The Sectoral Decarbonization Approach (SDA) by the Science Based Targets Initiative (SBTi)

Malte Schäfer, 26.11.2021

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Agenda

➡️ **What are Science Based Targets and Sectoral Decarbonization?**

➡️ How does the Sectoral Decarbonization Approach work?

➡️ Some criticism & moving forward

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What is the Science Based Targets Initiative (SBTi)?

- Defines and **promotes best practice in emissions reductions** and net-zero targets in line with climate science.

- **Provides technical assistance and expert resources to companies** who set science-based targets in line with the latest climate science.

- Brings together a team of experts to provide companies with independent **assessment and validation of targets**.

- [...]

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What is a Science Based Target (SBT)?

Science-based targets provide a **clearly-defined pathway for companies to reduce greenhouse gas (GHG) emissions**, helping prevent the worst impacts of climate change and future-proof business growth.

Targets are considered 'science-based' if they are **in line with what the latest climate science** deems necessary to meet the **goals of the Paris Agreement** – limiting global warming to well-below 2°C above pre-industrial levels and pursuing efforts to limit warming to 1.5°C.

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How do you define a SBT?

Sectoral Decarbonization Approach (SDA) ▶ SBT ◉

SECTORAL DECARBONIZATION APPROACH (SDA):
A method for setting corporate emission reduction targets in line with climate science

A product of the Science Based Targets Initiative
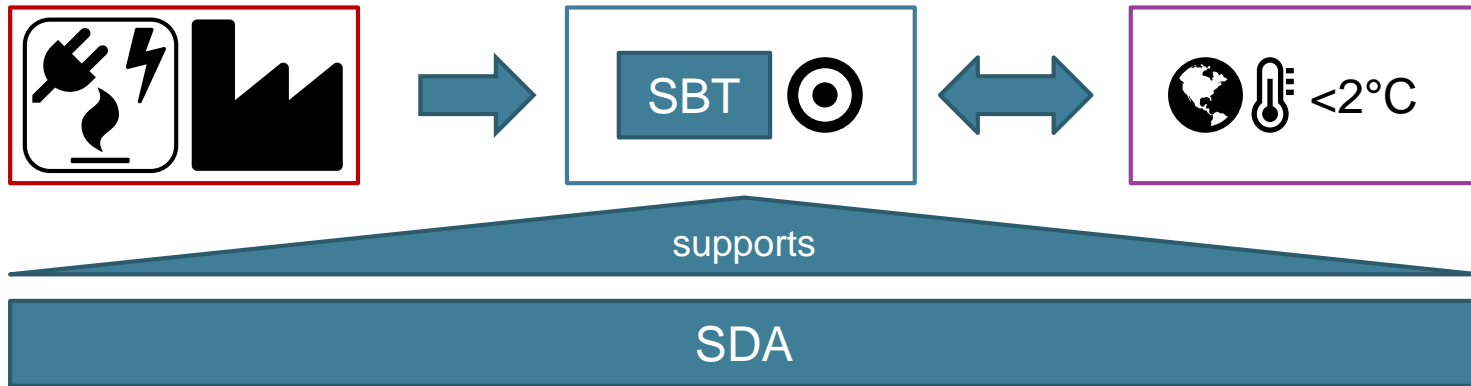DRIVING AMBITIOUS CORPORATE CLIMATE ACTION

*"[A] scientifically-informed method for companies
to set GHG reduction targets necessary to stay
within a 2°C temperature rise above preindustrial levels."*

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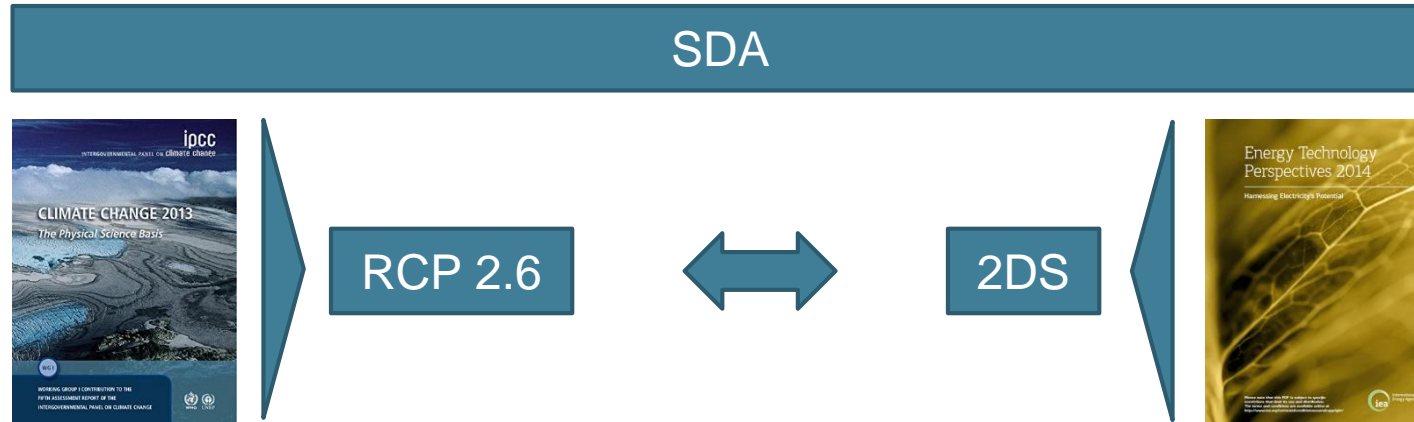und Fertigungstechnik

What is the purpose of the SDA?

The SDA is intended to help
companies in homogenous, energy intensive sectors
align their **emissions reduction targets**
with a **global 2ºC pathway**.

(Homogeneous: Sectors that can be described using a single physical indicator.)

More on physical indicators later.

SBT

<2°C

supports

SDA

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What is the SDA based upon?

SDA

RCP 2.6 ⟷ 2DS

The Energy Technology Perspectives report's budget is consistent with the **representative concentration pathway 2.6 (RCP2.6)** scenario from the **IPCC's Fifth Assessment Report**, which gives the highest likelihood of staying within the global target temperature of less than 2°C in the year 2100.

(RCP2.6 : increase in radiative forcing of 2.6 W/m² relative to pre-industrial times.)

The [SDA] method is based on the **2°C scenario (2DS)**, one of the **International Energy Agency's (IEA)** detailed CO_2 sector scenarios modeled in their **2014 Energy Technology Perspectives report**.

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Who is the SDA for?

The SDA is best suited for companies in the following subsectors with <u>well-defined activity and physical intensity data</u>:

- **Electricity generation**
- **Iron and steel**
- **Chemicals**
- **Aluminum**
- **Cement**
- **Pulp and paper**
- **Road, rail, and air transport**
- and **commercial buildings**
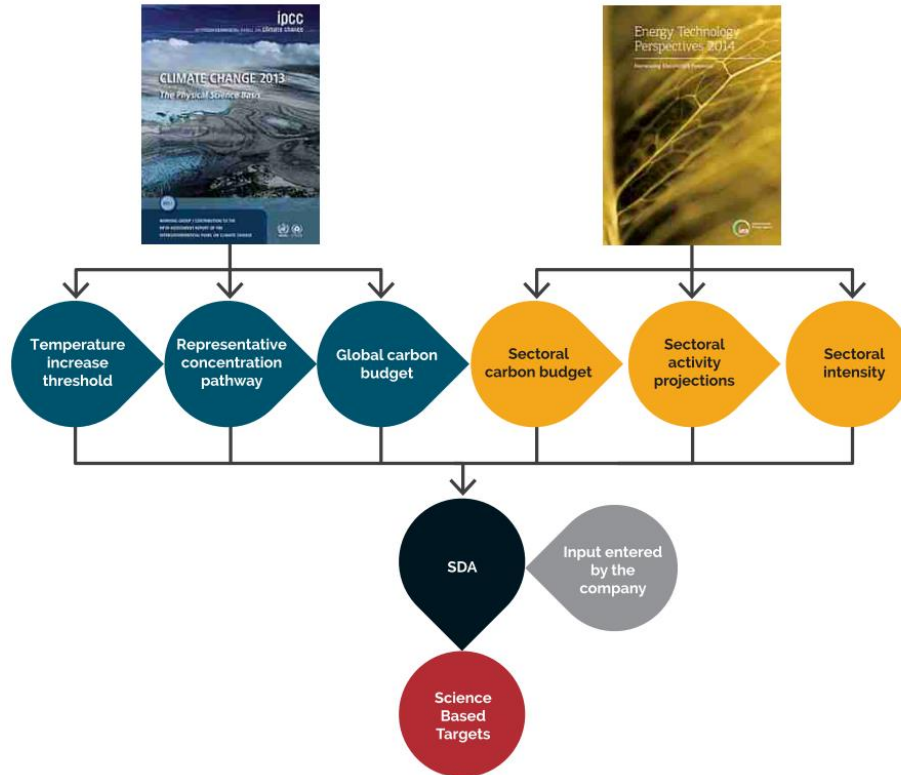
25 % of emissions from electricity and heat sector.

