

The Limits to Growth: Sustainability and the Circular Economy

Lecture 3: Challenges II: Natural Resources and Pollution

Prof. Dr. Benjamin Leiding
M.A. Theresa Sommer

License

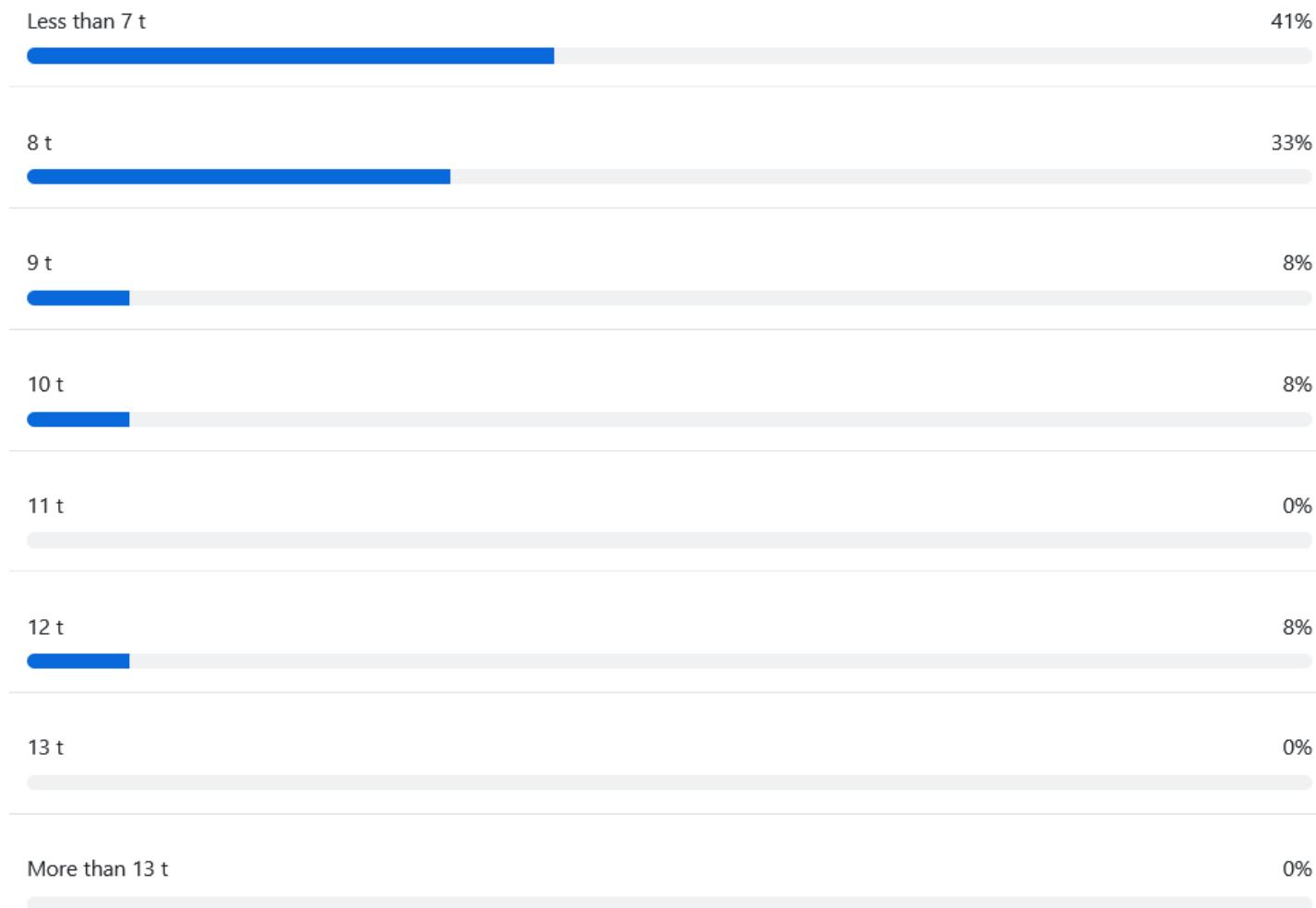
- This work is licensed under a **Creative Commons Attribution-ShareAlike 4.0 International License**. To view a copy of this license, please refer to <https://creativecommons.org/licenses/by-sa/4.0/> .
- Updated versions of these slides will be available in our [Github repository](#).

