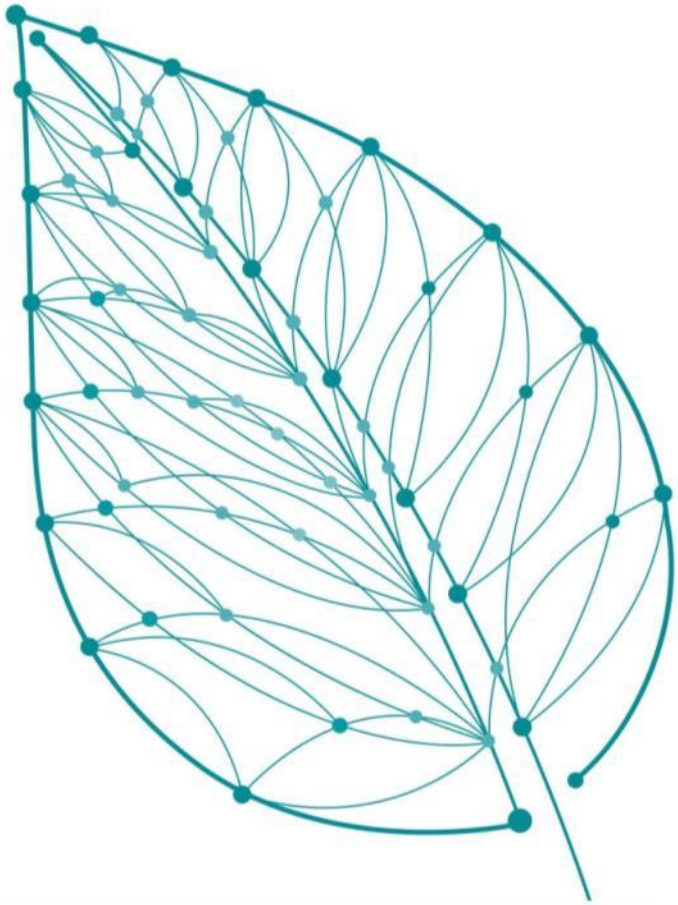
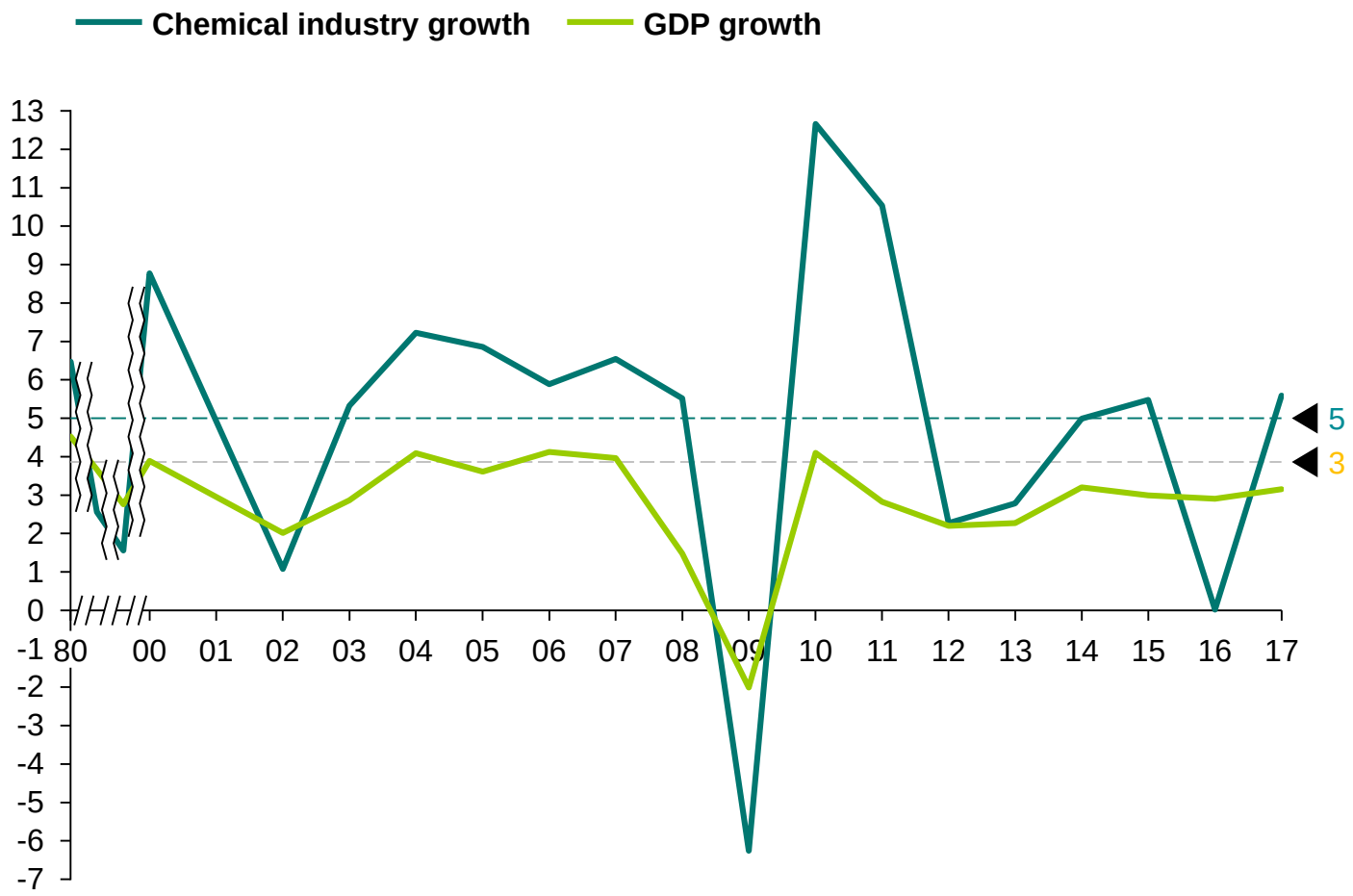


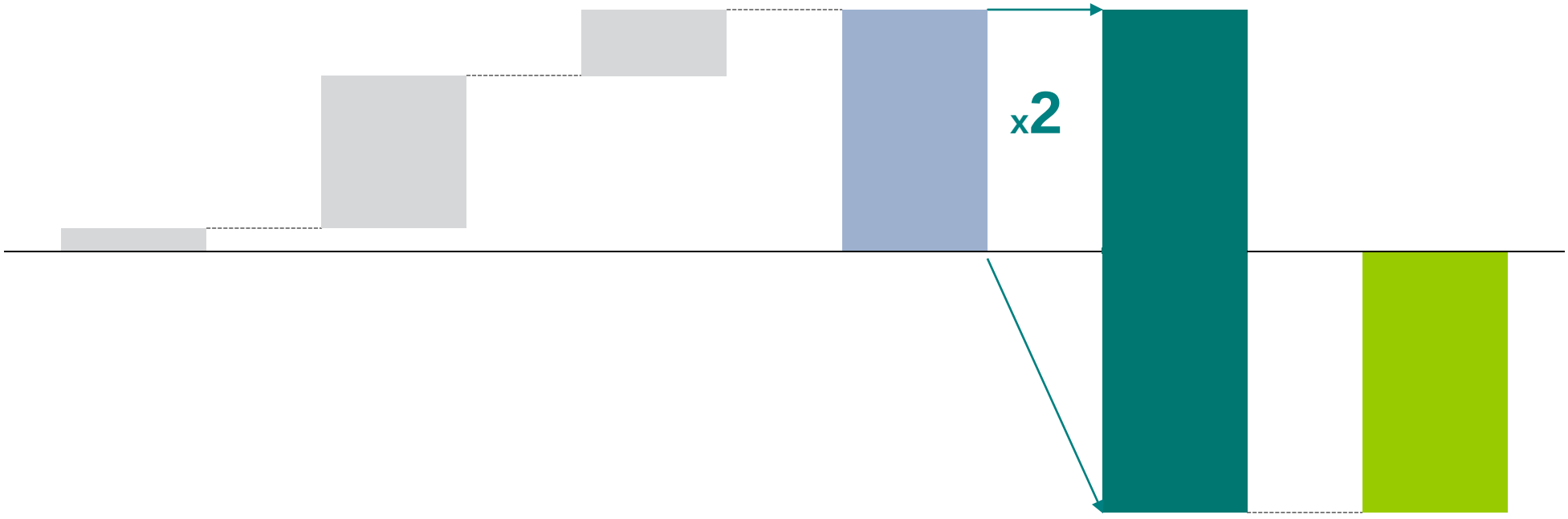
Petrochemical industry trends: sustainability and circular economy

