digital solutions and offer new services which allow a decoupling of growth from resource consumption.

Circular Feedstocks: ChemCycling™ Biomass Balance

By using alternative raw materials, we can manufacture the same products in a more sustainable way

Renewable feedstock

Biomass Balance portfolio



Derived from biomass waste of agricultural production, crop or food processing, or residues

Dedicated bio-based portfolio



Sustainably sourced resources, e.g. RSPO certified

Recycled feedstock

e.g. ChemCycling™



Derived from post-consumer plastic waste or tires

ChemCycling™ is a complementary approach to existing recycling methods

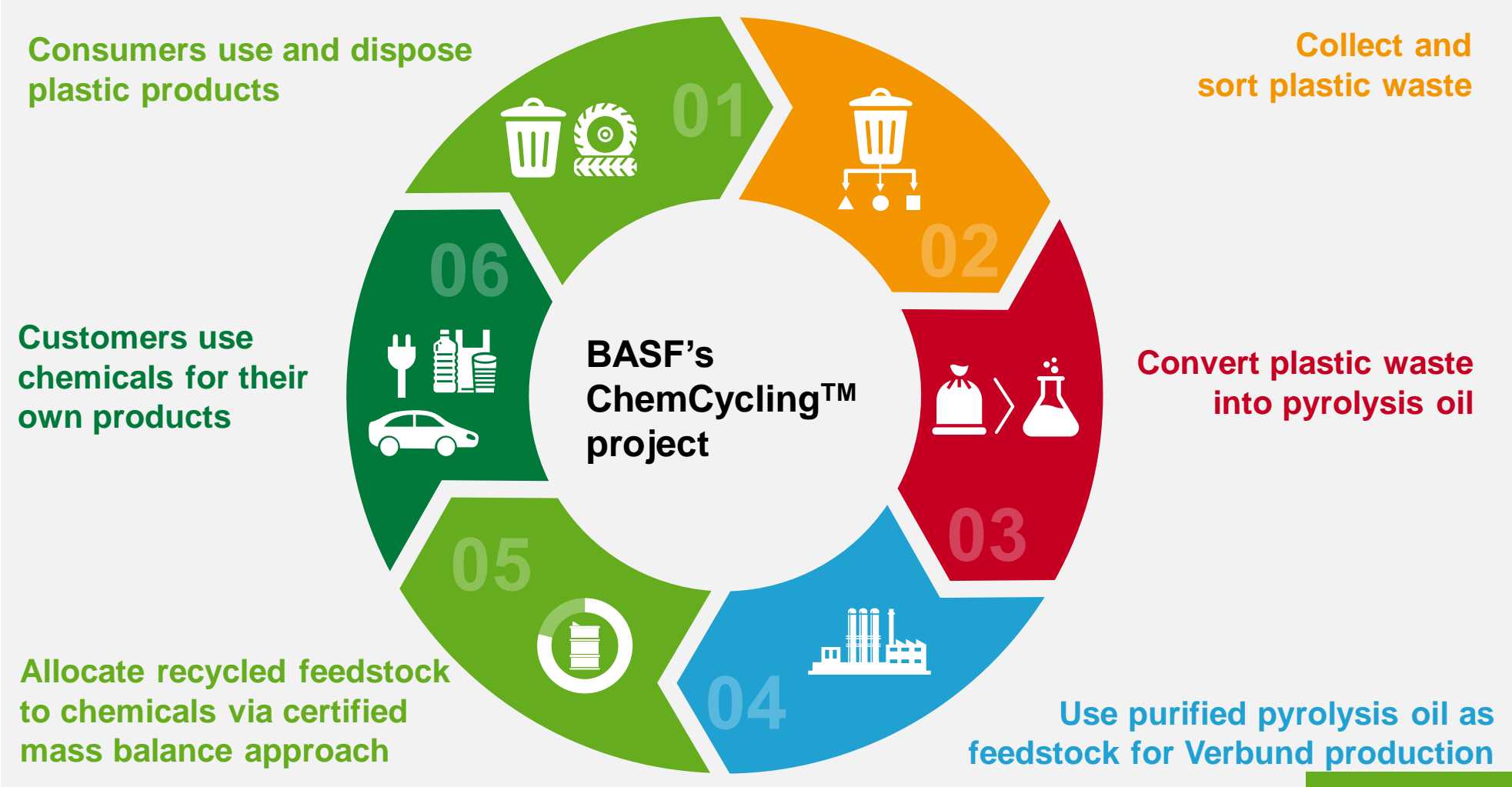
- We contribute to the recycling of **plastic waste for which no high value recycling processes are established** yet
- Examples of waste plastics which are difficult to recycle mechanically or which are incinerated include:
 - ▶ Plastics with adhering food residues
 - ▶ Multi-layer food packaging
 - ▶ Tires