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Agenda

→ What are Science Based Targets and Sectoral Decarbonization?

→ **How does the Sectoral Decarbonization Approach work?**

→ Overview

→ Sector Level
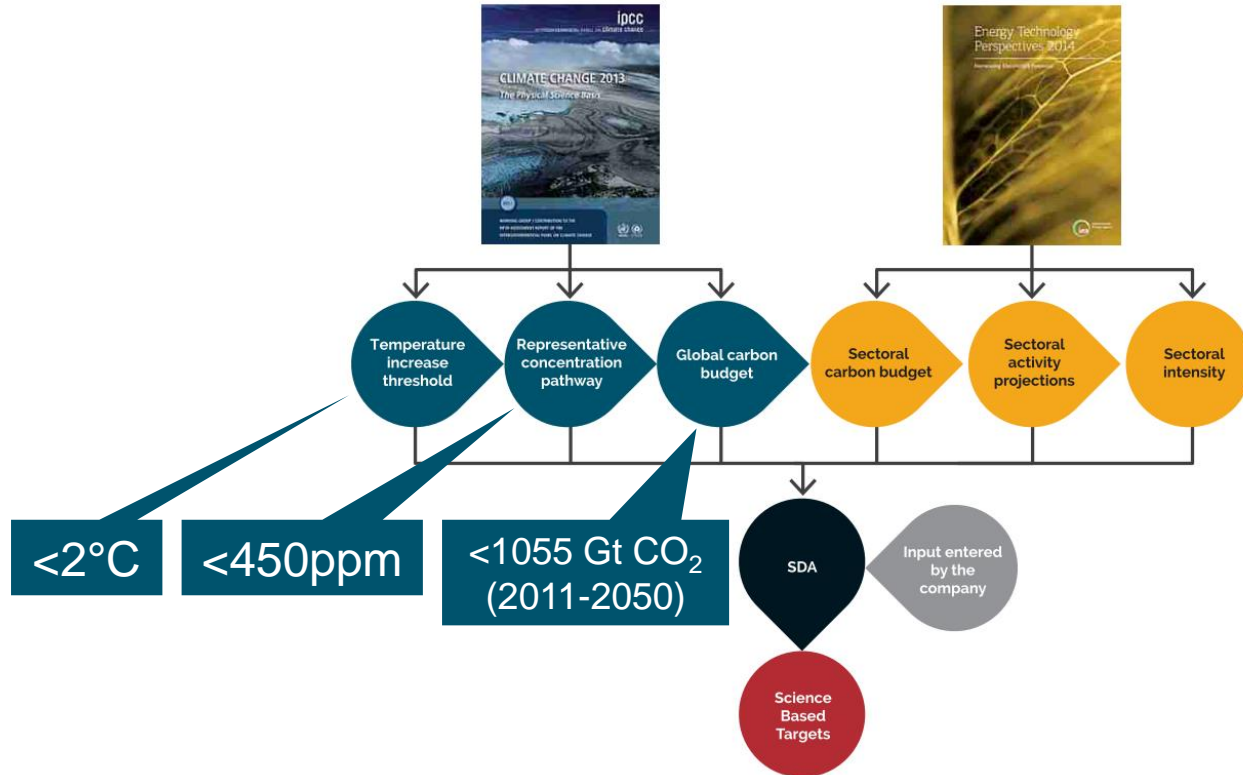
→ Company Level

→ Some criticism & moving forward

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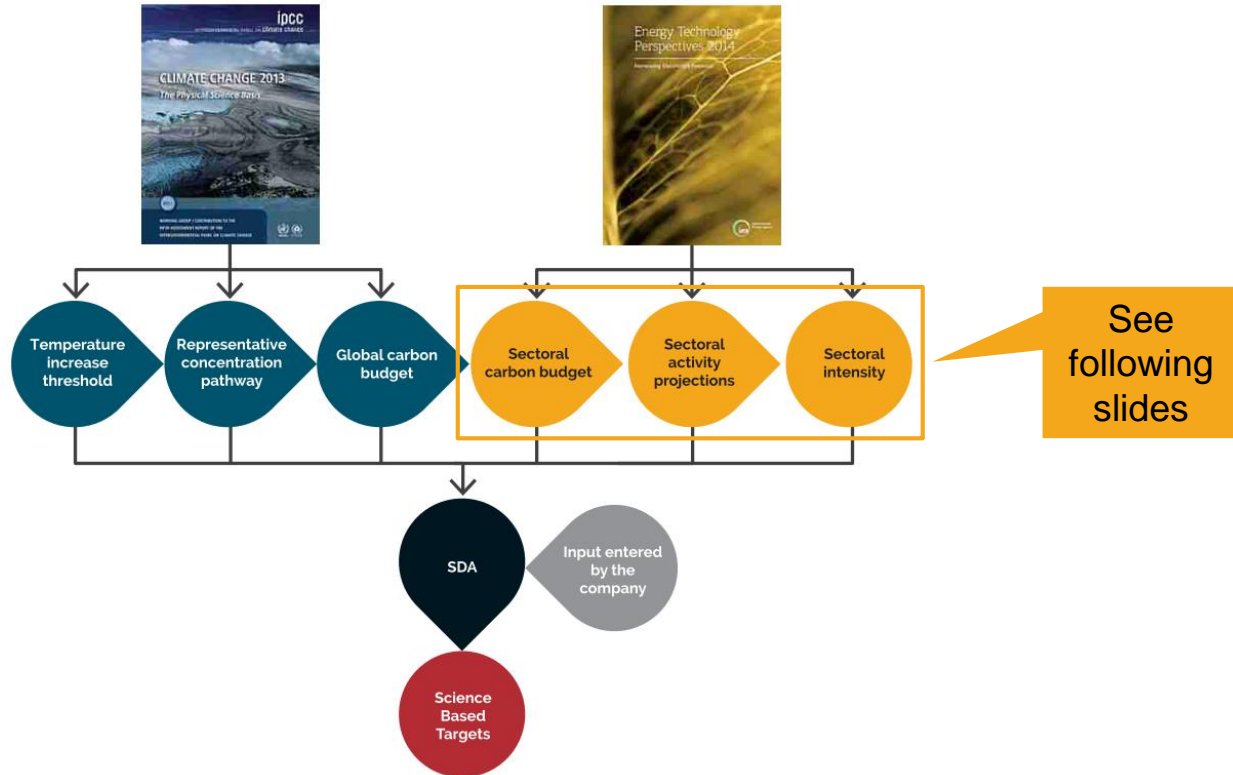Universität
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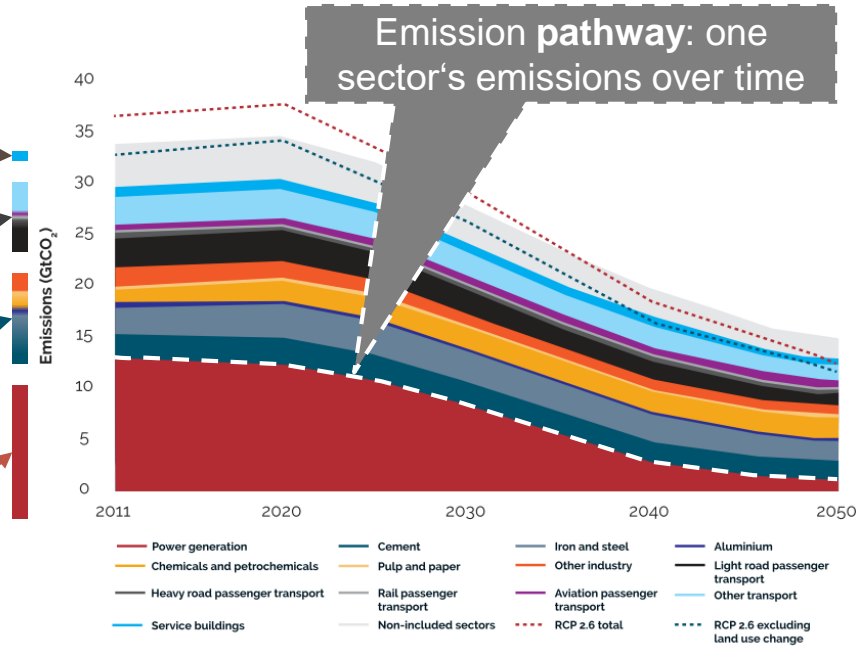Institut für Werkzeugmaschinen
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Agenda