Presentation for Partners

Dynamics of global chemical industry and global GDP growth (1980-2017), %



Positive effect from the use of petrochemicals significantly outweighs a negative effect from their production



Petrochemical products have a two-way impact on the environment: production certainly results in the release of greenhouse gases, however the use of petrochemicals in different industries **contributes to reducing such emissions by more than 2 times** compared to the produced asset, which generally **has a positive effect not only on the environment but also on the economy**.

Source: Innovations for Greenhouse Gas Reductions by ICCA & McKinsey, 2009

Production of polymers and other petrochemicals is more environmentally friendly than production of comparable materials including metal and paper

ECO-FRIENDLINESS OF PRODUCTS AND RECYCLABILITY OPPORTUNITY

Energy consumption for production of 1 item 355 ml	0.9 W*h	0.63 W*h	0.58 W*h
Recycling potential	100%	Up to 80%	100%
Decomposition time	500 years	>1,000 years	300 years
Air emissions CO_2 equivalent	1.2 kg	2.2 kg	0.5 kg

Source: Table D-1, Franklin Associates, Green Lifestyle Magazine, The Container Recycling Institute, Columbia University Fu Foundation School of Engineering and Applied Science

However, recently, regulators impose limitations and bans on some plastics

Products	Regulations
• **Plastic bags** **127 countries** adopted various forms of plastic bags regulation	(x) number of countries (83) ban on free-of-charge distribution (61) bans on manufacturing and imports (51) recycling targets (43) elements of extended producer responsibility (41) requirements to the content of material: biodegradable, compostable and/or recycled (38) regulating the thickness of plastic bags (27) production taxes/fees
• **Single-use plastics** Such regulation may concern certain products (dishware, packaging, etc.), materials (PS) or volume/format of production	(63) elements of extended producer responsibility (51) circulation/ recycling regulation (such as requirements to separate collection, etc.) (29) various forms of taxes (26) recycling targets (23) deposit return schemes of sales (primarily bottles) (16) specific polymers bans (primarily PS and EPS)
• **Plastic microgranules** A number of large companies voluntarily refuse using microplastics.	(8) ban on using (Canada, France, South Korea, Sweden, the UK, the US, etc.) (7) control over use and/or production (including cleaning agents) (4) Belgium, Brazil, India, Ireland, EU intend to introduce a ban

Source: UNEP

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Regulators are driving change

EU Plastic Strategy 2030:

- 55% of recycled material in plastic packaging
- More than 50% of plastic waste are to be recycled
- Plastic packaging is 100% recyclable and/or suitable for reuse
- Growth of capacities for waste separation and recycling for 4 time (compared to 2015)
- Biodegradable plastic ban

Secondary plastic content in EU by 2025

Bottles, PET

PET in packaging

Bottle caps

Pallets, PETF

Shrink wrap, PE

Asian legislation:

- > 60% of states enacted bans and restrictions in regards of single-use plastic
- Ban on plastic waste import in China
- India is to ban 100% single-use plastic by 2022
- Indonesia to reduce plastic waste by 70% by 2025

Germany:

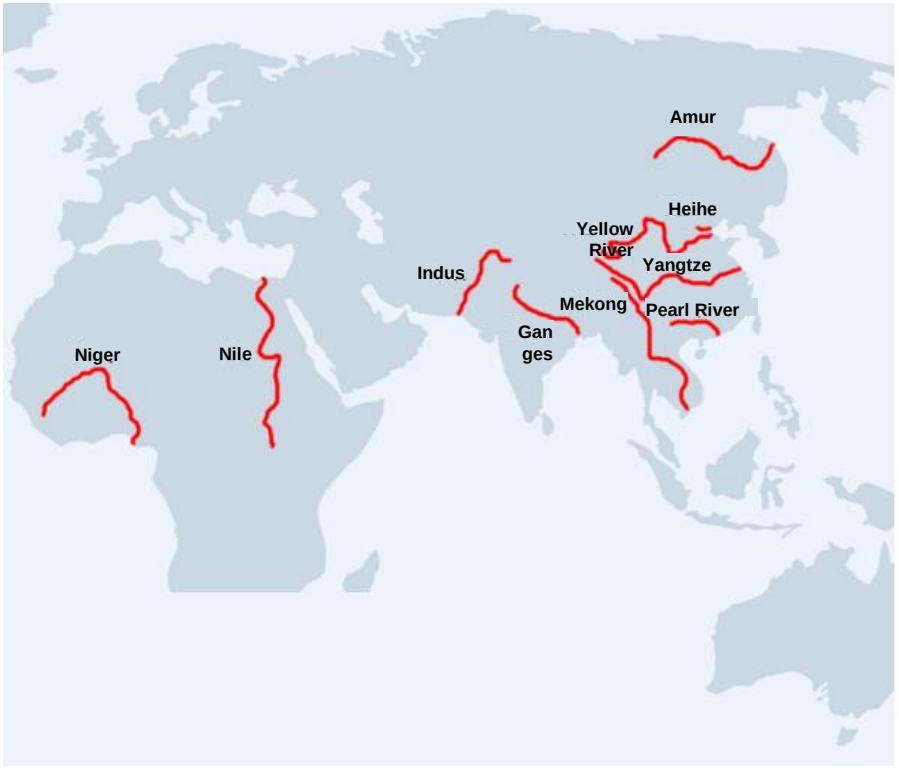
Consumers pay obligatory utilization fee (22ct) for each single-use plastic bag; distributors and vendors are responsible for waste collection and recycling

Kenia:

