



European Committee of Manufacturers of Electrical
Machines and Power Electronics

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CEMEP sustainable products, systems & services



European Committee of Manufacturers of Electrical
Machines and Power Electronics

Eco Design for Sustainable Drives Solutions

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The background of the slide is a collage of various Sustainable Development Goals (SDGs) icons and text. Visible elements include: Goal 4 (Quality Education) with an icon of an open book and pencil; Goal 5 (Gender Equality) with a female symbol and an equals sign; Goal 6 (Clean Water and Sanitation) with a water drop icon; Goal 10 (Reduced Inequalities) with an icon of three upward-pointing arrows; Goal 11 (Sustainable Cities and Communities) with an icon of city buildings; Goal 12 (Responsible Consumption and Production) with an infinity symbol; Goal 16 (Peace, Justice and Strong Institutions) with a dove icon; and Goal 17 (Partnerships for the Goals) with an icon of three interlocking circles. The text "Eco Design for Sustainable Drives Solutions" is overlaid in large white font, with a vertical teal bar to its left. Below the main title, the text "Background & Status" is written in a smaller white font.

Eco Design for Sustainable Drives Solutions

Background & Status

Agenda

Top	Topic	time
1	Introduction: Sustainability challenges and sense of urgency	5'
2	Glimpse into the EU regulatory framework	5'
3	Eco-Efficiency Case Studies & Sustainable Drives Solutions	10'
4	Q&A	10'

Introduction

The Call for Decarbonization & Decoupling



1850

2018



Global warming
and climate change are
key challenges
of our time.

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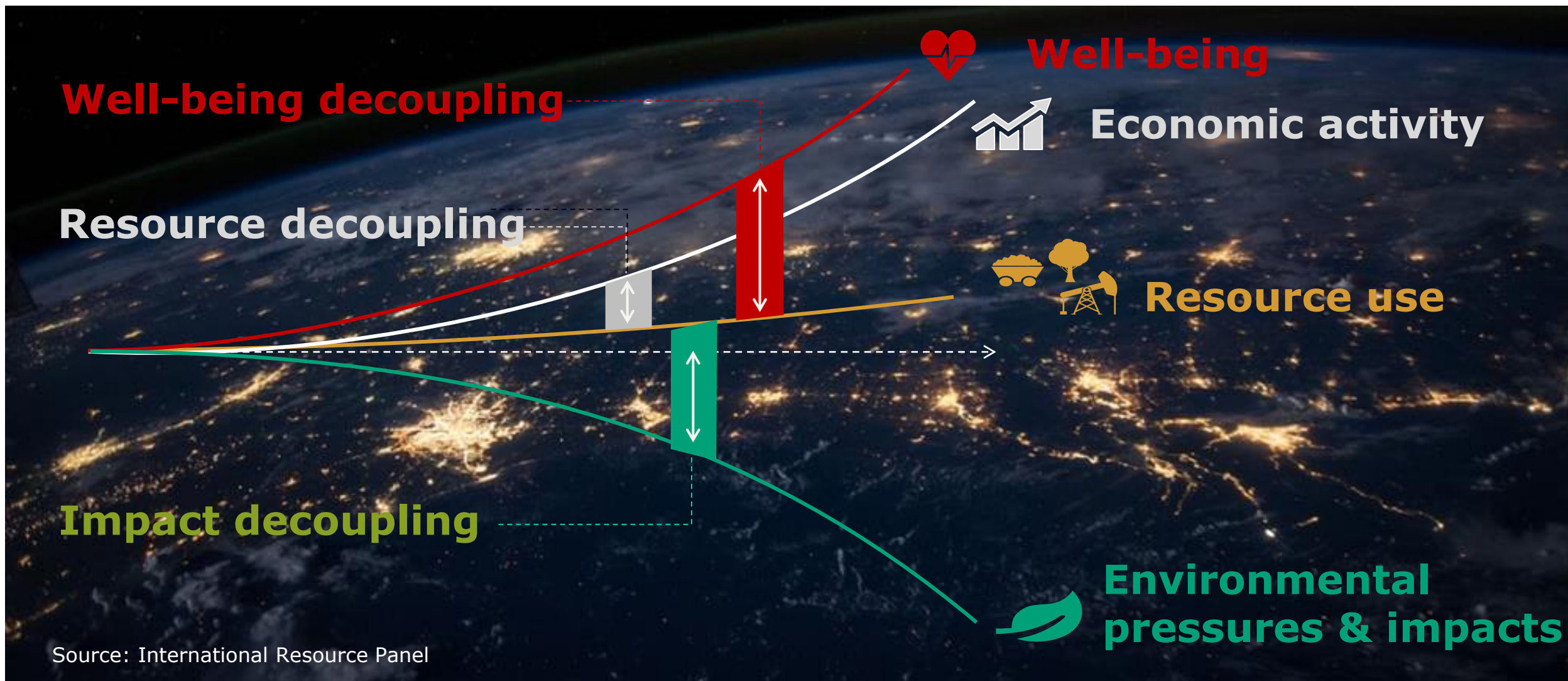
1/3