With ChemCycling™ overall recycling rates of plastic waste will be increased



BASF's ChemCycling™ project

Breaking new ground in plastics waste recycling



ChemCycling™ is attractive in terms of CO₂ emissions

- Result of an external, critically-reviewed **life-cycle assessment (LCA)** for ChemCycling™ :
 - ▶ **ChemCycling™** emits **50 percent less CO₂** in comparison to incineration of mixed plastic waste
 - ▶ Manufacturing new plastics out of **mechanical or chemical recycled feedstock** show **comparable CO₂ -emissions.**



BASF's Biomass Balance Approach

- Requires **no reformulation** – identical product performance
- **Available** easy and fast for nearly all our products
- **Saves fossil resources** and **reduces greenhouse gas** emissions
- Drives the use of sustainable **renewable feedstock**



The Biomass Balance Approach: Replacing fossil resources in the current Production Verbund

Feedstock

Fossil



Renewable

Use of renewable feed-stock in very first steps of chemical production (e.g., steam cracker)

BASF Production Verbund



Utilization of existing Production Verbund for all production steps

Products

Conventional product



Biomass Balance product

Allocation of renewable feedstock to selected products

Renewable raw materials for BMB need to be sourced sustainably

Use certified renewable raw materials

- Waste/residues are preferred, e.g. from paper and wood industry, biogas
- Independent sustainability certification from recognized schemes, e.g., REDcert and ISCC

Apply standardized sustainability criteria

- Minimum sustainability criteria as in EURED*
- Greenhouse gas emissions savings
- Responsible biomass production
- Protection of areas with high biodiversity and large carbon stocks



Extend the loops

Extend the loops

Oxsilan®

- lower process costs, higher productivity, **reducing materials consumption** and pre-treatment times
- same degree of **corrosion** protection with ten times **thinner layers**
- Eco-friendly and multi-metal pretreatment
- Lower risk for safety, health and environment