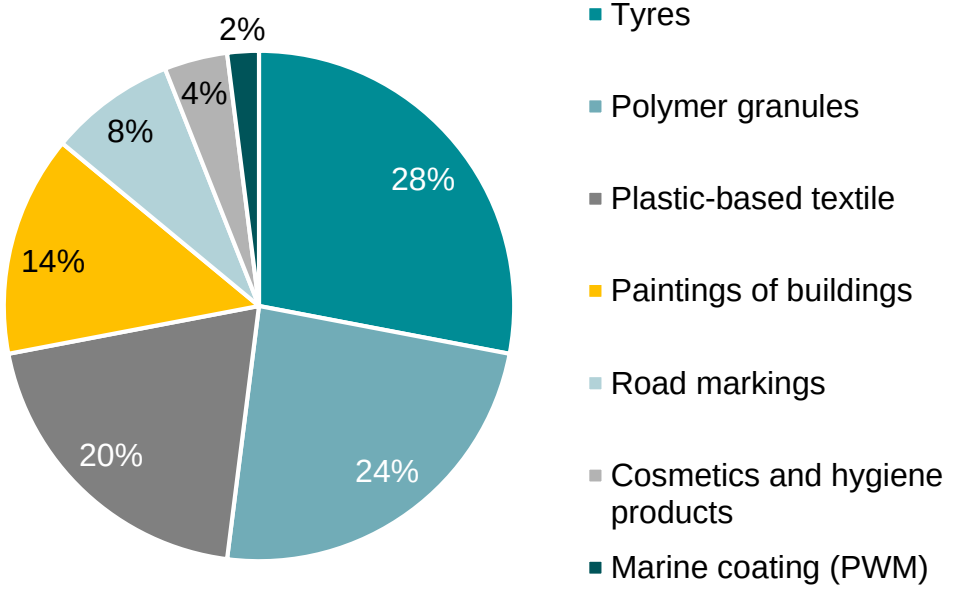
Penalty at a rate of $19-38k or 4 years of imprisonment for import, use or production of polybag

Primary driver of such regulation is concern about the increasing amount of plastic waste in the World Ocean

95% of plastic waste gets into the World Ocean from 10 rivers



Sources of microplastics in the World Ocean



Source: C. Schmidt, "Export of Plastic Debris by Rivers into the Sea", 2017

Global FMCG companies make voluntary commitments that are more stringent than the regulator has established

Global goals of manufacturers of consumer goods

Nestlé	PEPSICO	P&G
100% recyclable or reusable packaging by 2025	100% recyclable or biodegradable packaging by 2025	100% reusable or recyclable packaging by 2030
Coca-Cola	DANONE	Unilever
100% recyclable packaging, bottles are 50% made of recyclables, 100% bottles collected and recycled by 2030	100% recyclable, reusable or biodegradable packaging by 2025 Evian bottles of 100% recyclables	100% recyclable, reusable or biodegradable packaging by 2025 over 25% content of recyclables
Henkel	amcor	TESCO
100% recyclable or biodegradable packaging by 2025	100% reusable or recyclable packaging by 2030	100% recyclable packaging by 2019

Sustainability trend is strengthening

Ensuring sustainability is a global task (UN Sustainable Development Goals)

Capital markets tend towards “green” industries rather than “polluting” ones

Investors take non-financial (i.e. environmental) risks into consideration

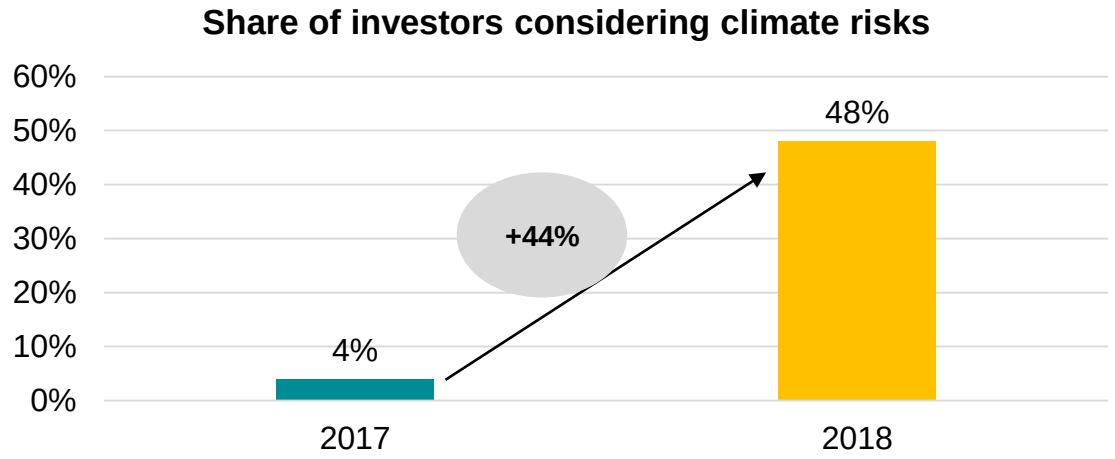
Consumers pay attention to ecological properties of goods and packaging

Regulators toughen up environmental laws

Shift from linear to circular model of consumption in B2C

Increasing demand to recycling and recycled materials use in B2B

The share of investors considering climate risks & sustainability is steadily growing



According to **PwC 2018 Private Equity Funds Survey**,

76% of investors consider waste management practices

77% of investors notice the significance of carbon footprint

According to **Barclays Survey**, **68%** of investors prefer to invest in companies producing eco packaging

Source: EY 2018; PWC Private Equity Responsible Investment Survey 2019; «Tackling the challenge of plastic pollution. What can investors do?» Barclays, 2018

Companies that integrate sustainability in corporate strategy have higher business valuation and higher profits

Oil & Gas	Pharmaceuticals	FMCG	Banking & Finance
Health & Safety	Expand access to drugs	Responsible procurement	Expand access to financial services

According to Boston Consulting Group research

Business valuation growth			
+19	+12	+11	+3
Profits grow			
+3.4 p.p. EBITDA	+8.2 p.p. EBITDA	+4.8	+0.5

Source: MSCI ESG Research LLC, OEKOM research AG, BCG

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Circular economy as a key paradigm of sustainability becomes a key to companies' success in the future

Resource efficiency and decrease of pollution

Transition to circular economy

According to the results of business leaders survey, BCG and WBCSD, 2018:

97% of respondents said that the circular economy drives innovation to help make the company more efficient and competitive

84% of respondents expect to increase their investments in circular economy projects in the future

96% of respondents believe that the circular economy is important for their company's future success

51% of respondents state that circular economy activities already add to company profits

Source: The New Big Cycle, by WBCSD and BCG, 2018

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Thanks to their unique properties, plastics are logically built into the circular economy

- **Plastics conserve resources**

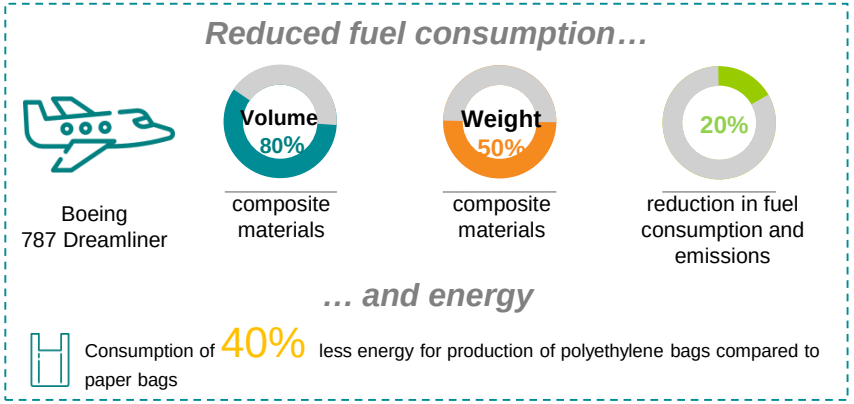
  Lower weight of polymer package helps to save fuel during operation and energy during production.