E02 – YOUR PERSONAL CARBON FOOTPRINT

Your Personal Carbon Footprint

Results E02

Results: What is your carbon footprint according to the instructions in the E02 exercise sheet?



Your Personal Carbon Footprint

Problem already solved?

So we just reduce our CO₂ footprint and we are good?

Your Personal Carbon Footprint

Microsoft will be Carbon Negative by 2030

“By 2030 Microsoft will be carbon negative, and by 2050 Microsoft will remove from the environment all the carbon the company has emitted either directly or by electrical consumption since it was founded in 1975.”

Your Personal Carbon Footprint

Apple will be Carbon Neutral by 2030

July 2020

“Apple today unveiled its plan to become carbon neutral across its entire business, manufacturing supply chain, and product life cycle by 2030. The company is already carbon neutral today for its global corporate operations, and this new commitment means that by 2030, every Apple device sold will have net zero climate impact.”

Your Personal Carbon Footprint

Polestar - 2030 Climate-neutral Car

“...we’re embarking on our greatest journey so far: challenging ourselves to create a climate-neutral car by 2030, by reducing emissions throughout supply chain and production.”

Your Personal Carbon Footprint

Polestar - 2030 Climate-neutral Car

“...we’re embarking on our greatest journey so far: challenging ourselves to create a climate-neutral car by 2030, by reducing emissions throughout supply chain and production.”

“Relying on the current trend of offsetting by planting trees is not sustainable in the long run. It would mean using too much land, and the long-term carbon-storage capacity of forests and soils is not well known. Offsetting by planting trees also risks contributing to monocultures and loss of biodiversity. Additionally, there can be no guarantee that a forest won’t later be logged, devastated by a forest fire or altered by climate change.”

Your Personal Carbon Footprint

Problem already solved?

It is not only about CO₂...

Your Personal Carbon Footprint

Greenwashing?

Apple iPad Pro 11" 2018	<ul style="list-style-type: none">• Gobs of adhesive hold most everything in place, making all repairs more difficult.• The battery is secured with both easier-to-remove stretch-release tabs and conventional, non-removable adhesive.• The USB-C port is modular and can be independently replaced.
Microsoft Surface Pro 6 2018	<ul style="list-style-type: none">• All repairs require first removing the display assembly—which is stubbornly glued in place, expensive, and prone to shattering.• The battery is firmly glued in place, with its connector pinned under the motherboard—requiring near-total disassembly for service.• Once upon a time, Surface Pro storage was removable—but not in this version.
Apple iPad Air 3 2019	<ul style="list-style-type: none">• Battery replacement is possible, but still unnecessarily difficult.• Gobs of adhesive hold many parts and cables in place, complicating all repairs.• Many components are modular and can be replaced independently, but the Lightning port is soldered to the logic board.
Apple iPad 7 2019	<ul style="list-style-type: none">• As with all iPads, a solid barrier of very strong adhesive hinders all repairs.• The Lightning port, a common point of failure, is soldered to the logic board.• More adhesive holds nearly everything else in place. Battery and logic board replacements are particularly obnoxious.
Apple iPad Mini 5 2019	<ul style="list-style-type: none">• Battery replacement is possible, but still unnecessarily difficult.• Gobs of adhesive hold many parts and cables in place, complicating all repairs.• Removing the home button is tough, and will be required for display replacement if you want to keep Touch ID functionality.

A LACK OF RESOURCES

We only have one planet

Resources



*"I am afraid of losing my child
to a resource war because of a
climate collapse"*

→ “Our parents will die of old
age, our children will die of
climate change”

We only have one Planet

Resource Wars

“Resource wars are violent conflicts that are largely driven by competition for control over vital or valuable natural materials, such as oil, water, land, timber, animals (or animal products), gold, silver, gems, and other key minerals.”