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How does the SDA method work? Overview

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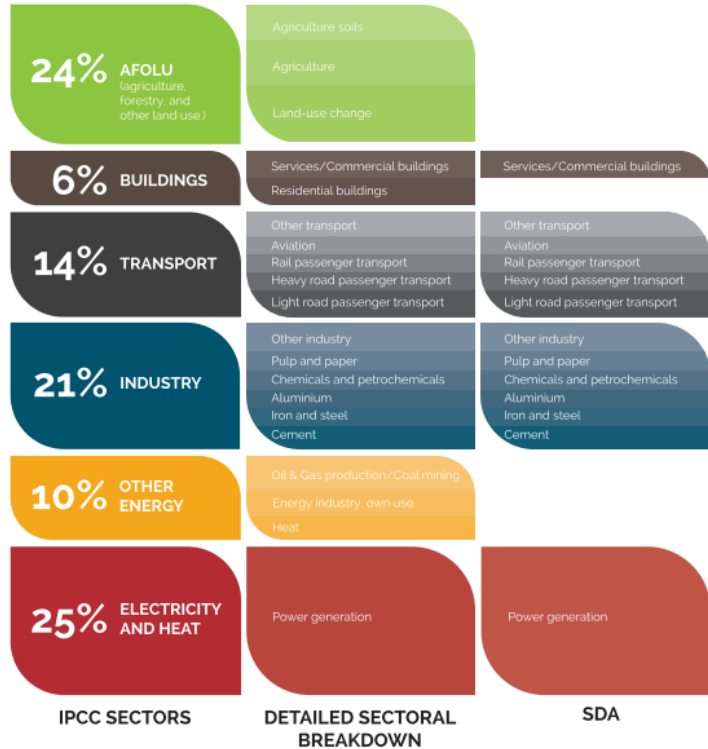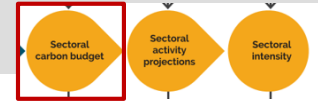<2°C <450ppm <1055 Gt CO_2 (2011-2050)

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    → **Sector Level**

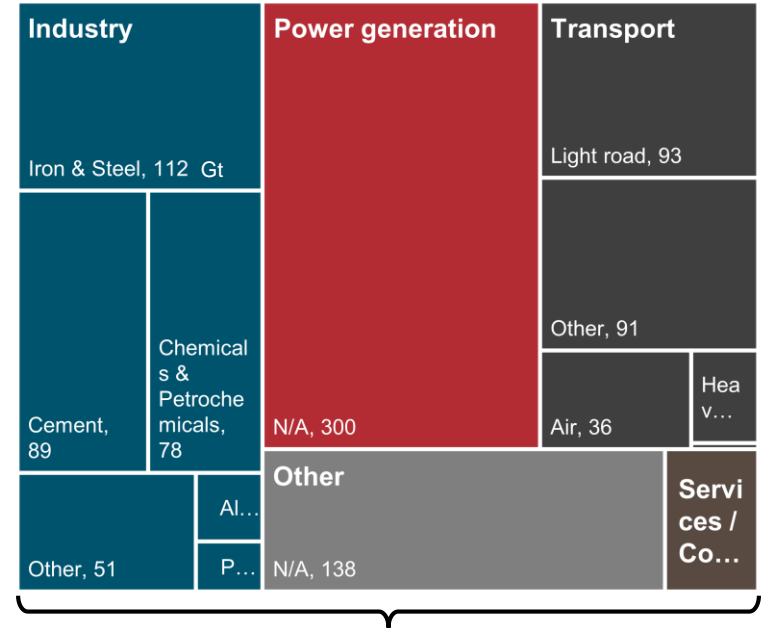   → Company Level
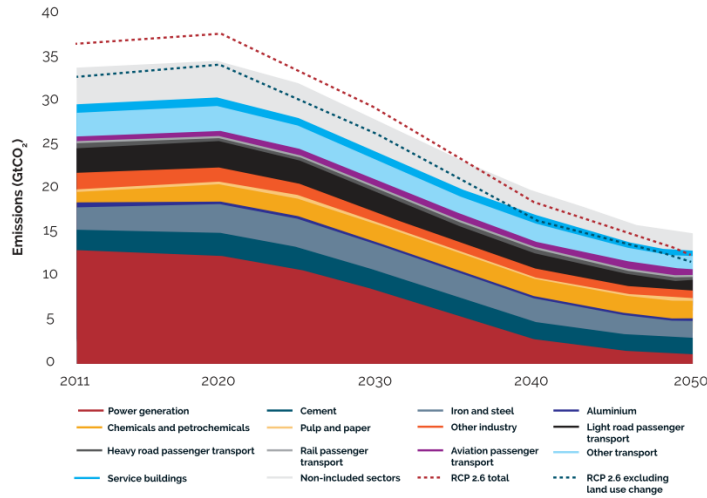
→ Some criticism & moving forward
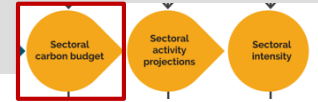
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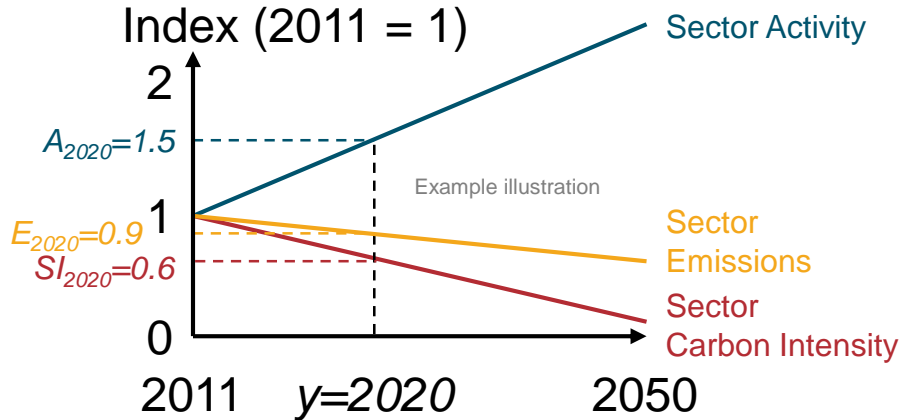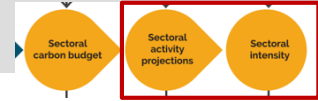# Sector emissions and sector emission pathways

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Sector emission pathways and sector budgets

Overall **budget: 1055 Gt CO$_2$** (sum of all emissions of all sectors from 2011-2050)

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Sectoral activity and sectoral carbon intensity

Index (2011 = 1)