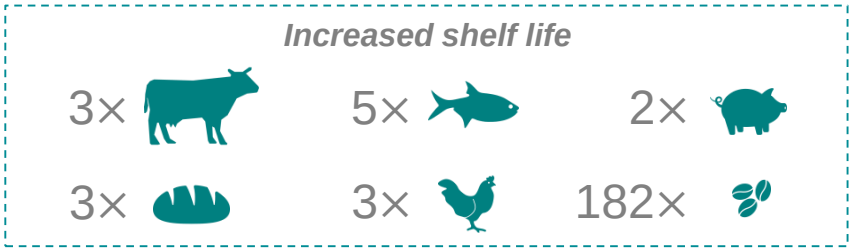
- **Plastics decrease the amount of rubbish**

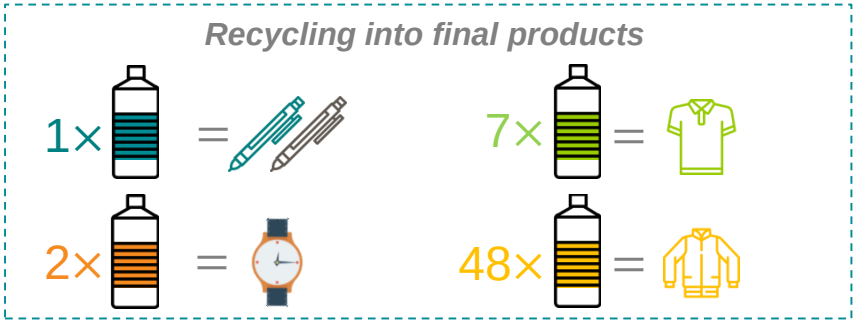
  Polymer packaging protects products from the effects of many external factors allowing consumers to receive fresh products and significantly extending a shelf life of such products by 2-4 times, thus ensuring a positive economic effect for producers and consumers.

- **Recycling of polymers into useful products**

  Plastics can be 100% recycled.

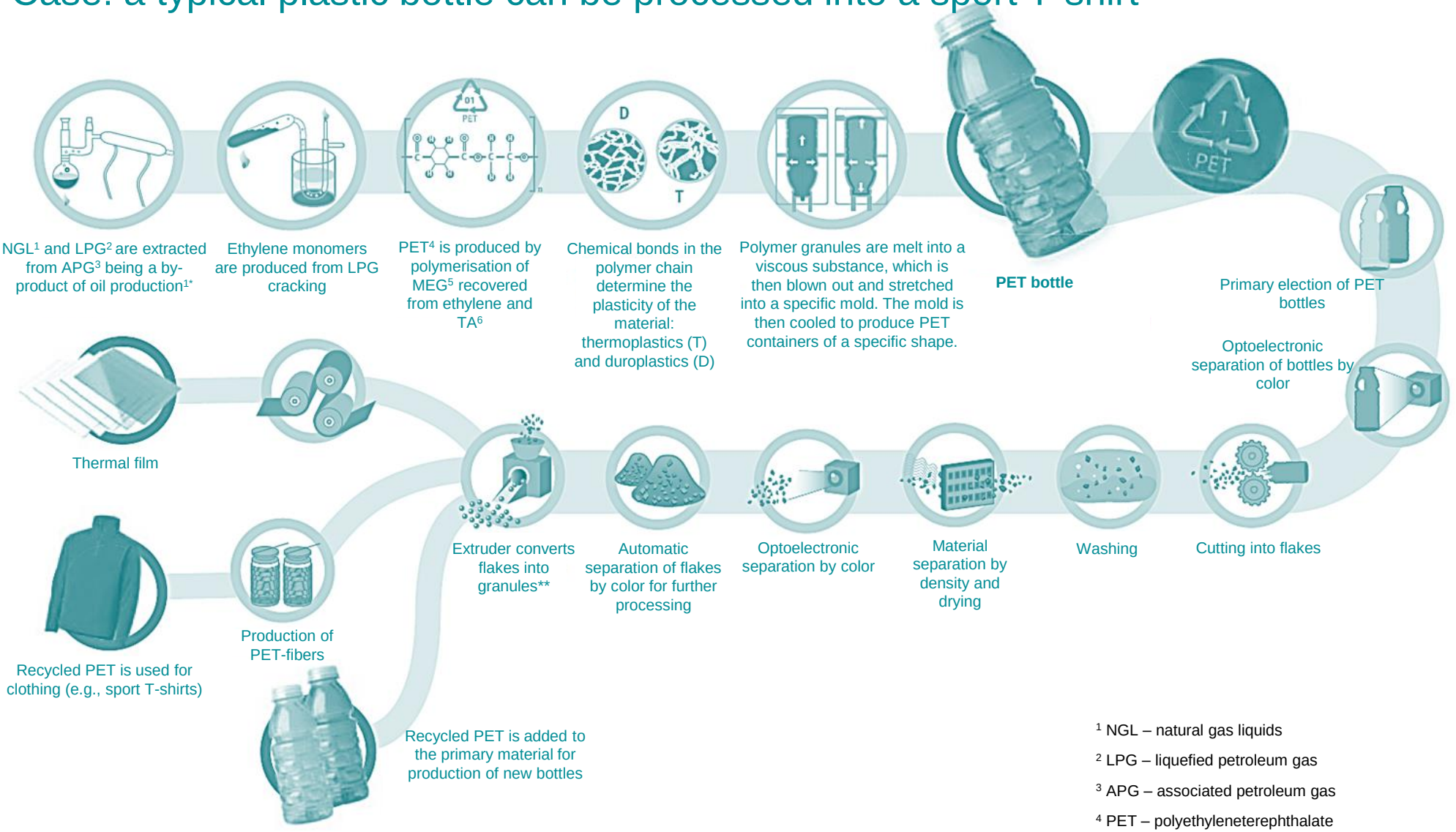






Sources: British Plastic Federation, Plasticsnews, NewChemistry,

Case: a typical plastic bottle can be processed into a sport T-shirt



[1] NGL – natural gas liquids

[2] LPG – liquefied petroleum gas

[3] APG – associated petroleum gas

[4] PET – polyethyleneterephthalate

[5] MEG – monoethyleneglycol

[6] TA - terephthalic acid

*Note: * PET can also be produced from other feedstocks such as naphta.*

*** Depending on the area of application different equipment should be installed with corresponding CAPEX and OPEX.*

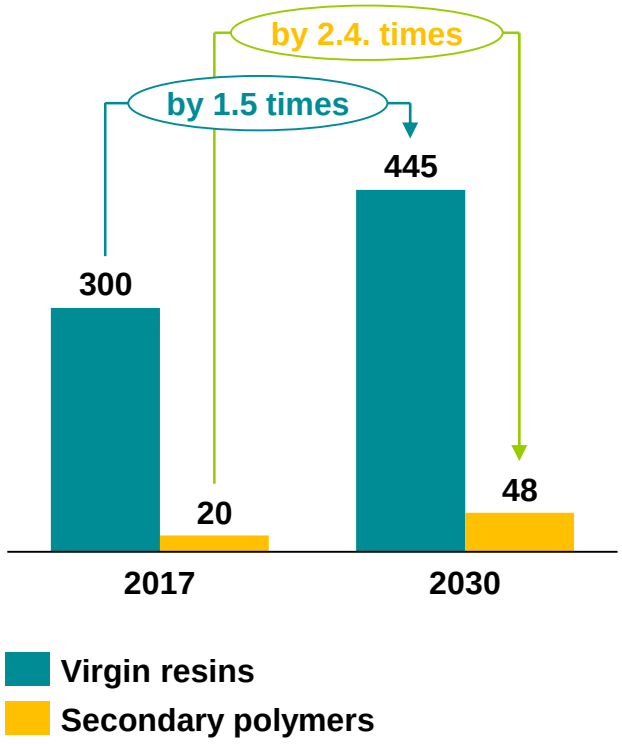
Source: Plastics Europe

Petrochemical companies' transition towards the circular economy will increase the recycling volume

Circular Economy is striving to close the loop of production-consumption-disposal by more efficient and sustainable use of resources across the whole value chain.