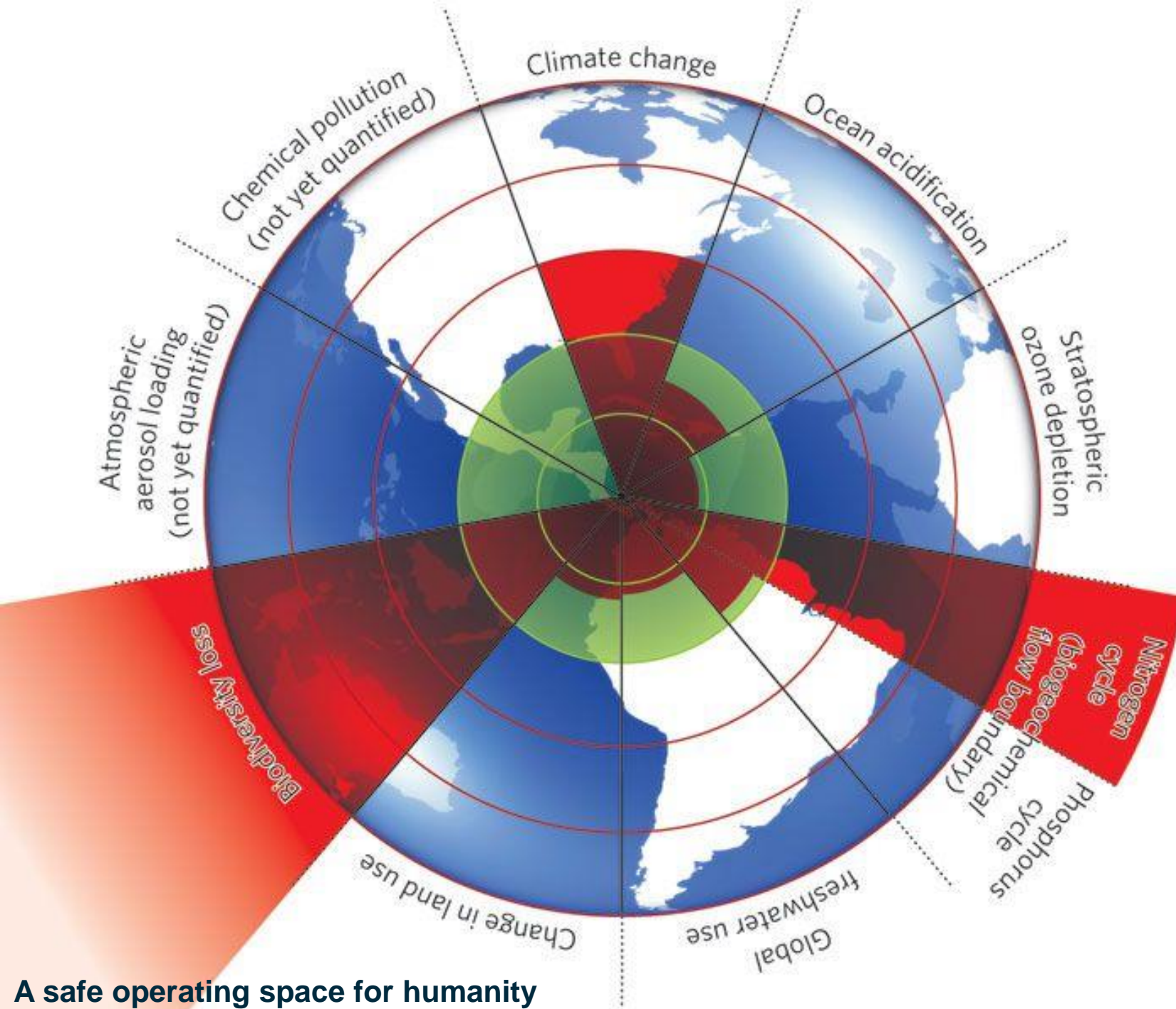
of the global
energy is consumed by
industries.

20%

of carbon emissions
come from industrial
production.

The decoupling principle





Resource based economy is creating severe environmental pressure (climate)

Circularity of resources is a crucial aspect to reduce the environmental pressure and increase the sustainability of business

Rockström et al., Nature Volume 461, pages 472–475 (2009)
<https://www.nature.com/articles/461472a>

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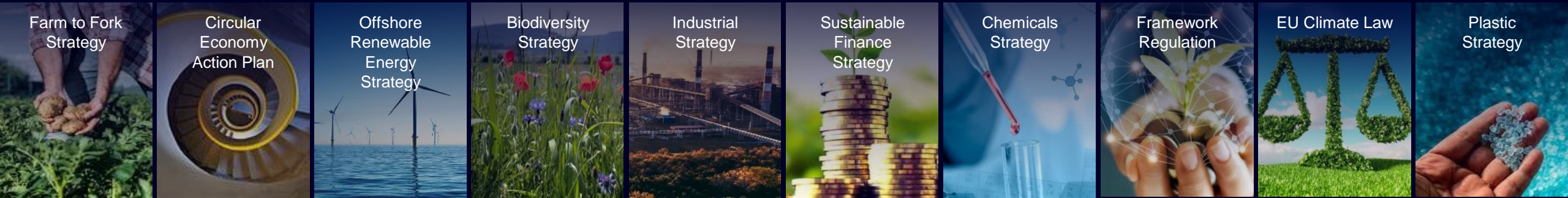
A safe operating space for humanity

Our resources are finite so industry must do more with less. Digitalization, automation, electrification, and the intelligent use of data are key to meet this challenge.

EU Regulatory Landscape

Circular Economy & Taxonomy

The strategic boosters for the EU Green Deal Policy architecture



e.g. Fit for 55” legislative package



GOAL

Fundamentally overhaul the EU’s climate policy architecture to put the EU on track to deliver on its 2030 climate target of 55%



TIMELINE

Released
in July 2021

Product Policy towards the Circular Economy, the Circular Economy Action Plan includes...

... revision of existing legislation:

- Waste Framework Directive (Battery, Packaging, WEEE)
- Plastic Strategy (prevent waste in the sea)
- **Widen Ecodesign Directive*** / **Introduction of the Sustainable Products Initiative (SPI)** to extend minimum sustainability requirements beyond energy-efficiency and energy-related products to a whole new array of sectors. These rules will ensure that products on the EU market are designed to not only be energy-efficient, but also repairable, durable, recyclable and free of hazardous chemicals.