Sector Activity

$A_{2020}=1.5$

$E_{2020}=0.9$

$SI_{2020}=0.6$

Example illustration

Sector Emissions

Sector Carbon Intensity

2011   y=2020   2050

$$\iint_{j\ y}\left(A_{j,y}\times SI_{j,y}+Other_y\right)\le Budget_{2^\circ C,2050}$$

1055 Gt CO_2

$$\int_j\left(A_{j,y}\times SI_{j,y}\right)+Other_y\le Emissions_{2^\circ C,y}$$
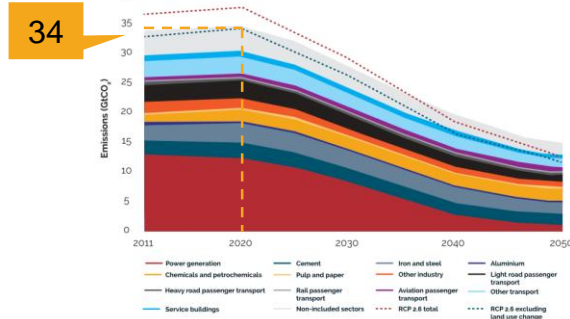
34 Gt CO_2 in 2020

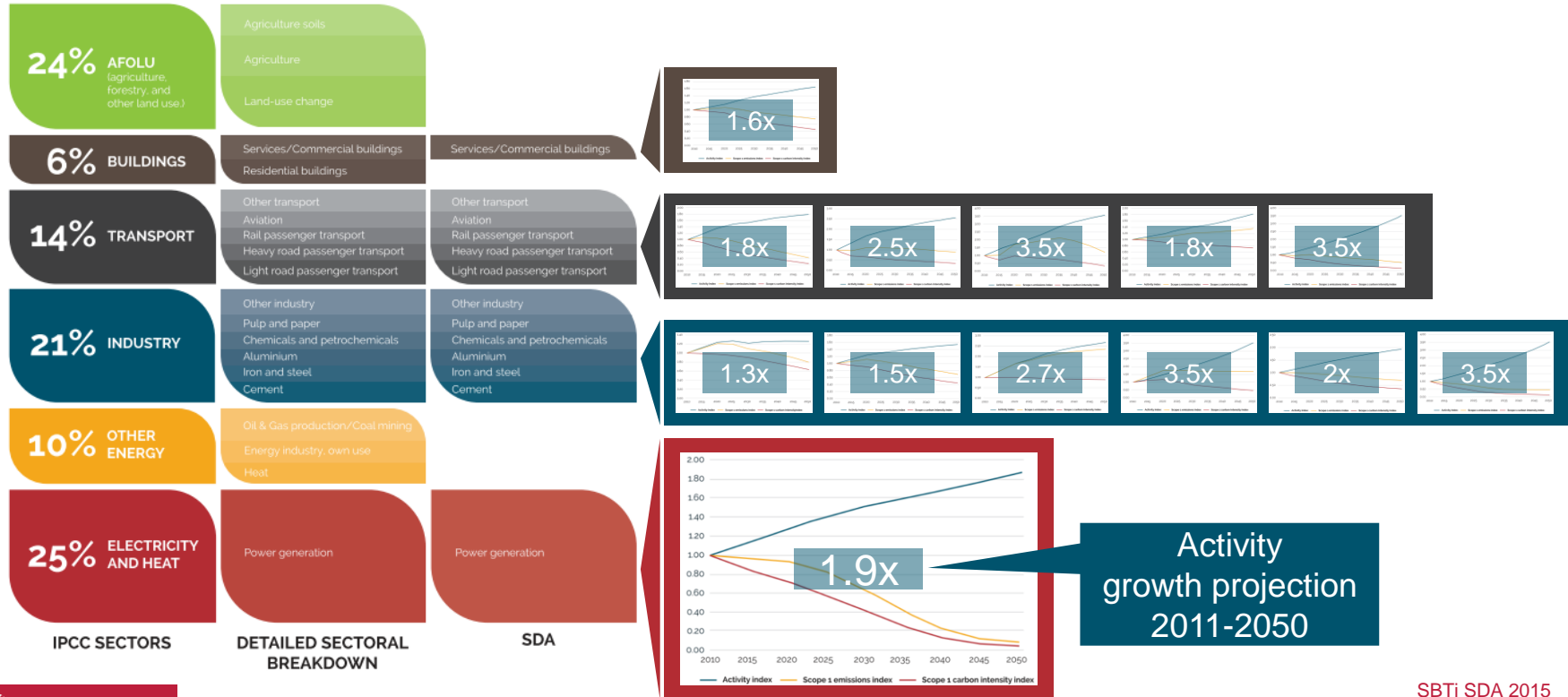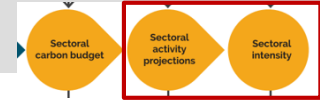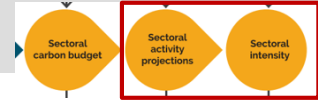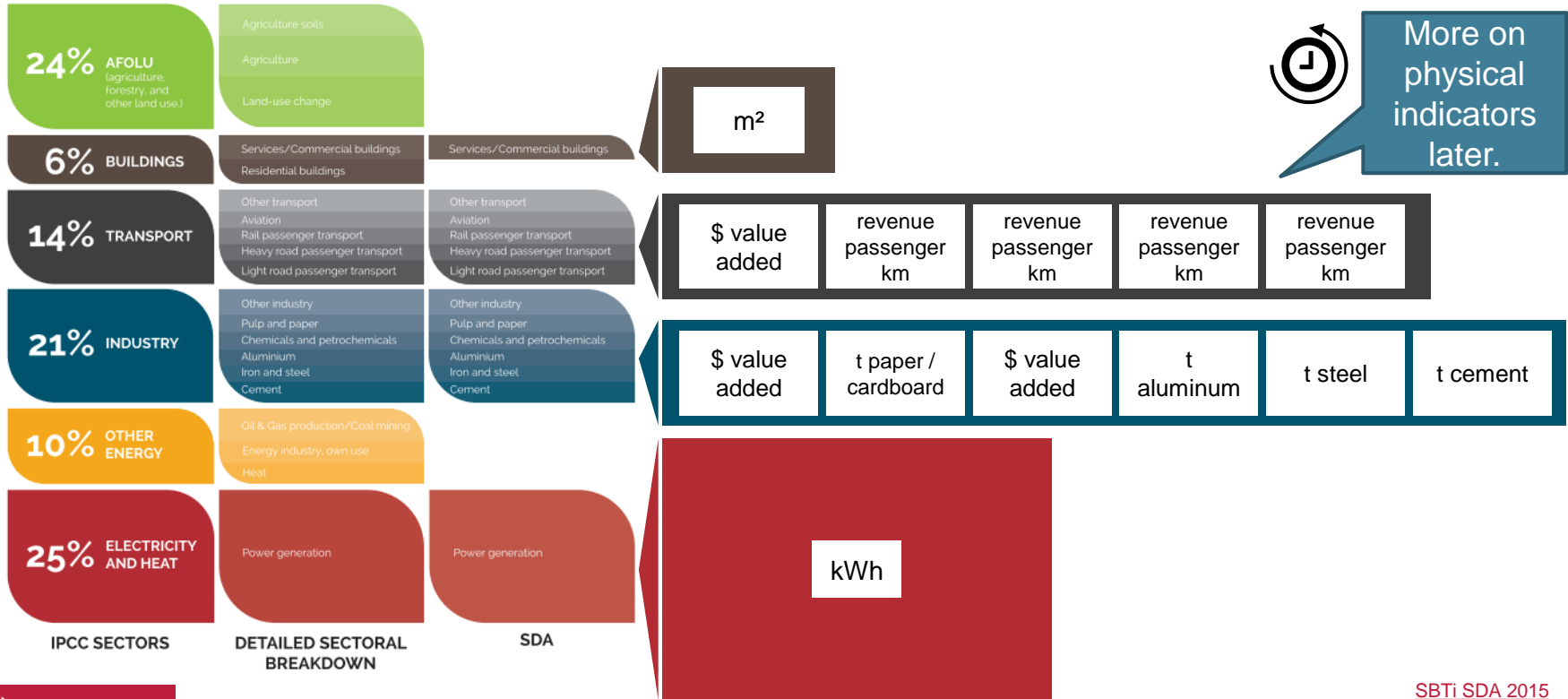|	
$A_{j,y}$	Activity of sector j in year y
$SI_{j,y}$	Carbon intensity of sector i in year y
$Other_y$	Other GHG emissions (not accounted for in the SI_{jy} variable) in year y
$Budget_{2^\circ C,2050}$	Cumulative carbon budget 2011–50 compatible with a below 2ºC scenario
$Emissions_{2^\circ C,y}$	Emissions in year y compatible with a below 2ºC scenario

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Activity and intensity projections

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More on physical indicators later.