Extend the loops

Tinuvin® NOR® 356

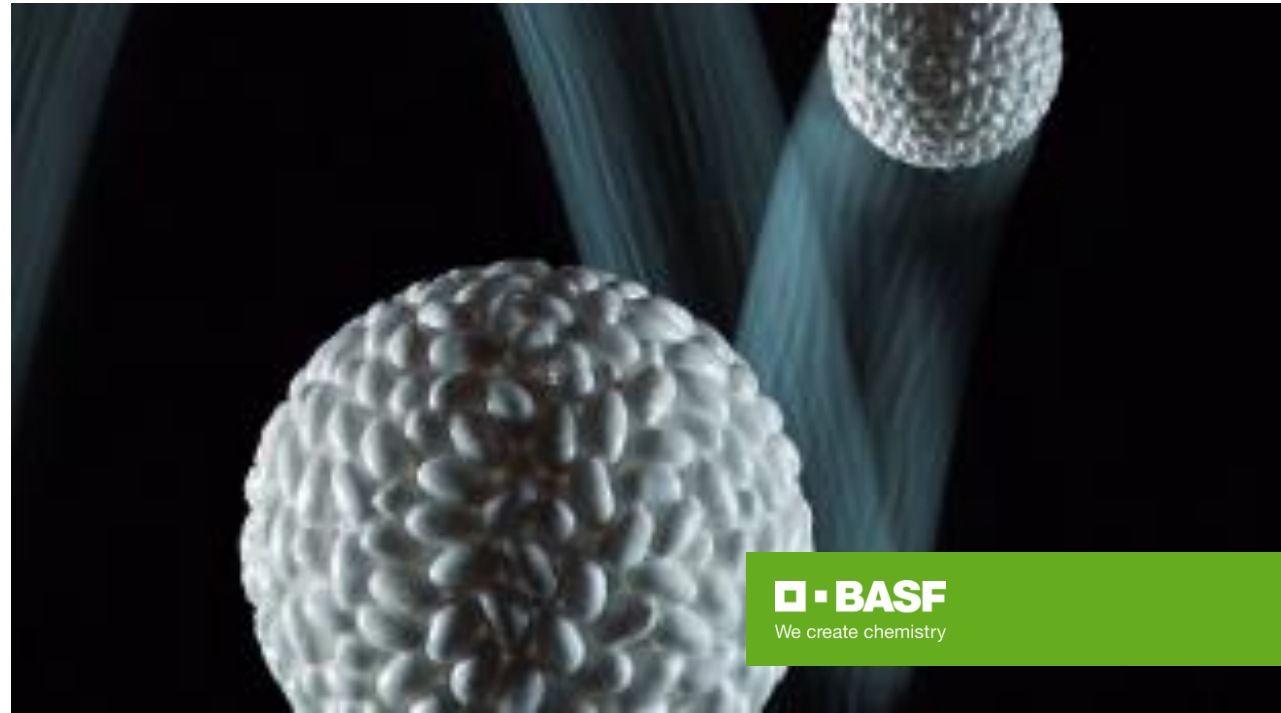
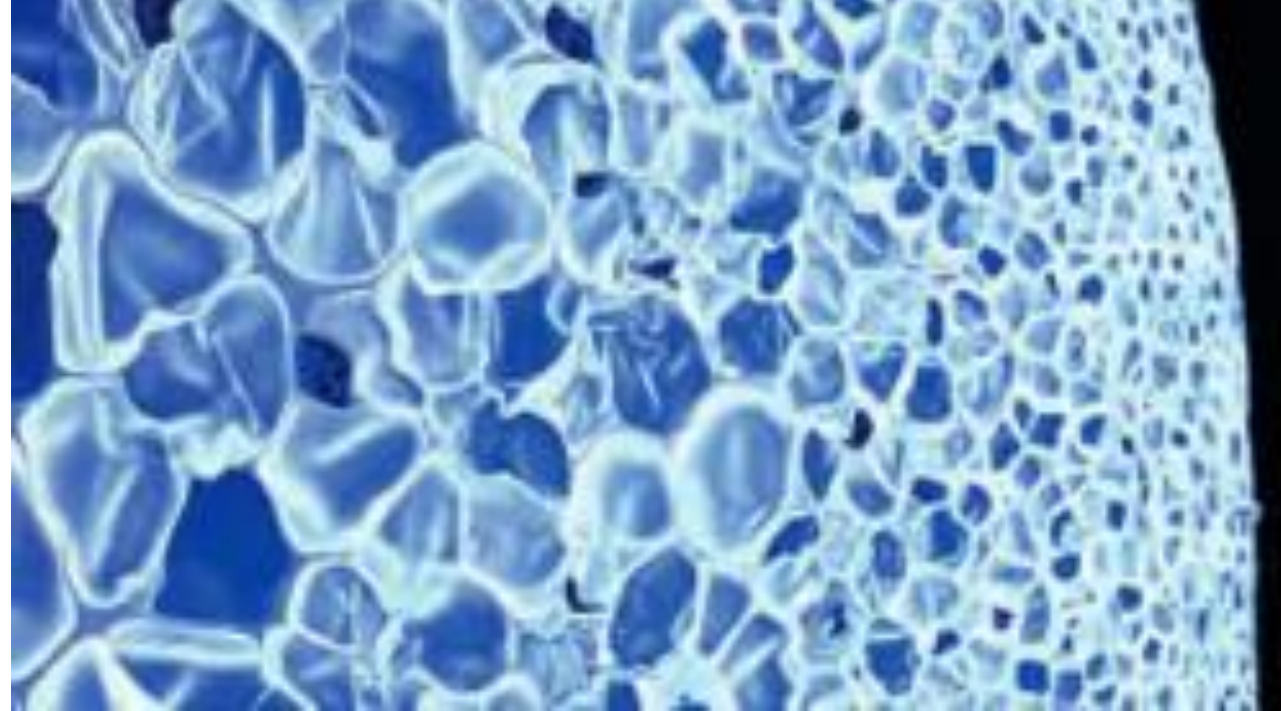
- Exceptional **light stabilization extends the lifetime** of agricultural films up to 60%
- Enhanced film protection and light transmission increases productivity, improves crop quality and **reduces plastic waste**
- Protects films against very high levels of UV radiation, heat, and agrochemicals (including sulfur)
- Designed to be compatible with organic farming and integrated pest management