*Sustainable Products Initiative (SPI), see e.g. https://ec.europa.eu/commission/presscorner/detail/en/QANDA_22_2014; https://ecostandard.org/news_events/ecos-briefing-sustainable-products-initiative-spi-what-to-expect/

In June 2020, the EU adopted the Taxonomy Regulation entering into force in December 2021 and influence the access to capital for investments

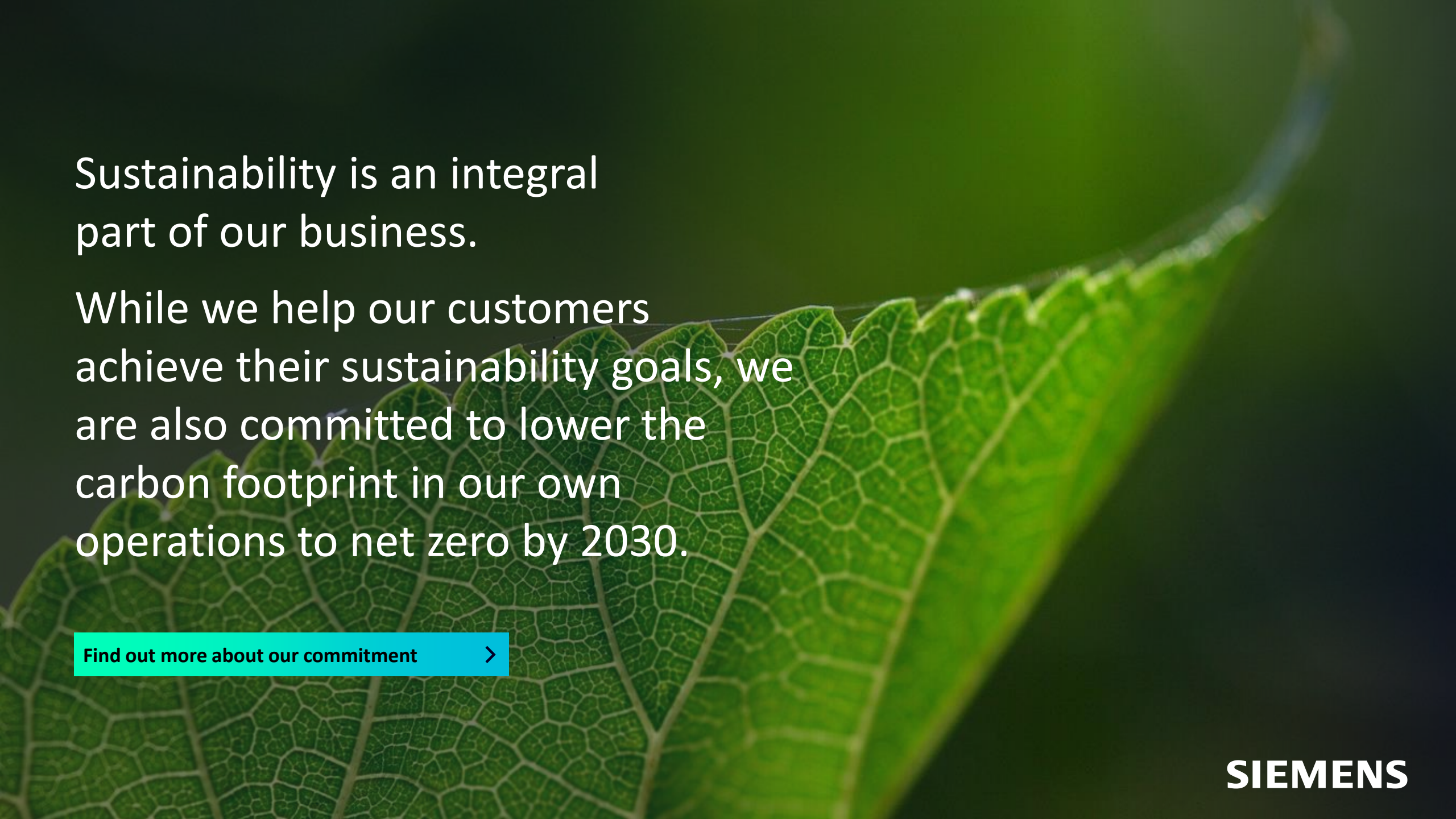


Summary

- **Steadily growing regulatory framework** in regard to decoupling of resource utilization as basis for economic activity and related environmental impacts.
- **Circular Economy and Material Efficiency are key aspects for Sustainable Products / Eco Design**, as well as the EU Taxonomy.

Eco Design Approach

Methodological Approach



Sustainability is an integral
part of our business.

While we help our customers
achieve their sustainability goals, we
are also committed to lower the
carbon footprint in our own
operations to net zero by 2030.