IPCC SECTORS	DETAILED SECTORAL BREAKDOWN	SDA	Activity indicators
24% AFOLU (agriculture, forestry, and other land use.)	Agriculture soils / Agriculture / Land-use change		
6% BUILDINGS	Services/Commercial buildings / Residential buildings	Services/Commercial buildings	m²
14% TRANSPORT	Other transport / Aviation / Rail passenger transport / Heavy road passenger transport / Light road passenger transport	Other transport / Aviation / Rail passenger transport / Heavy road passenger transport / Light road passenger transport	$ value added / revenue passenger km / revenue passenger km / revenue passenger km / revenue passenger km
21% INDUSTRY	Other industry / Pulp and paper / Chemicals and petrochemicals / Aluminium / Iron and steel / Cement	Other industry / Pulp and paper / Chemicals and petrochemicals / Aluminium / Iron and steel / Cement	$ value added / t paper / cardboard / $ value added / t aluminum / t steel / t cement
10% OTHER ENERGY	Oil & Gas production/Coal mining / Energy industry, own use / Heat		
25% ELECTRICITY AND HEAT	Power generation	Power generation	kWh

26.11.2021 | Malte Schäfer | Sectoral Decarbonization | Slide 19

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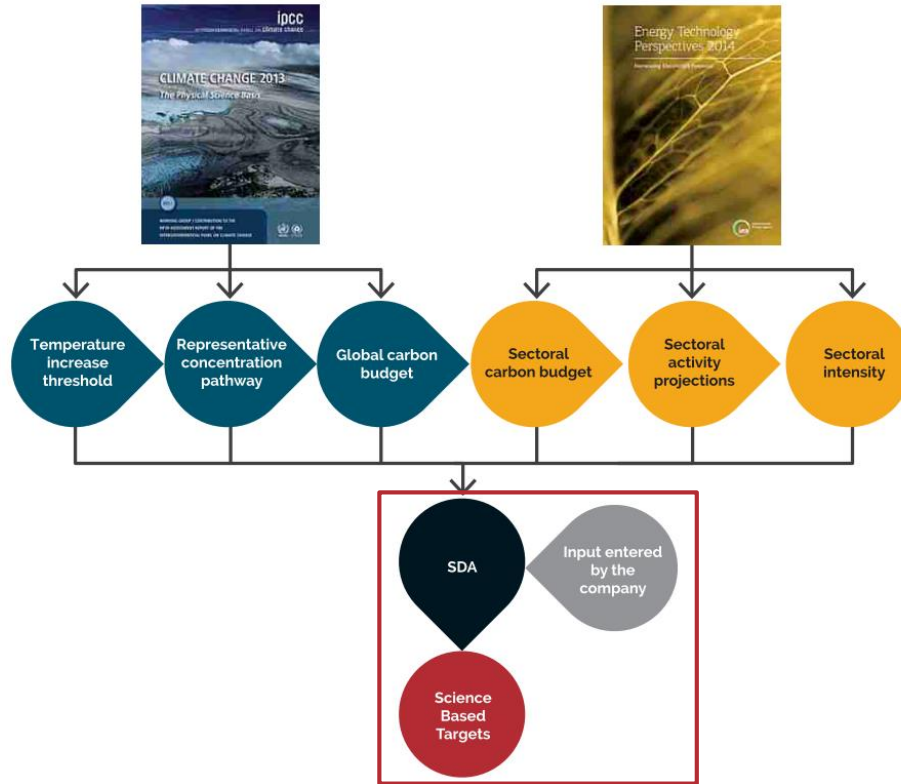
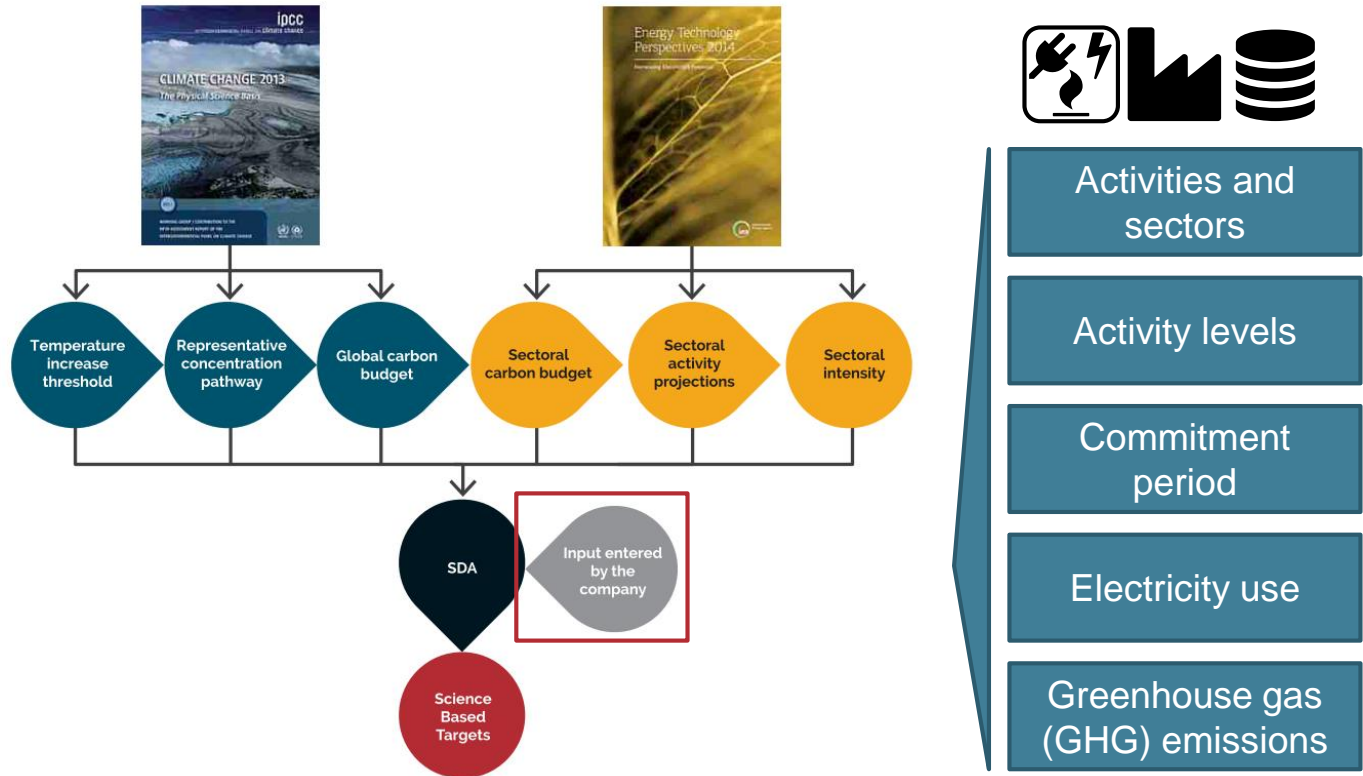Institut für Werkzeugmaschinen und Fertigungstechnik

Agenda

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    → **Company Level**

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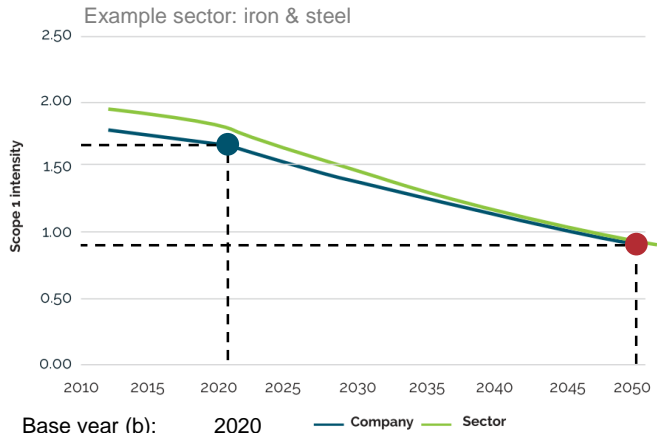und Fertigungstechnik

What data are used to calculate targets?