Extend the Loops

Infinergy®

- **Longer lifetime of shoes** and better **durability** compared to Ethylene-vinyl acetate (EVA)
- **Saves resources**
- Simplified design and production process
- Option for a recycling concept of shoes (one-material-shoe)



Close the loops

New Material Cycles

Certified compostable plastics

Biodegradable and bio-based polymers

- **ecovio**[®] and **ecoflex**[®] brands
- Certified compostable polymers
- **ecovio**[®] is used for organic waste bags, fruit and vegetable bags, carrier bags with dual-use, packaging applications and agricultural films
- Improves the collection and recovery of food waste, helps avoid microplastics in soil
- **ecoflex**[®] is fossil-based and suited for the production of flexible film products in the packaging industry



Close the loops

Battery Recycling

- Using metals from recycled batteries to make new battery materials **offer significant CO₂ reduction** in the production of electric vehicles
- Fortum, BASF and Nornickel have signed a letter of intent to plan **a battery recycling cluster in Harjavalta, Finland**
- With this, BASF will be able to offer **a highly efficient “closed loop” in Europe**, covering all steps in the **recycling value chain**
- Recycling is also essential to **meet the growing demand of critical metals** in the electric vehicle sector



Putting the mattress waste problem to bed

- Every year in Europe, **30 million used mattresses are thrown away**
- BASF aims to **recover high quality polyols** from old mattresses
- How? With a **chemical recycling process** that breaks down the flexible polyurethane foams and enables a closed loop



Petra®

Recycling-based PET

- Petra® grades are based on **100% post-consumer** PET bottles
- Performance advantages through high-temperature performance, chemical resistance, good electrical properties and ease of processing
- Applications:
 - ▶ Appliance electrical connectors
 - ▶ Power tool motor components / housings
 - ▶ Appliance handles