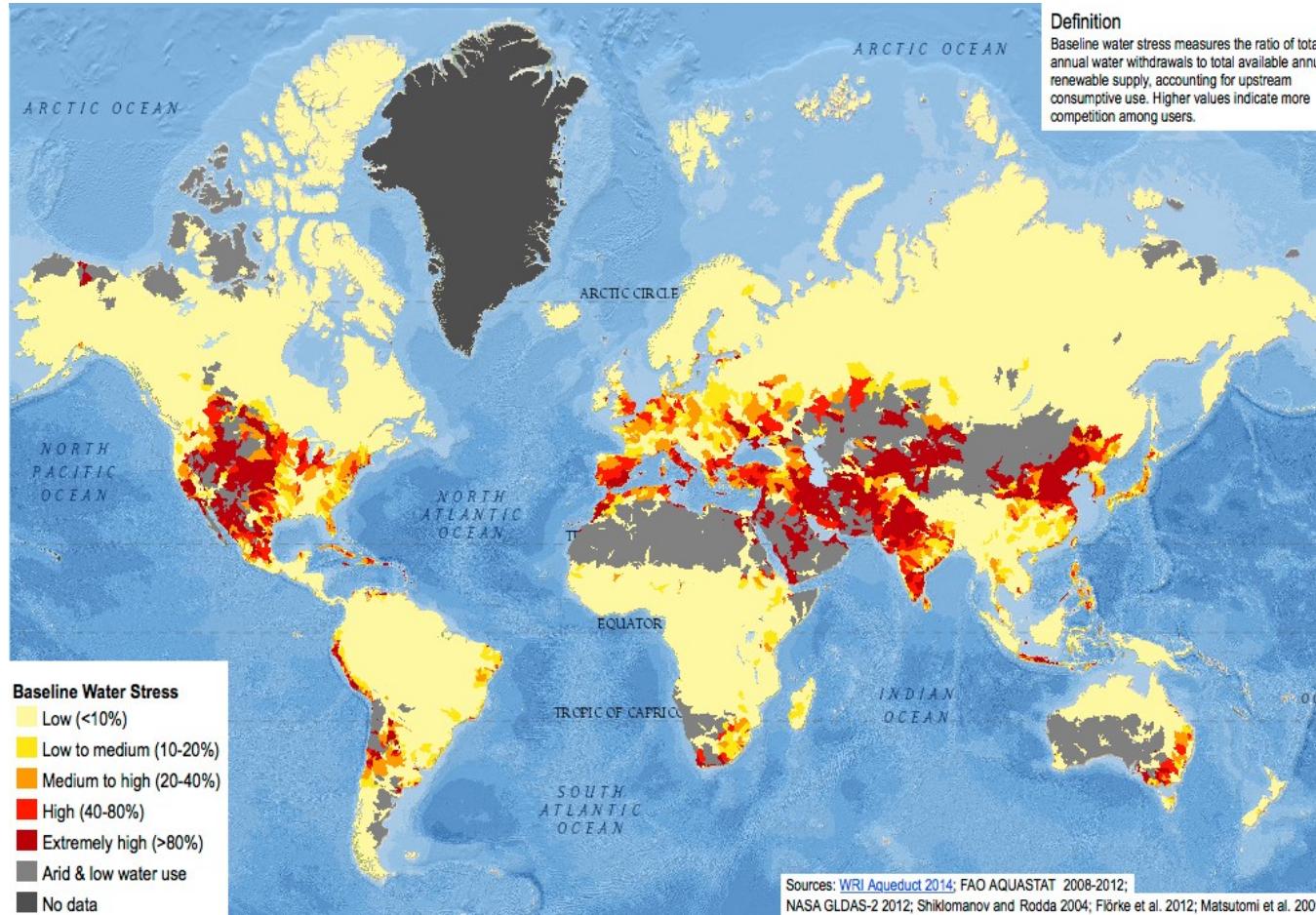
We only have one Planet

Resource Wars - Oil, etc.