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Calculating company intensity target CI

CI (Carbon intensity): company target

? ? ?

$$CI_y = d * p_y * m_y + SI_{2050}$$

CI_y	Intensity target of the company in year y (tCO_2e/activity)
d	Initial company performance in the base year relative to 2050 target (tCO_{2e}/activity)
p_y	Decarbonization index of the sector in year y
m_y	Market share parameter in year y
SI_{2050}	CO_2 intensity of the sector in target year 2050 (tCO_{2e}/activity)

Example sector: iron & steel

$SI_{2050} = 0.9$
(t CO_2/t steel)

Base year (b): 2020
Target year: 2050

Company Sector

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Calculating initial company performance d

$$CI_y = d*p_y*m_y + SI_{2050}$$

✔ 0.8   ✔ 0.9

$$d = CI_b - SI_{2050}$$

Example sector: iron & steel

$CI_b = 1.7$

$SI_{2050} = 0.9$

Scope 1 intensity

Base year (b):	2020
Target year:	2050
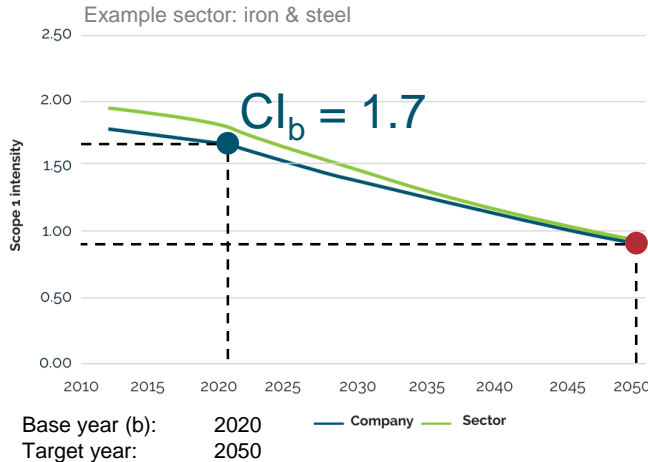
— Company — Sector

d	Initial company performance in the base year relative to the 2050 sector target (tCO₂ₑ/activity)
CI_b	CO$_2$ intensity of the company in base year b (tCO$_2$/activity)
SI_{2050}	CO$_2$ intensity of the sector in year 2050 (tCO$_2$/activity)

d =
$CI_b - SI_{2050}$ =
$1.7 - 0.9$ =
0.8

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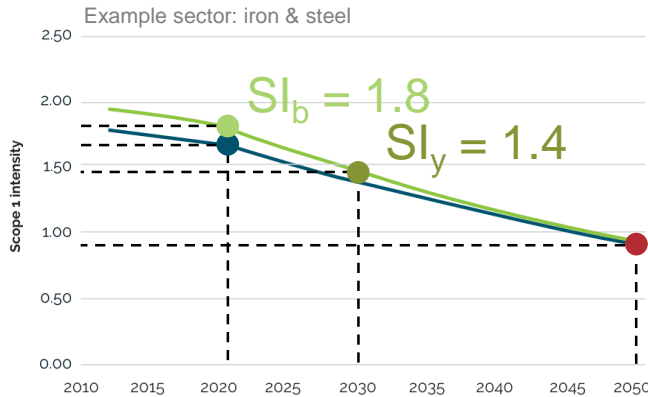Institut für Werkzeugmaschinen und Fertigungstechnik

Calculating decarbonization index p

$$CI_y = d * p_y * m_y + SI_{2050}$$

✓ ✓   ✓

0.8 0.56   0.9

$$p_y = (SI_y - SI_{2050}) / (SI_b - SI_{2050})$$

p_y	Decarbonization index of the sector in year y
SI_y	CO_2 intensity of the sector in year y (tCO_2/activity)
SI_{2050}	CO_2 intensity of the sector in target year 2050 (tCO_2/activity)
SI_b	CO_2 intensity of the sector in base year b (tCO_2/activity)

Example sector: iron & steel

$SI_b = 1.8$

$SI_y = 1.4$

$SI_{2050} = 0.9$

Base year (b):	2020
Year (y):	2030
Target year:	2050

$p_y =$
$(SI_y - SI_{2050}) / (SI_b - SI_{2050}) =$
$(1.4 - 0.9) / (1.8 - 0.9) =$
$0.5 / 0.9 =$
0.56

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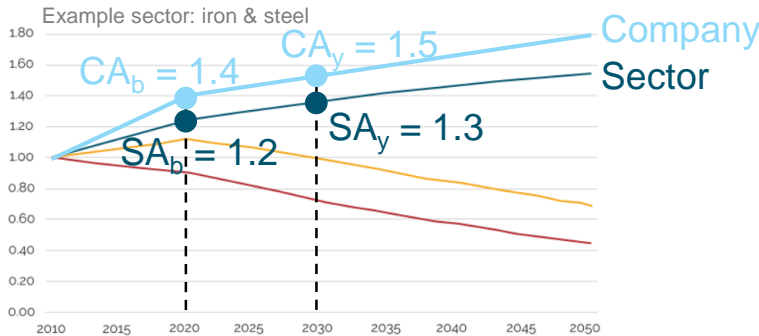# Calculating market share parameter m

$$CI_y = d * p_y * m_y + SI_{2050}$$

✓ ✓ ✓ ✓
0.8 0.56 1.01 0.9

$$m_y = (CA_b / SA_b) / (CA_y / SA_y)$$

m_y	Market share parameter in year y (%)
CA_b	Activity of the company in base year b
SA_b	Activity of the sector in base year b
CA_y	Activity of the company in year y
SA_y	Activity of the sector in year y

Example sector: iron & steel

$CA_b = 1.4$
$CA_y = 1.5$
Company
Sector
$SA_y = 1.3$
$SA_b = 1.2$

— Activity index — Scope 1 emissions index — Scope 1 carbon intensity index

Base year (b):	2020
Year (y):	2030
Target year:	2050

$m_y =$
$(CA_b / SA_b) / (CA_y / SA_y) =$
$(1.4 / 1.2) / (1.5 / 1.3) =$
$1.17 / 1.15 =$
1.01

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Calculating company intensity target CI

$$CI_y = d*p_y*m_y + SI_{2050}$$

✓ ✓ ✓ ✓
0.8 0.56 1.01 0.9

⊙ CI (Carbon intensity): company target ▷ $CI_y = d*p_y*m_y + SI_{2050}$

CI_y Intensity target of the company in year y (tCO_2e/activity)
d Initial company performance in the base year relative to 2050 target (tCO_2e/activity)
p_y Decarbonization index of the sector in year y
m_y Market share parameter in year y
SI_{2050} CO_2 intensity of the sector in target year 2050 (tCO_2e/activity)

Example sector: iron & steel

$CI_y = 1.35$

Base year (b): 2020
Year (y):   2030
Target year: 2050

SBTi SDA 2015

$CI_y =$
$d*p_y*m_y + SI_{2050} =$
$0.8*0.56*1.01 + 0.9 =$
1.35 (t CO_2/t steel)

⊙ Company target: reduce carbon intensity from 1.7 (in 2020) to 1.35 (in 2030) t CO_2 / t steel.