New Business Models

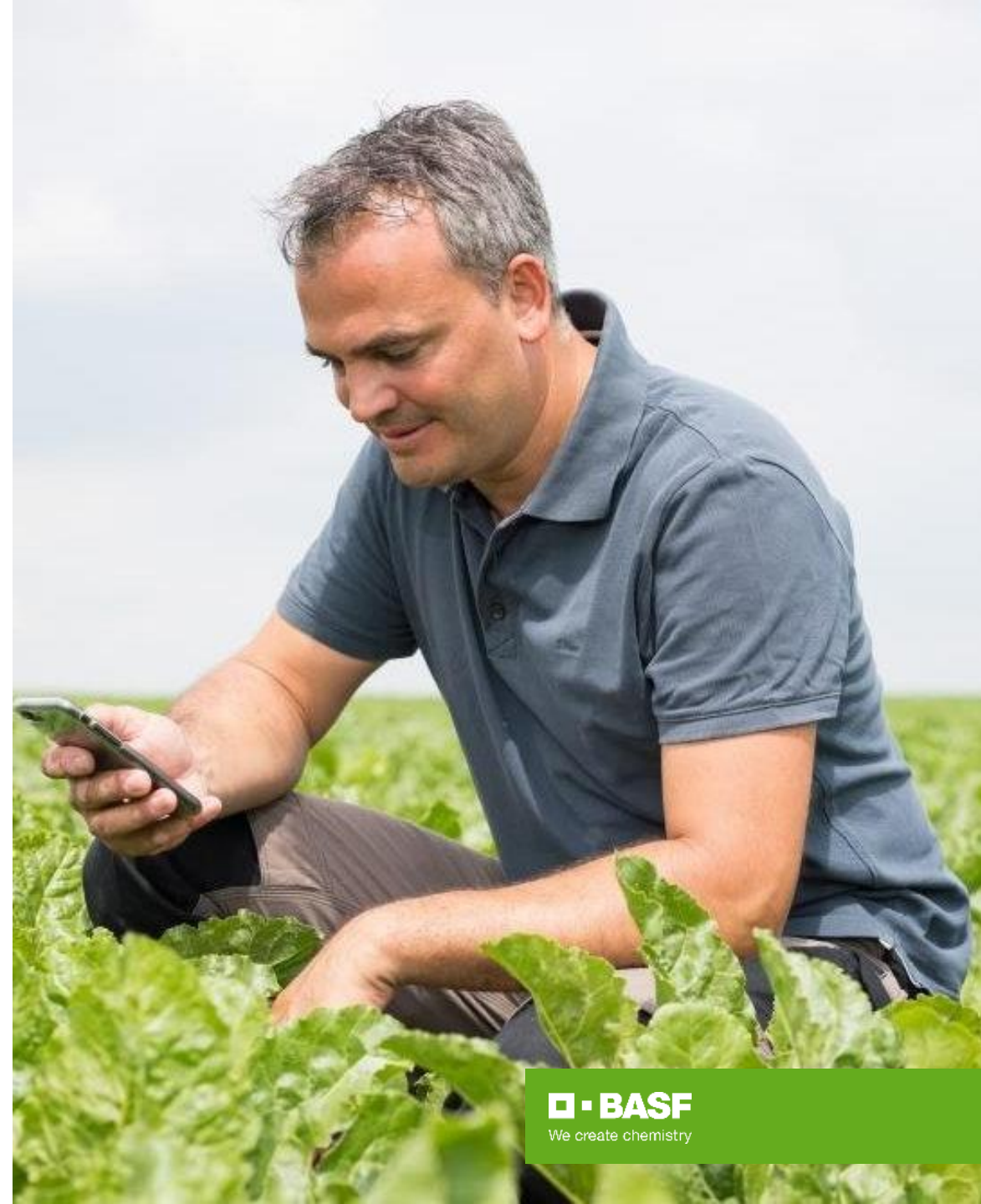
Infrared Spectroscopy

- trinamiX GmbH was founded in 2015 as a wholly owned subsidiary of BASF SE
- trinamiX has developed a mobile Near-Infrared (NIR) Spectroscopy Solution to **identify plastics for easier sorting**
- trinamiX technology can
 - ▶ precisely determine diverse compositions of different plastics
 - ▶ distinguish via the simple use of a portable handheld device that combines trinamiX data analysis with a mobile app
- **Recycling and recyclability are improved**, paying off for both the environment and businesses alike



xarvio™ – the Future of Farming

- xarvio™ – Digital Farming Solutions offers digital products that deliver independent field-zonespecific agronomic advice enabling farmers to **produce their crops most efficiently**
- Using xarvio™ means to have a **better oversight, less risk and more reliability** for planning and managing fields and field zones
 - ▶ Use of a mobile app
- The scouting, field manager and healthy fields products are already being used by farmers in more than 100 countries worldwide





We create chemistry