Despite a significant increase in demand for secondary polymers, the bulk of demand is driven by virgin polymers.

Growing demand for polymers

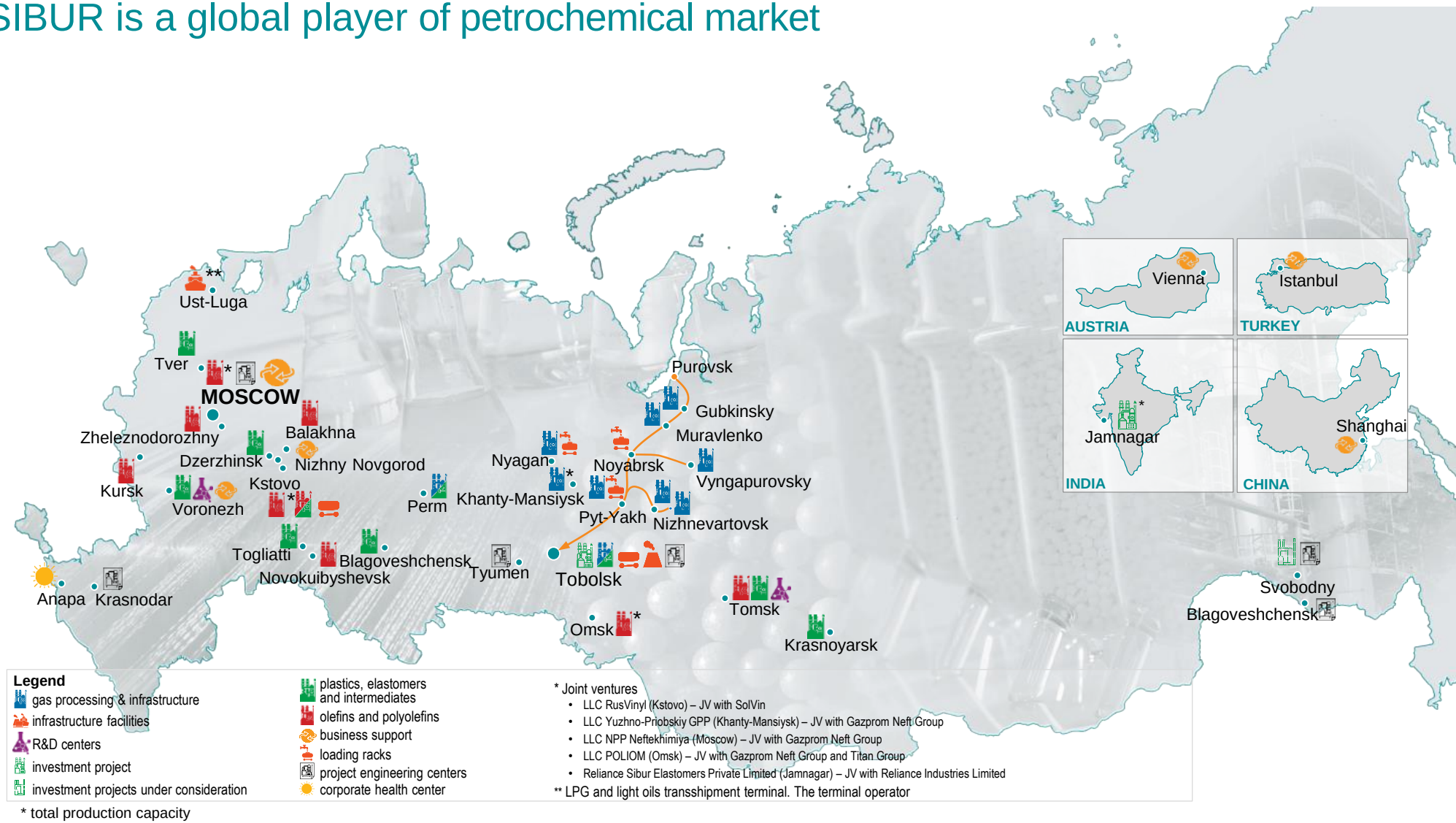


Circular economy within petrochemical value chain: developing recycling potential

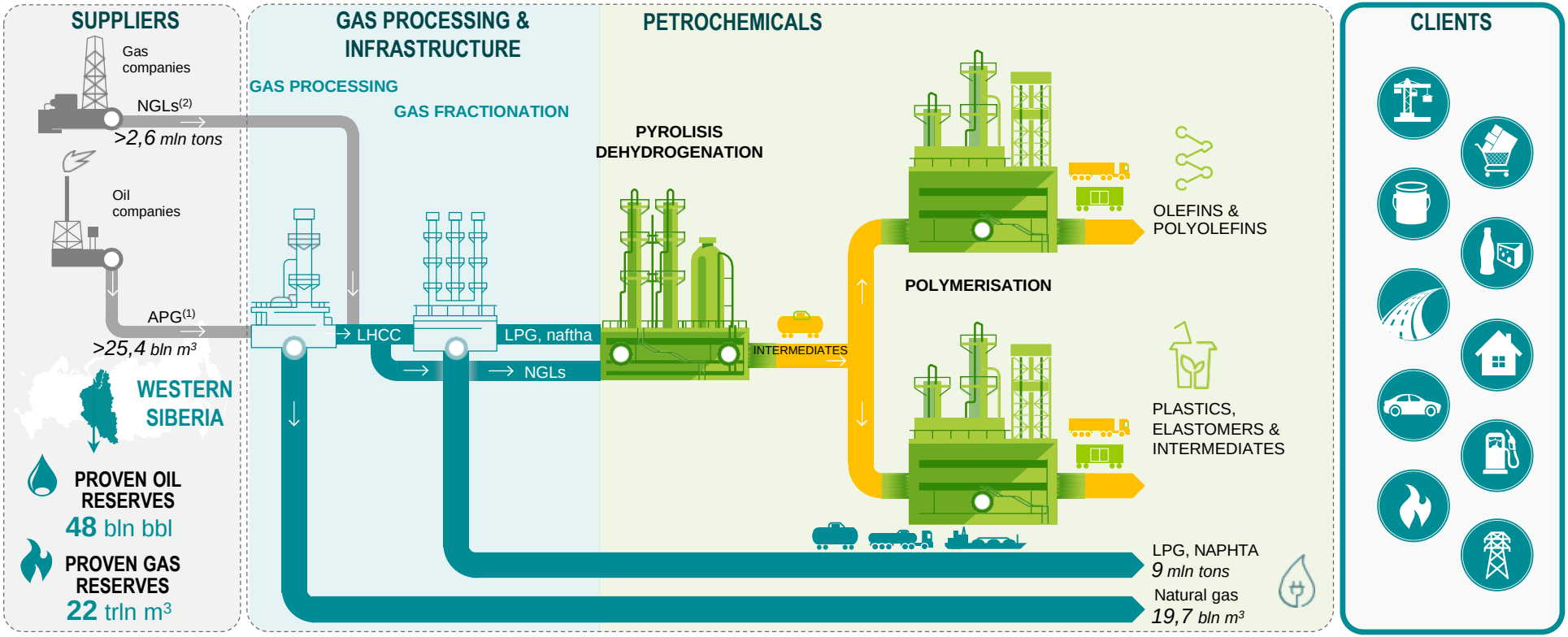
سابك sabic	Plastics	Chemical recycling	Signed a Memorandum of Understanding (MoU) with Plastic Energy Ltd, a UK based chemical recycling company, to supply raw materials for SABIC petrochemical activities in the EU
DOW DUPONT™	Plastics	Collection / recycling	• New business models and growth strategies that monetize plastics waste recycling streams • New product offerings via technologies that will be used to transform plastic waste into valuable resources in North America and EMEA • New recycling, collection and infrastructure platforms for local value chain partners
INDORAMA VENTURES	PET resin / polyester fiber	Chemical recycling	Joint venture with Loop Industries Inc., a leading technology innovator in sustainable plastic resin; partnership plan to begin production in Q1 2020
lyondellbasell	Polypropylene / HDPE	Chemical recycling	• Plastics recycling joint venture with Suez in the Netherlands • Agreement with Karlsruhe Institute of Technology (KIT), Germany
BOREALIS	LDPE / HDPE	Mechanical recycling	Acquisition of Ecoplast (Austria) that processes approximately 35 thousand tons of industrial and household plastic waste