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Summary of the SDA method

CI (Carbon intensity): company target

$$CI_y = d * p_y * m_y + SI_{2050}$$

Sector target

$$d = CI_b - SI_{2050}$$

Initial company performance
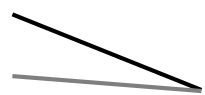
$$p_y = (SI_y - SI_{2050}) / (SI_b - SI_{2050})$$

Decarbonization index

$$m_y = (CA_b / SA_b) / (CA_y / SA_y)$$

Market share parameter

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Some key assumptions of the SDA method

Excerpt of assumptions:

The carbon intensity of each company in a homogeneous sector will **converge with the sectoral carbon intensity** in 2050.

Economic **growth is decoupled** from CO_2 emissions arising from the use of energy and materials.

2°C

The societal goal to stay below **2°C is sufficient** to avoid dangerous climate change and thus the consequent carbon budgets to stay below that threshold are used.

If companies adopt long-term targets (e.g. in 2050) they are also taking on **short-term targets** along the non-linear RCP2.6 trajectory that ensures the overall budget is not blown.

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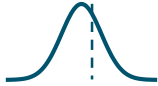Institut für Werkzeugmaschinen
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Agenda

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Some criticism of the SDA method

Critical issues:

No space for **new sectors** and their emissions

Only **66 % confidence** in avoiding 2°C warming

Assumes **limiting to 2°C warming is enough**
*(but: methodology is currently being overhauled
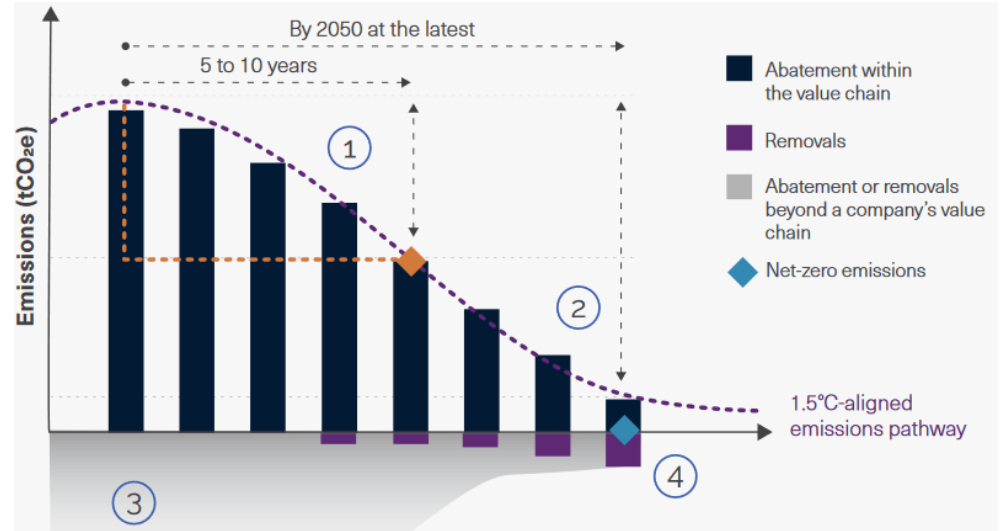to consider 1.5°C and net-zero targets)*

Assumes **decoupling** of economic growth and emissions is possible

Intensity instead of absolute targets: emission growth still possible
(but: see net-zero targets)

[…]

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Moving forward: SBTi Net-Zero Target Setting

Thank you! Questions, comments?

Malte Schäfer, 26.11.2021

References

SBTi Website https://sciencebasedtargets.org/

SBTi Sectoral Decarbonization Approach 2015 https://sciencebasedtargets.org/resources/files/Sectoral-Decarbonization-Approach-Report.pdf

IEA ETP 2014 https://www.iea.org/reports/energy-technology-perspectives-2014

IPCC AR5 Synthesis Report: Climate Change 2014 https://www.ipcc.ch/report/ar5/syr/

SBTi Corporate Net Zero Standard 2021 https://sciencebasedtargets.org/resources/files/Net-Zero-Standard.pdf

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What are defining features of the SDA?

subsector-level approach and global least-cost mitigation perspective.

SDA results and assumptions are based on mitigation potential and cost data from the IEA's TIMES model 2ºC scenario (2DS), which identifies the least-cost technology mix available to meet final demand for industry, transport, and buildings services.
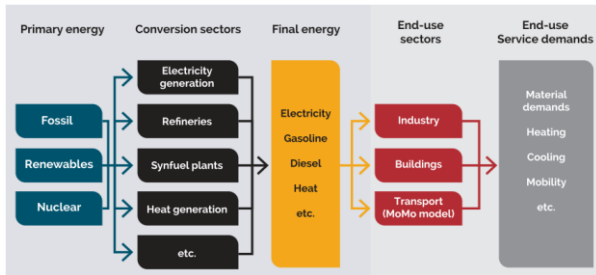
Least cost technology mix

Final demand for industry, transport and buildig services

2°C warming

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EQUATION 7

$$CE_y = CE_b * (SE_y / SE_b)$$

WHERE:

CE_y Company emissions in year y (tCO_{2e})
CE_b Company emissions in base year b (tCO_{2e})
SE_y Emissions of the sector in year y (tCO_{2e})
SE_b Emissions of the sector in base year b (tCO_{2e})

What about scope 2 emissions?

Can be important for many companies

So far we only focused on scope 1

EQUATION 8

$$SI_{s2y} = \frac{PS_y * SI_{Power,y}}{SA_y}$$

WHERE:

$SI_{s2, y}$ Scope 2 intensity of the sector in year y (tCO_{2e}/activity)
PS_y Power consumption of the sector in year y (MWh)
$SI_{Power, y}$ Intensity target for the power sector in year y
SA_y Activity of the sector in year y (tCO_{2e})

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What are scope 1/2/3 emissions?

- Scope 1: All direct GHG emissions.
- Scope 2: Indirect GHG emissions from consumption of purchased electricity, heat, or steam.
- Scope 3: Other indirect emissions, such as the extraction and production of purchased materials and fuels, transport-related activities in vehicles not owned or controlled by the reporting entity, electricity-related activities not covered in Scope 2, outsourced activities, waste disposal, etc.
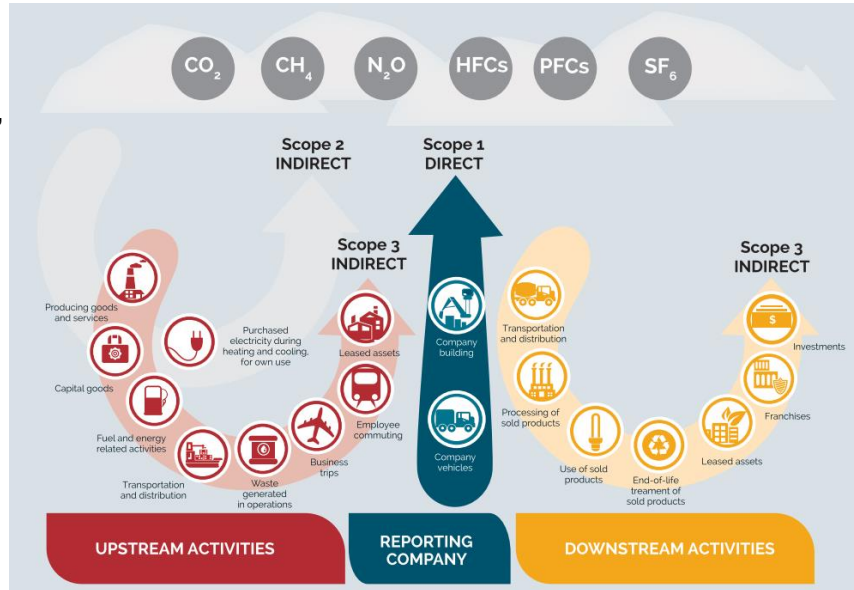
Relevant for SDA: scope 1 & 2

On double counting:

Cross-sector dependencies can hamper proper accounting of emission reductions. For example, a truck manufacturer can achieve a scope 3 target by making more efficient trucks. A transportation company can achieve a scope 1 target by using these more efficient trucks. When both companies claim these emission reductions, it results in double counting. This shouldn't be a problem, since:

- The objective of the method is to set targets for individual companies, not to set up a validated accounting system at the global level. Double counting is only an issue when you aggregate individual results.