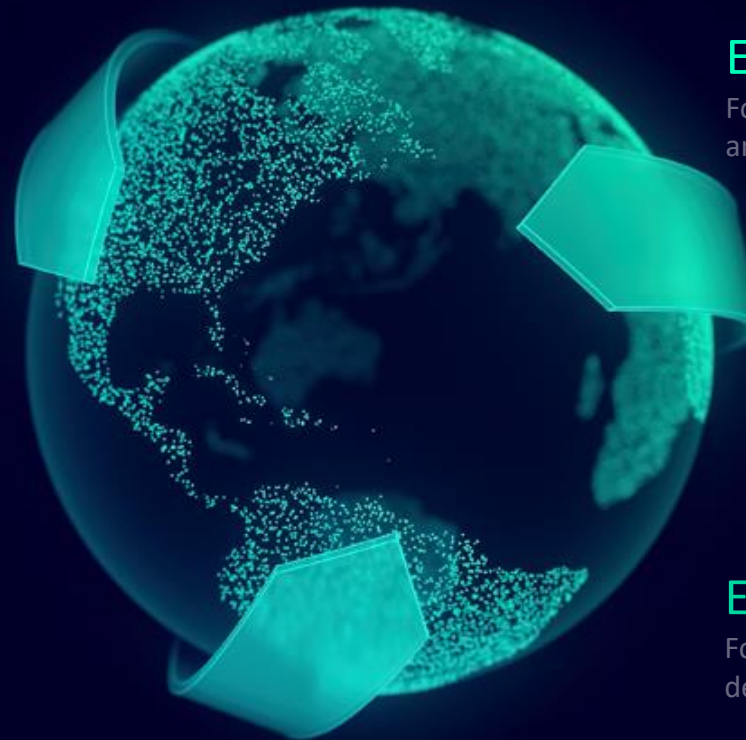
[Find out more about our commitment](#)



SIEMENS

Our commitment to sustainability

With our **DEGREE** framework, we set strategic ambitions for the benefit of all our stakeholders on environmental, social and governance topics (ESG).



Decarbonization

Support the 1.5 °C target to fight global warming

Ethics

Foster a culture of trust, adhere to ethical standards, and handle data with care

Governance

Apply state-of-the-art systems for effective and responsible business conduct

Resource efficiency

Achieve circularity and dematerialization

Equity

Foster diversity, inclusion, and community development to create a sense of belonging

Employability

Enable our people to stay resilient and relevant in a permanently changing environment

Consequently, Robust Eco Design approach implementation should be integrated into the complete product life cycle as an integrated product-service system

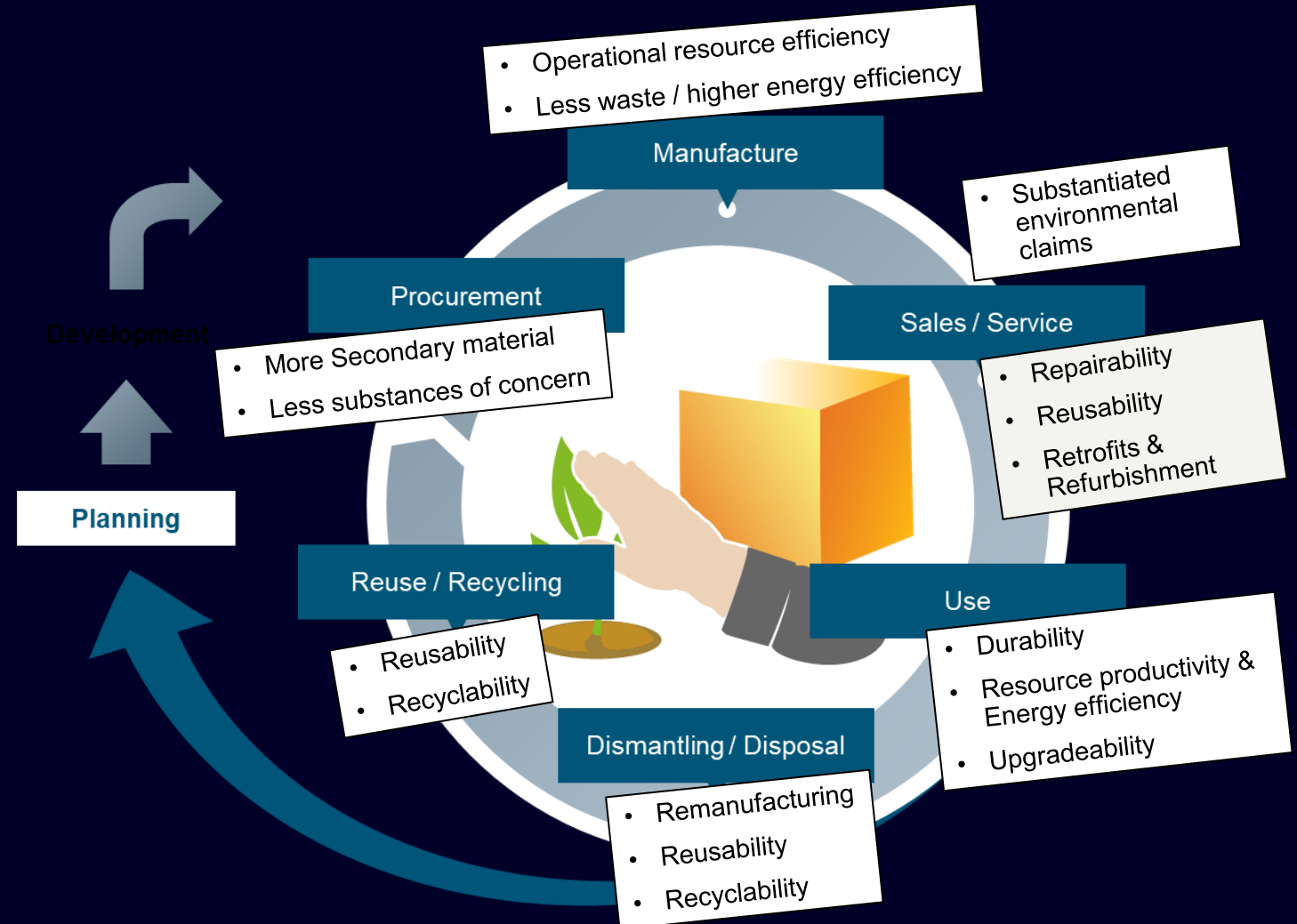
! ... transition to a Circular Economy
... increased relevance of sustainability
... performance in capital markets
... environmental movements

Features & Requirements:

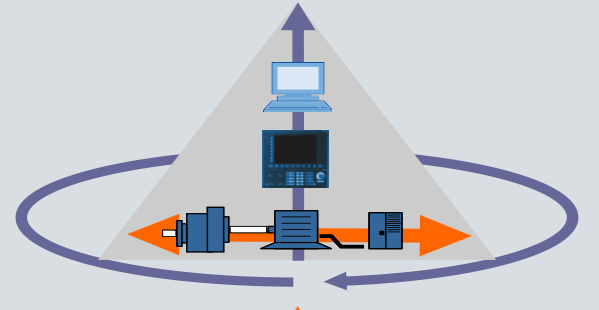
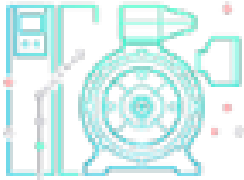
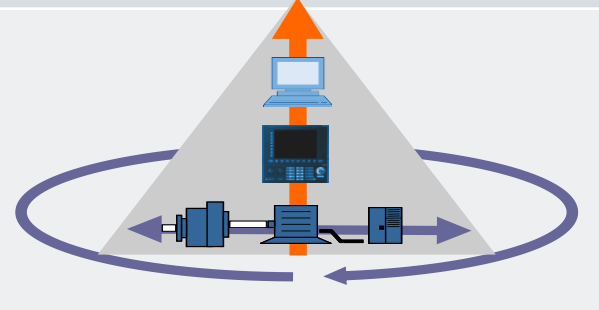

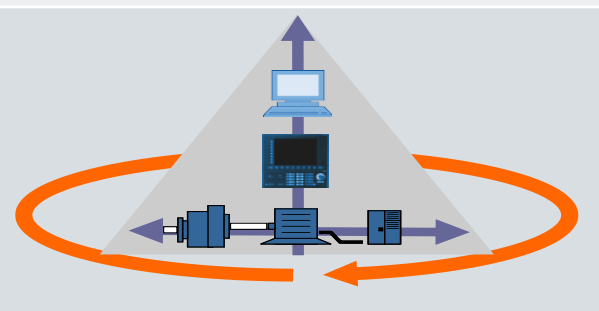

- Customer
- Legal
- Investors

Consideration of:

- Market context / application perspective
- Quantitative environmental impact assessment
- Design for dematerialization



Integrated product-service solutions: The three dimensions of integrated drive system

Integrated Drive Systems		Examples	Benefit
Horizontal Integration Integration of drive components to create coordinated drive systems		 Smart Products	<ul style="list-style-type: none">• Productivity• Reliability• Efficiency
Vertical Integration Integration of the Drive System in the Automation & Control System		 IIoT Platform	
Lifecycle Integration Tools and services throughout the whole life cycle		 Lifecycle Service	

Relevance of Drives to support the sustainability transition

Examples

Innovation by horizontal and vertical integration lead to measurable sustainability benefits at hollow glass manufacturing – Sklostroj, Czech Republic