SUSTAINABILITY IN SIBUR

SIBUR is a global player of petrochemical market



SIBUR effectively reprocesses by-products purchased from oil and gas companies into high value-added products



(1) Associated petroleum gas (APG) is a by-product of oil production
(2) Liquified hydrocarbon crude (LHCC) including natural gas liquids (NGL), liquified petroleum gas (LPG) and naftha is by-product of gas production

SIBUR produces a wide range of petrochemical products

FUEL AND FEEDSTOCK PRODUCTS

POLYOLEFINS

BOPP FILMS

RUBBERS

ORGANIC SYNTHESIS

POLYETHYLENE TEREPHTHALATE

EXPANDED POLYSTYRENE ALPHAPOR

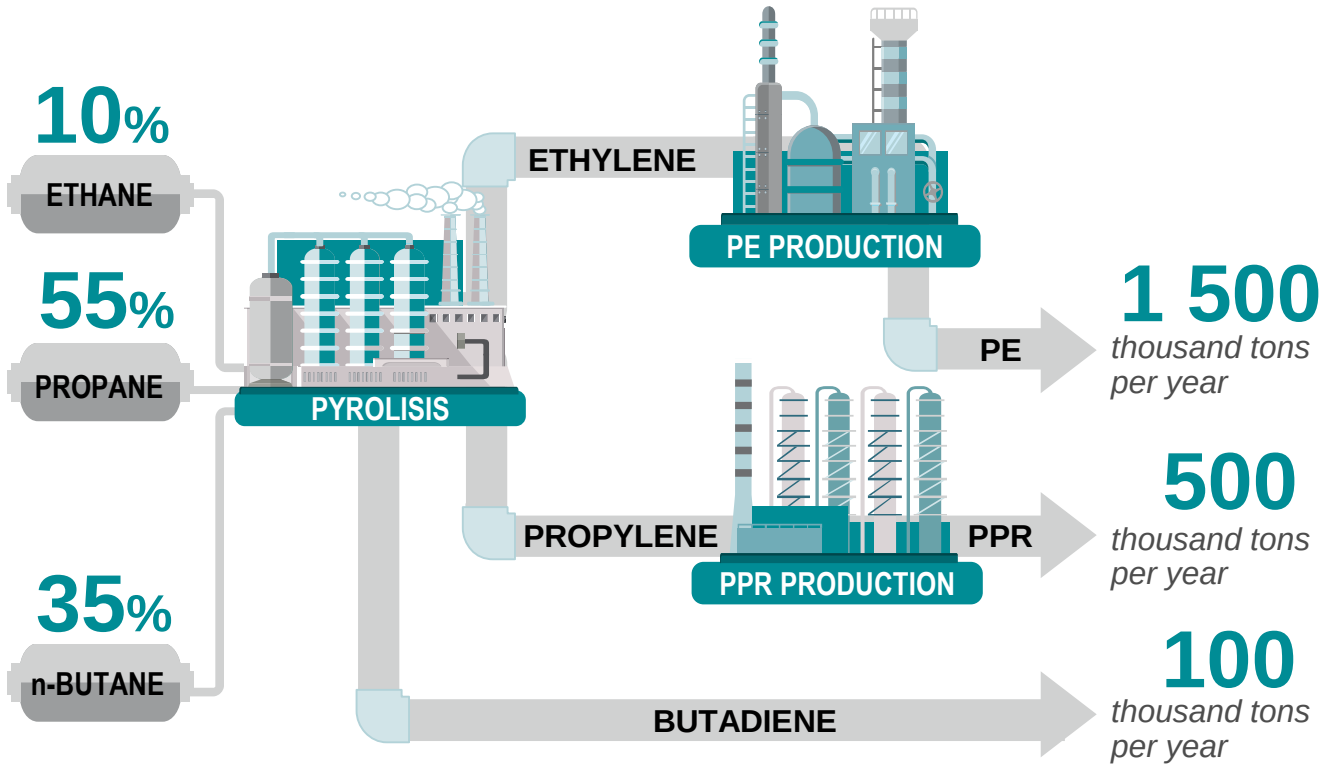
THERMOPLASTIC ELASTOMERS

Launch of ZapSibNefteKhim will sufficiently increase range of product solutions

~9 bln dollars
of investments

Top-5
p/c world's complexes

~2 mln tons
polymeric products per year



SIBUR is the member of CEFIC…

All products exported by SIBUR Group to the EU were registered in 2010 under the EU REACH Regulation (Registration, Evaluation and Authorisation of Chemicals).

In 2017 SIBUR became a member of the European Chemical Industry Council (Cefic) and joined the European Ethylene Producers Committee (EEPC).

… and active participant of Operation Clean Sweep

In January 2018, SIBUR joined Operation Clean Sweep – a PlasticsEurope initiative that aims to prevent the loss of polymer particles during production and logistics processes.

During 2018 prevented the loss of 186 tons of plastic pellets into the environment, with 86% going back to the production cycle and the rest being disposed of as required or sold.

SIBUR takes care of possible social and environmental consequences of its activity and follows the principles of sustainable development

Social responsibility

Charity activity of PJSC SIBUR Holding is performed within the scope of "Good deeds formula" programme.

ФОРМУЛА ХОРОШИХ ДЕЛ

In 2017,

130 projects from 17 SIBUR's presence cities

became winners of Regional Socially Important Projects Competition

Total amount invested in implementation of these projects numbered

₽ 91 316 283 rubles

Responsible approach

SIBUR has implemented an integrated management system (IMS) and got it certified to the requirements of the following international standards:

- **OHSAS 18001**
- **ISO 9001**
- **ISO 14001**
- **ISO 50001**

In 2014, SIBUR joined Responsible Care Programme.

Responsible Care®
Our commitment to sustainability.