- The fact that two companies reduce emissions in the same activity will only create a stronger impetus to achieve this target, and support a better business model, such as the example of the truck manufacturer.

- The objective, in this example, is to reduce the emissions of the transportation sector. By achieving this target, both companies contribute to achieving the global 2°C decarbonization pathway.

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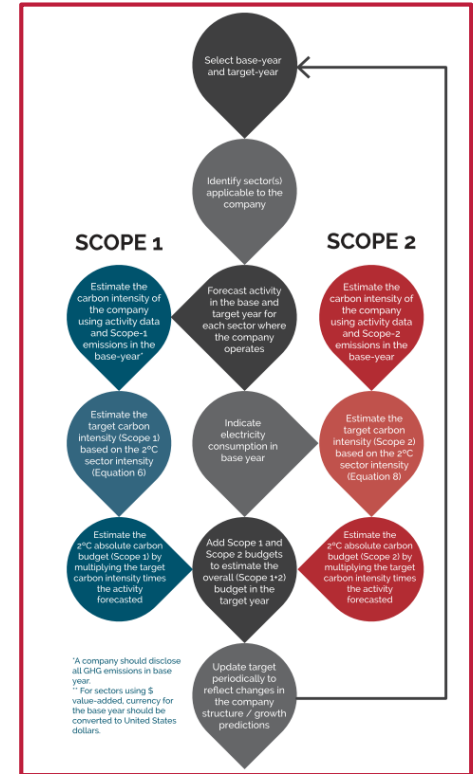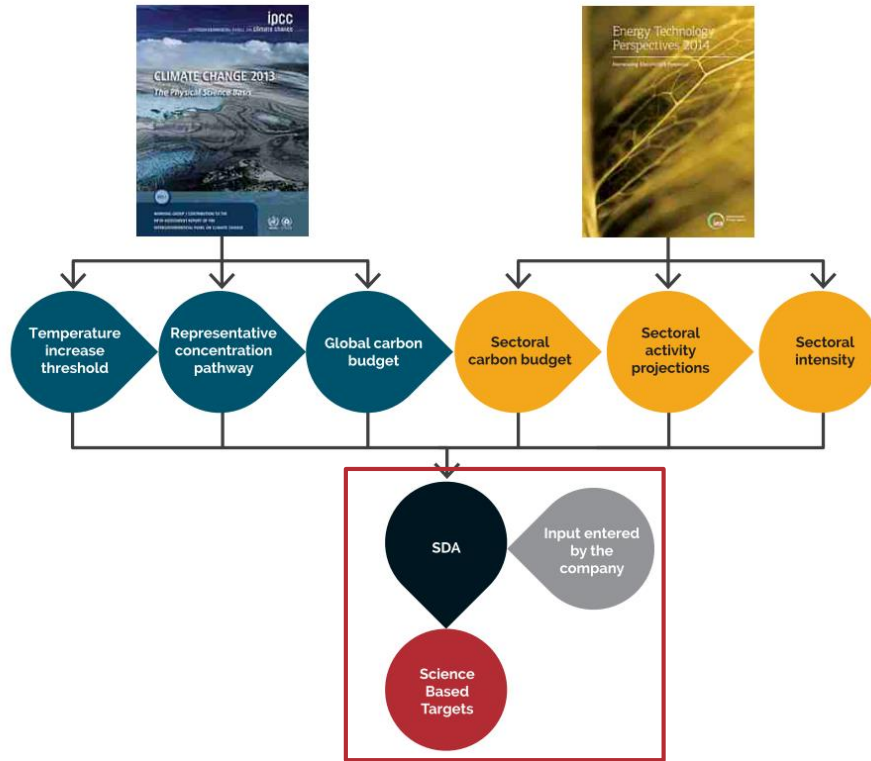
Case study: steel company

Figure 21. Scope 1 carbon intensity
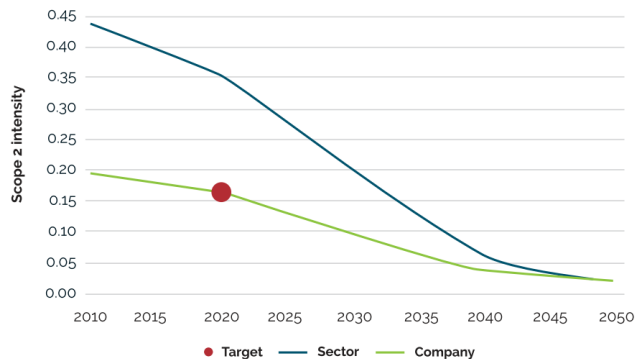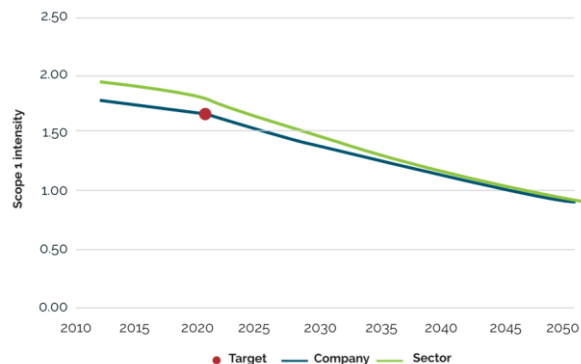
TABLE 4. COMPANY A INPUT INFORMATION

Company:	Company A
Sector:	Iron and steel
Base year:	2012
Target year:	2020
Activities in the base year:	70,560,000 tons crude steel
Annual activity growth rate:	1.6% per year
Scope 1 emissions company base year:	126,400,000 tCO2e
Scope 2 emissions company base year (market method):	13,600,000 tCO2e
Electricity consumption base year:	31,493,191,200 kWh
Scope 1 emission intensity base year:	1.79 tCO$_2$/ton crude steel
Scope 2 emission intensity base year:	0.19 tCO$_2$/ton crude steel

TABLE 5. CARBON INTENSITY AND ABSOLUTE EMISSIONS TARGETS FOR COMPANY A

Iron and steel		Unit of measure	2012	2020	Percent change
Scope 1	Carbon intensity target	tCO$_2$/t crude steel	1.79	1.67	-7
	Absolute emissions target	tCO$_2$	126,400,000	133,555,125	6
Scope 2	Carbon intensity target	tCO$_2$/t crude steel	0.19	0.16	-14
	Absolute emissions target	tCO$_2$	13,600,000	13,215,418	-3
Scopes 1 and 2	Carbon intensity target	tCO$_2$/t crude steel	1.98	1.83	-8

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Assumptions – IEA 2DS
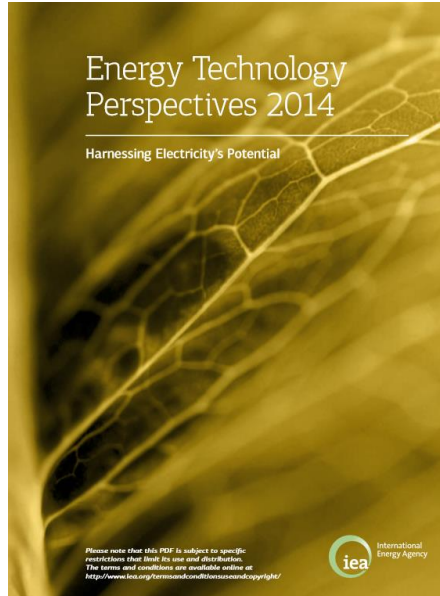
TABLE 3. DRIVING ASSUMPTIONS IN THE IEA ETP 2DS

GDP growth	2011–20	2020–30	2030–50	2011–50	
Compound annual growth rate (CAGR) in %	4.0	3.4	2.7	3.2	

Marginal abatement cost[a]	2020	2030	2040	2050	
US$/tCO$_2$	30–50	80–100	120–140	140–170	

Population projections	2011	2020	2030	2040	2050
Global population (millions)	6,986	7,701	8,406	9,016	9,524

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