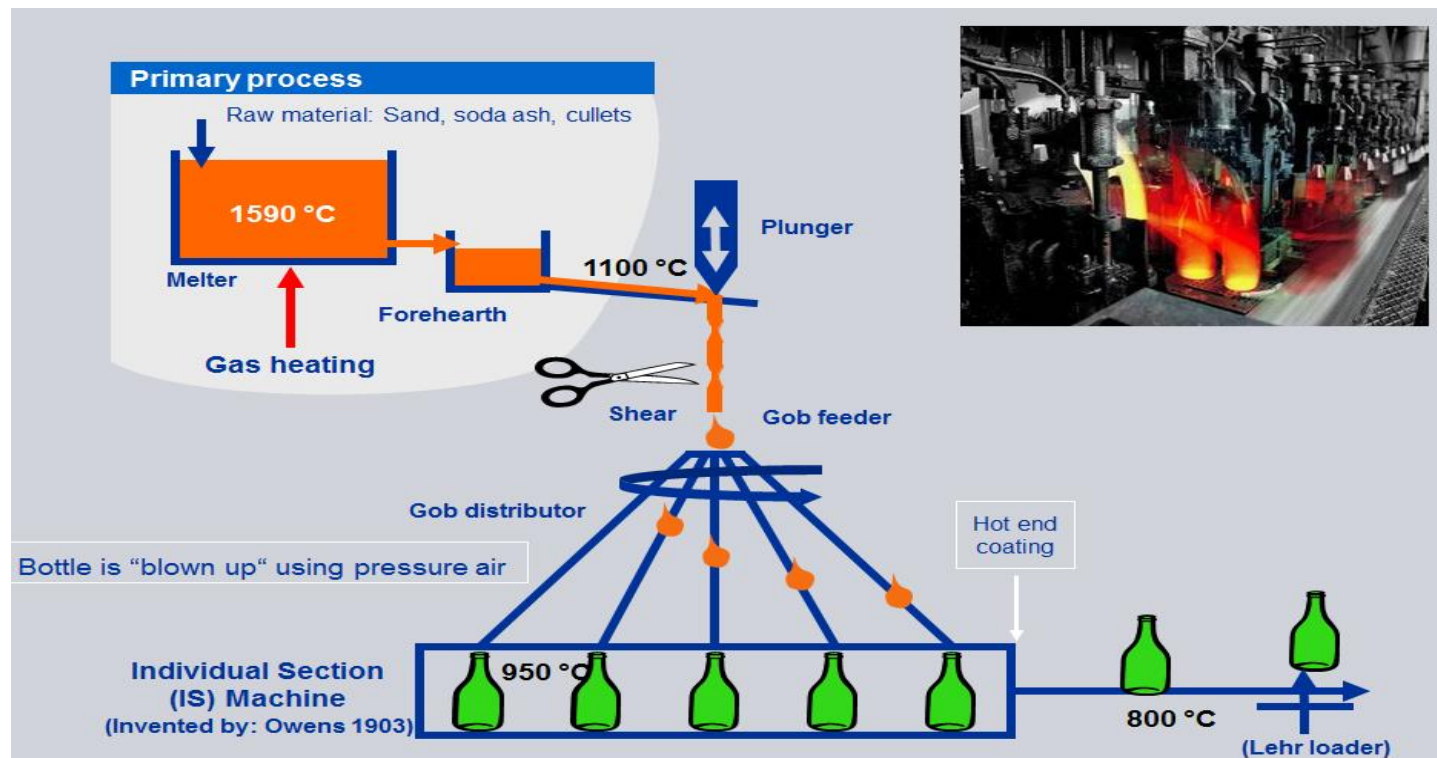


Customer Challenge	Customer Benefit	Siemens Unique Solution
<ul style="list-style-type: none">• New concept for drive technology and automation for glass bottle manufacturing	<ul style="list-style-type: none">• Highly compact and flexible machine• Highest effectiveness, efficiency and reliability of plants• Approximately 40% savings in energy costs• 15% increase in machine availability	<ul style="list-style-type: none">• Replacement of the existing pneumatic solution<ul style="list-style-type: none">• Motion Control System SIMOTION D445-2• Converter SINAMICS S120• SIMOTICS servomotors 1FK7 and 1FK6

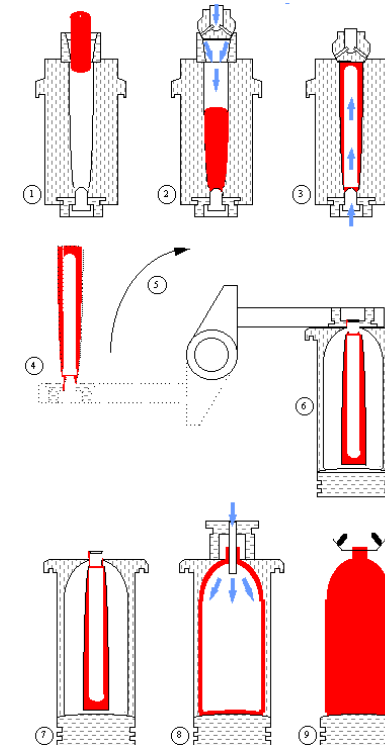
Improve Asset Utilization	✓✓	Reduce Costs	IDS ✓
Create Sustainability	✓✓	Increase Turnover	

Eco-Efficiency case study on upgraded individual section (IS) machines to substantiate environmental claims and quantify benefits (I)

Glass container manufacturing with IS machines



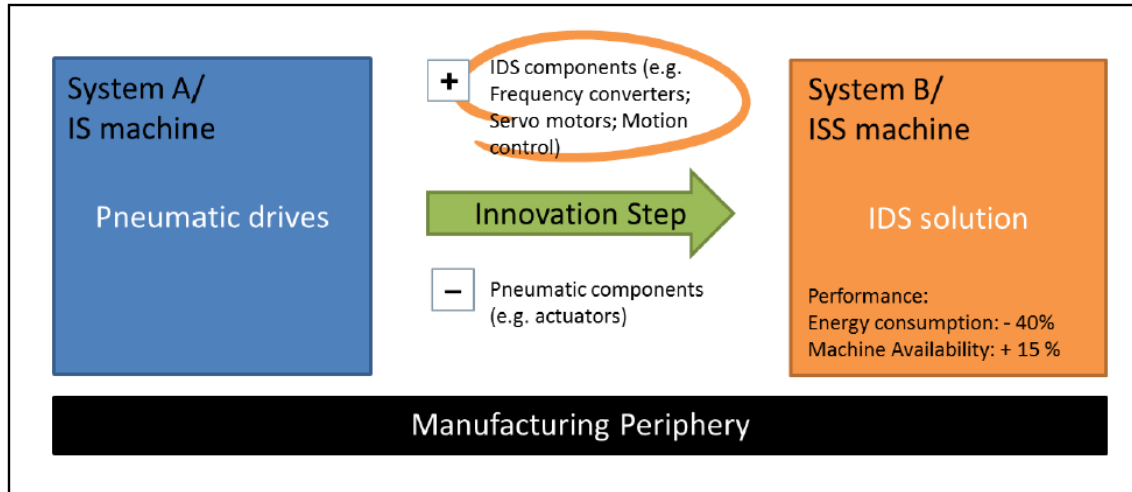
2-Step Forming Process: Synchronization and high precision in each step of the forming process



[Auer et al., 2017] <http://dx.doi.org/10.1016/j.jclepro.2016.08.096>

Eco-Efficiency case study on upgraded individual section (IS) machines to substantiate claims and quantify benefits (II)

IS machine – System innovation:



Results

- absolute number of saved CO2: 1.9 million kg CO2-eqv.; Monetary savings: 450,000€
- Environmental “pay-off” period: 2 y; Monetary “pay-off” period: 5,3y

Eco-Care-Matrix



[Auer et al., 2017] <http://dx.doi.org/10.1016/j.jclepro.2016.08.096>

Eco-Efficiency case study applying life cycle assessment and life cycle costing for drives solutions in a pump application context (I)