SIBUR's ecological mission

In 2017, SIBUR processed

22,8 bln m^3 **APG,**

preventing atmospherical emission of

≈7 mln tons

of polluting substances

It is comparable with annual emissions of such countries as Malta, Cyprus, Iceland, Albania, Moldova, and Estonia

Participation in international ratings of sustainable development (CDP, EcoVadis, Sustainalytics). SIBUR took the 14th place in the first ECO-rating of the largest Russia's Implementation

Implementation of the "green office" concept (separate collection of garbage in public areas, installation of motion sensors in public areas in order to save electricity, office of recycled materials etc.)

SIBUR

SIBUR is also elaborating recycling projects

Mechanical recycling

1. **Flex-to-resin (FTR) production at production facilities**
2. **Integration of print removal, metallization from BOPP films and obtaining secondary feedstock**
3. **Development of a special HDPE grade for manufacturing polymer pellets**
4. **Obtaining secondary feedstock such as granules and using it to produce FFS film**

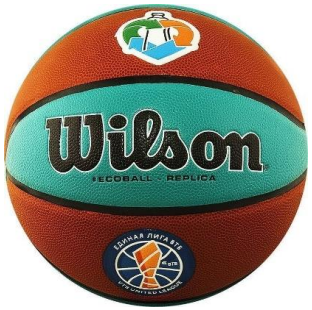
Chemical recycling

1. **Chemical recycling of secondary plastics** – thermolysis of secondary plastics into a mixture of hydrocarbons that is subsequently converted into olefins, whereupon new polymers are produced
2. **Gasification of the municipal solid waste** left after sorting producing synthesis gas and subsequent production of ethanol.
3. **Chemical recycling of PETE –** depolymerization of low-quality feedstock (dirty colored flake, cloth, carpets, etc.) with polymer cleanup and subsequent production of clean virgin PET.

SIBUR actively supports the transition of Russia towards the circular economy model

Basketbottle and Hockeybottle – projects aimed at collection of plastic bottles in and around national sports arenas

15 t **collected during 2 years of the project implementation**



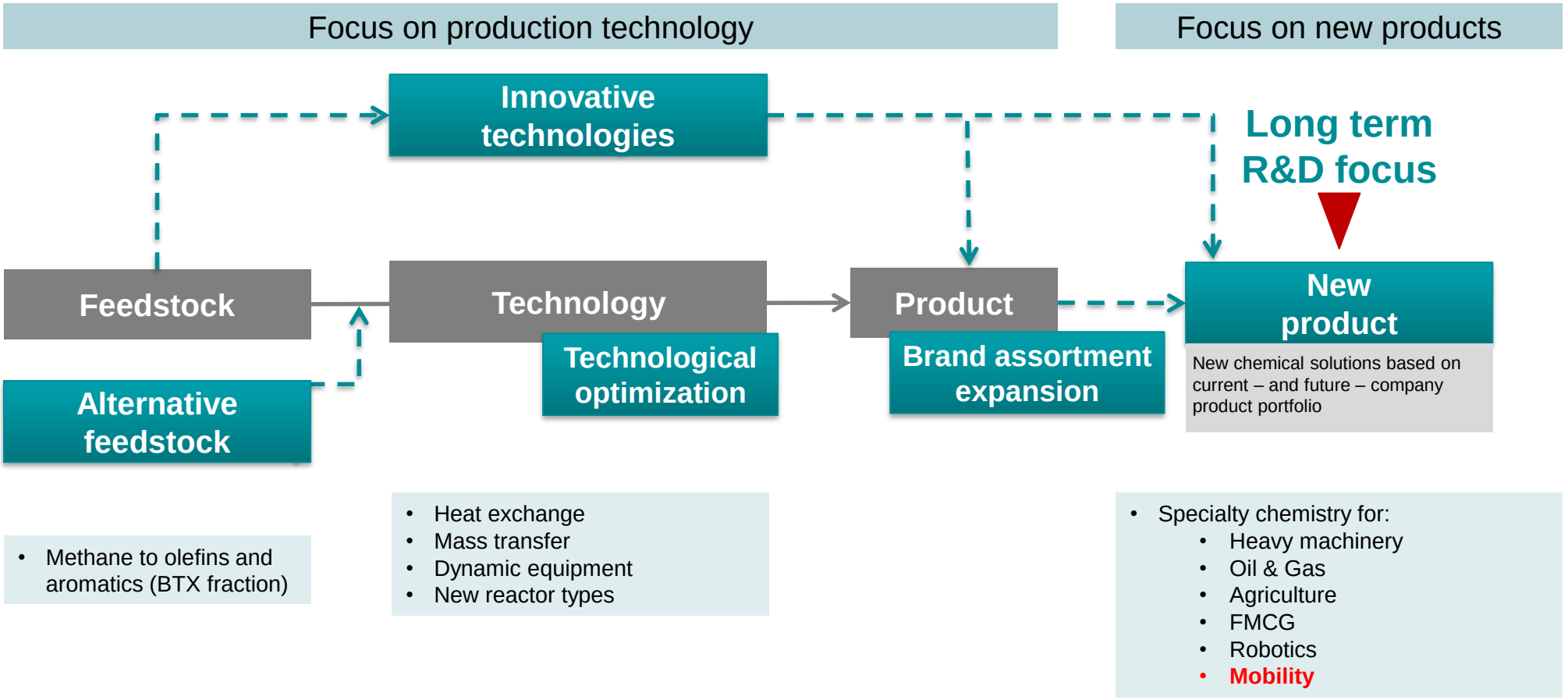
Jointly with **Wilson**, a global manufacturer of equipment for tennis and team sports, SIBUR presented the first eco-friendly **basketball made from recycled plastic bottles**. It's the official ball of the VTB United League

РАЗДЕЛЯЙ ПРАВИЛЬНО

SIBUR supported the **"Separating the Right Way"** initiative of the Ministry of Natural Resources and Ecology of Russia designed to pursue a complex of activities and campaigns in the area of separate collection and disposal of municipal waste.

R&D IN SIBUR: INNOVATIVE & SUSTAINABLE

On top of operational excellence focus, we are also looking for specialty chemistry opportunities in multiple industries



… and our R&D projects are carried out throughout the value chain - from raw materials to new products

Our R&D expertise goes from development of new grades and compounds to processing technologies and testing of end products

NIOST

Technical Center for Development and Processing of Polyolefins

Developing and testing of new polymers

- Assessment of material properties
- Analysis of competitive samples
- Development and optimization of materials formulations

Processing of new polymers

- Processing of raw materials on pilot production lines into end products across various segments:
  - Compounds
  - Packaging
  - Consumer goods
  - Piping
  - Fibers

Testing of end products

- Testing of formulated grades and end products on a state-of-the-art equipment in accordance to requirements of the industry

NIOST in Tomsk is in the avant-garde of SIBUR's R&D activities

NIOST laboratories are equipped with state-of-the-art analytical facilities of global leading manufacturers and workplaces of employees are compliant with global standards

220 employees

Key objectives:

- ✓ R&D projects implementation in the priority scientific and technical areas of the company
- ✓ Development of innovative ideas and proposals to be implemented by the Company
- ✓ Concentration and advanced training of scientific staff

To expand our R&D capabilities we employ Scientific Advisory Board (SAB) with the world's leading experts from Business and Academia

The SAB's role is to

- Review and advise on the proposals and plans prepared by SIBUR;
- Identify new areas of research where SIBUR can reap the benefits of cutting edge science and build the foundation for enterprise and industry growth;
- Highlight critical issues and emerging global trends where SIBUR could fill a gap or meet a need;
- Assist and advise on the management of R&D.

Some of 11 members of SAB in 2018:

Timothy Diephouse

University of Michigan
Ph.D. Organic Chemistry

32 year career in R&D at Dow Chemical

Krzysztof Matyjaszewski

Carnegie Mellon University
University Professor

Over 150 patents

Geoffrey Coates

Stanford University
Ph.D. in Organic Chemistry

Cornell University
Tisch University Professor

Brian Goodall

Advisor to Fortune 100 Chemical Company (polymerization catalysts)

100 US patents

In 2019, SIBUR opened PolyLab – a collaborative R&D center for the development and application of polyolefins

Location

on the territory of Skolkovo Innovation Center

Building area

5350 m^2

Main objectives of the center

- Development of new grades
- Technical support, promotion of developed grades
- Optimization of developed grades
- Quality improvement of manufactured grades
- Platform for industry events and promotion of plastics consumption
- Complaint management

Processing equipment

- Injection moulding
- Extrusion blowing
- Pipes extrusion
- Production of films
- Multifilament production line
- Thermoforming

Laboratory equipment

- Physical and mechanical, analytical, reological, thermophysical, physical and chemical testing
- Testing of manufactured goods:
  - moulding goods
  - films
  - canisters
  - pipes

PolyLab – **technical center for development and processing of polyolefins**

Polymer processing and application development block

COMPOUNDING

Production of compounds and premixes:



- Laboratory batches for processing on the R&D center equipment
- Pilot batches for testing at clients site (1 – 3 ton)
- Testing of new polymers in model compounds

MOLDING & FORMING

Production of articles by:

- Injection molding
- Extrusion blow molding
- Thermoforming



FILMS

Production of films:


- Blown films
- Cast films
- Biaxial oriented films

PIPES AND FIBERS

Production of pipes and fibers:

- Extrusion of 32 mm and 110 mm pipes
- Multifilament fibers production


Analytical testing laboratory

ANALYTICAL TESTS

- GPC, HPLC, GC
- DCS, DMA, TG
- FT-IR
- Optical & Electron Microscopy

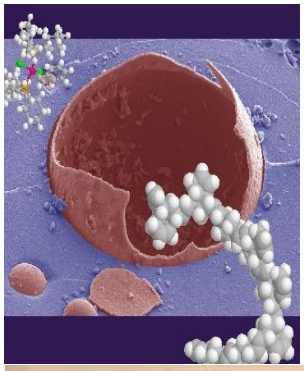
BASIC TESTS

- Mechanical testing
- Optical testing
- Rheological testing
- Thermal testing

APPLICATION TESTS

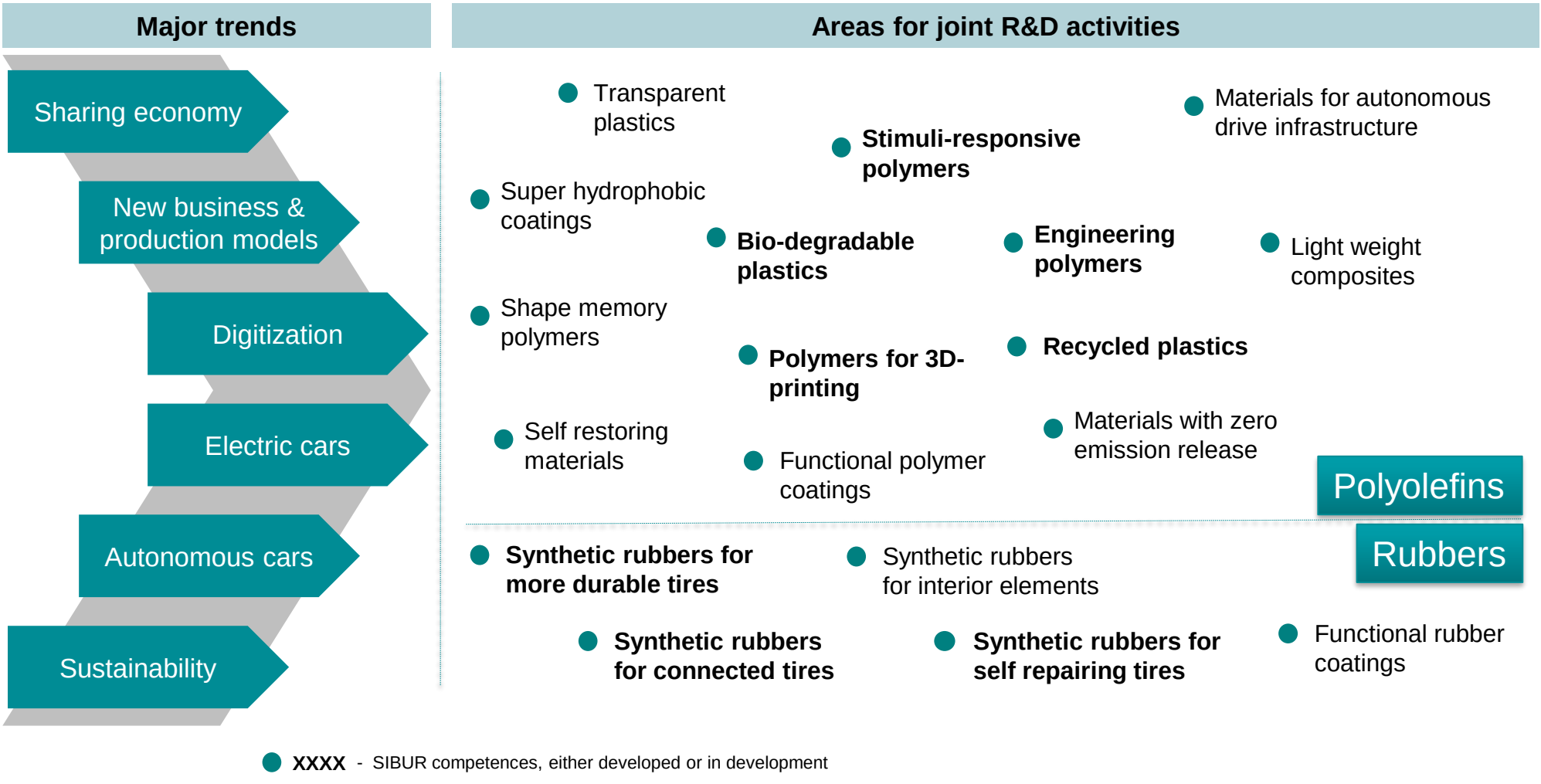
- Top load
- Drop tests
- Shrinkage, warpage
- Films properties
- Pipes tests (MRS, FNCT, ESCR)
- Barrier and sealing properties

We are intensively looking into Technology Platforms to focus on the most promising mid- to long-term R&D projects



Technology platform	Key applications
Polymers with controlled decomposition	• Biodegradable polymer coatings for fertilizers • Biodegradable agricultural films • Super-absorbing polymers
Encapsulation for various polymer applications	• Self-healing polymers • Self-lubricating polymers
Stimuli sensitive materials/polymers	• Artificial muscles • Shape-memory polymers • Innovative packaging • New polymers for tires
New polymers for 3D-printing	• New generation of filaments • 3D-printing for industrial use and construction

Creation and filling of Technology Platforms is based on global trends and industries' demand



XXXX - SIBUR competences, either developed or in development