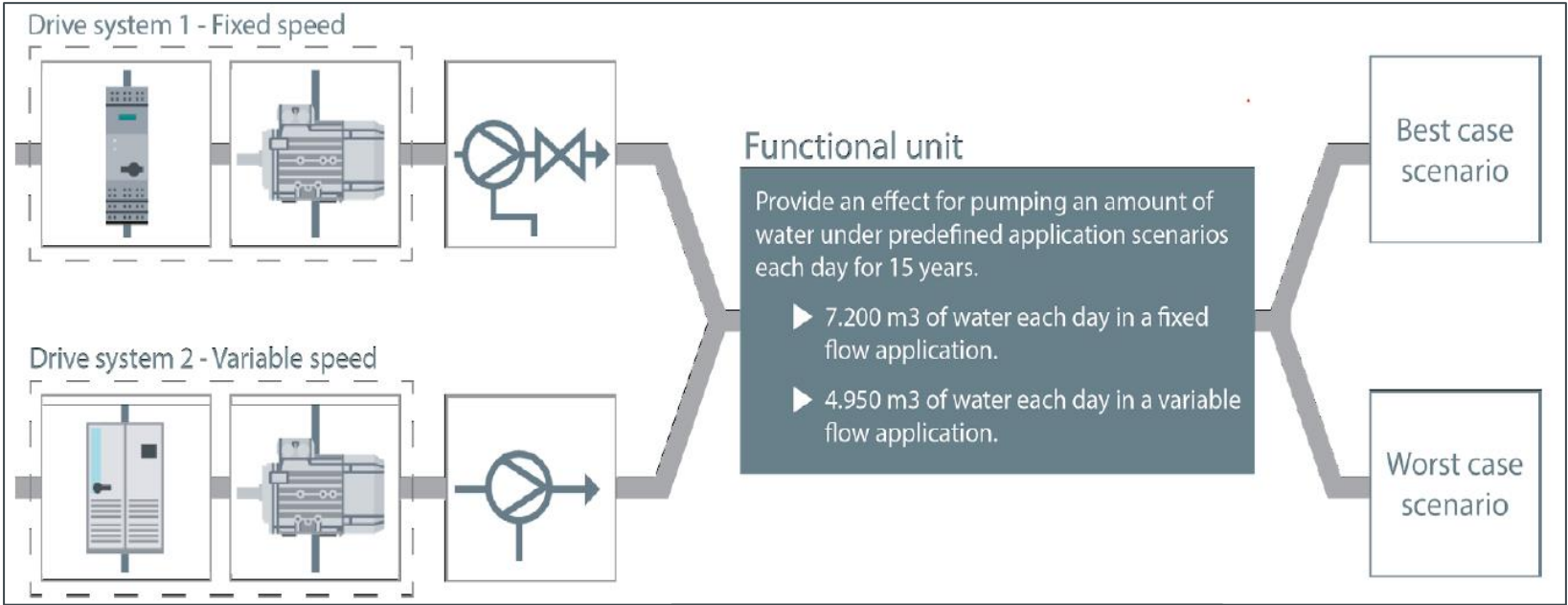
3 possible drive solutions compared in 2 different use scenarios (operating profiles)

Pump application – drive system configuration:

DS1.0: Fixed speed drive – Softstarter + IE3-Motor + Throttle

DS1.1: Fixed speed drive 2 – Softstarter + IE4-Motor + Throttle

DS2.0: Variable speed drive – Converter + IE3-Motor



Operating profiles:

	Flowrate [%]	10	20	30	40	50	60	70	80	90	100
1) Fixed Speed	Operating hours	0	0	0	0	0	0	0	0	0	24
2) Variable Speed	Operating hours	0	0	1	2	3	5	5	4	3	1

[Auer et al., 2017] [Quantitative Eco Design in Drives and Automation Technologies](#)

Eco-Efficiency case study applying life cycle assessment and life cycle costing for drives solutions in a pump application context (II)

Pump application – drive system configuration:

DS1.0: Fixed speed drive – Softstarter + IE3-Motor + Throttle

DS1.1: Fixed speed drive – Softstarter + IE4-Motor + Throttle

DS2.0: Variable speed drive – Converter + IE3-Motor

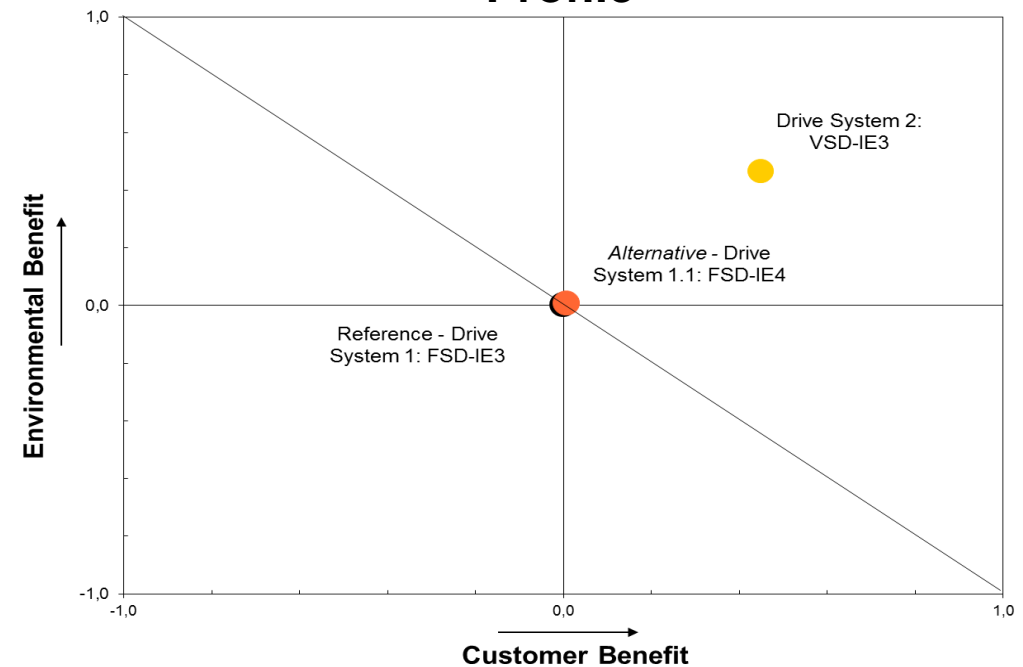
Brief Summary of Results

- Fixed Speed Profile:
 - DS1.0 (marginally) better than DS2.0
- Variable Speed Profile:
 - DS1.1 marginally better than DS1.0
 - DS2.0 about 45 % better than DS1.0

Data for Variable Speed Profile and DS2.0

- Savings of about 550,000 € and 3 Mt of CO₂ eq. (German electricity mix)
- Break-even of the investment = 3.6 months in this application scenario in SinaSave

Eco-Care-Matrix for Variable Speed Profile



[Auer et al., 2017] [Quantitative Eco Design in Drives and Automation Technologies](#)

Decarbonization & Energy efficiency

49%

increase of global CO₂
concentration since 1750

US\$ 23 trillion

loss of global value creation
by 2050 due to climate change

3.7°C

mean temperature increase by 2081-2100
without additional decarbonization measures

Our drivetrain systems **are up to 50% more energy efficient** than conventional motors and drives and can even **replace gas turbines**, thus significantly **reducing heavy industries' CO₂ emissions**

Clean water supply

0.014%

of water on Earth is **fresh**
and **easy to access**

1/3

people globally have **no access**
to **safe drinking water** today

Our tailored W&WW offerings for **desalination plants** and **irrigation systems** make **clean water available** where it's not accessible

Remote support / Digitalization

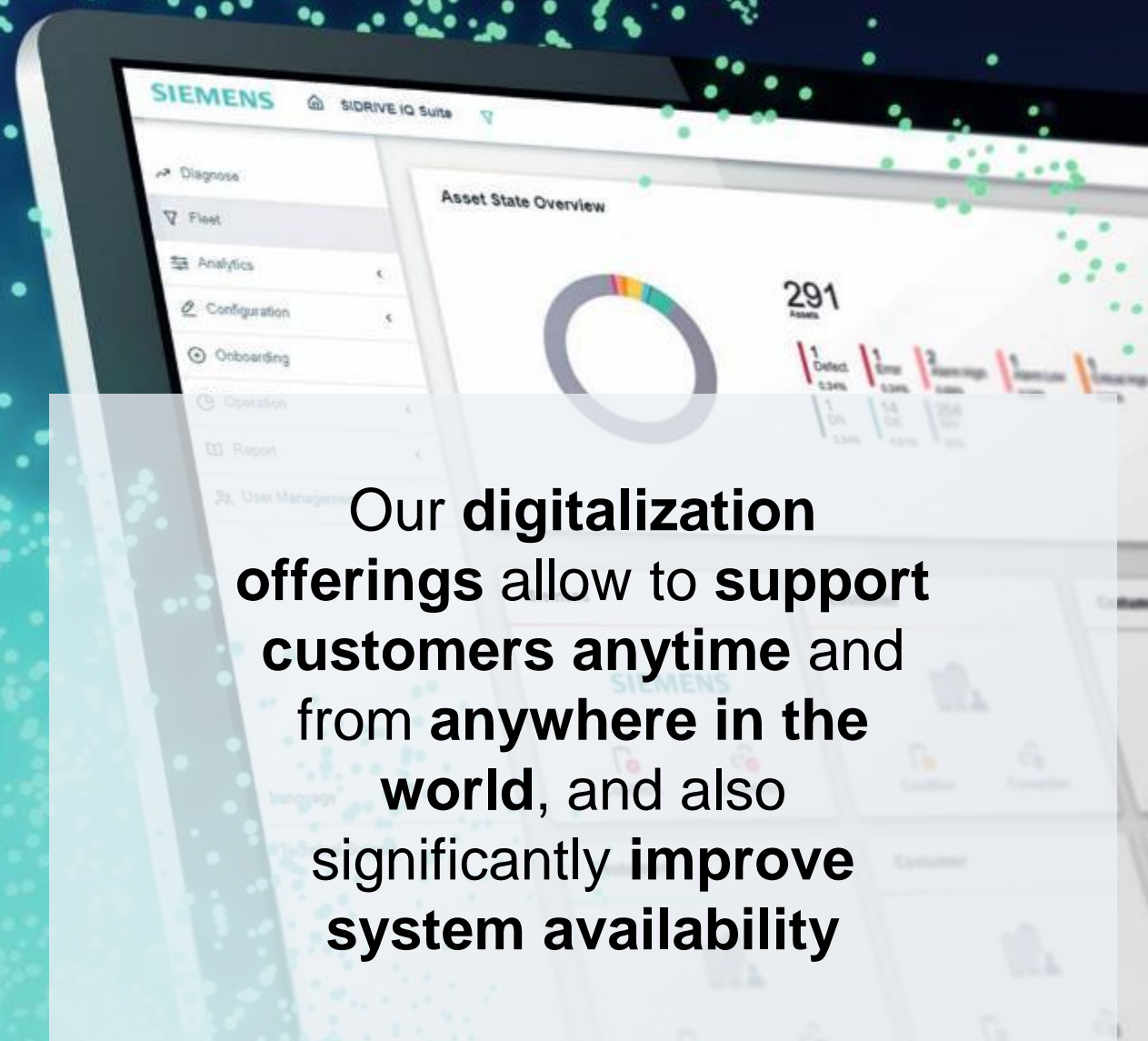
– 60%

decline in world total passengers in 2020 due to Covid-19 pandemic

Covid-19 pandemic changed travel habits and customer expectations, making it inevitable to offer **remote support**

Up to US\$ 280 billion

business air travel costs were saved by companies in 2020 due to pandemic travel restrictions



Q&A

Thanks for the attention!