We only have one Planet

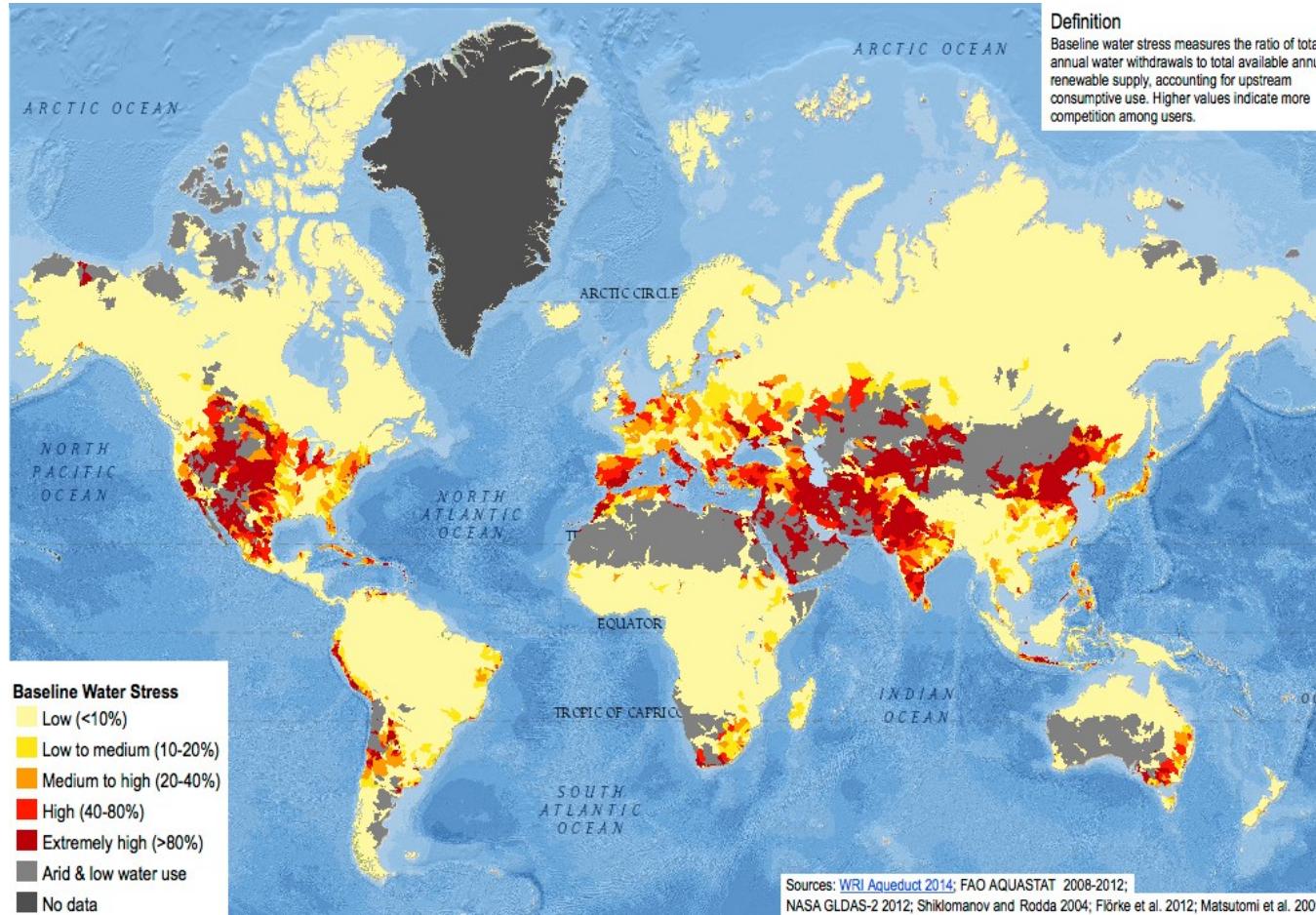
Resource Wars – Water



1. Sampa – https://commons.wikimedia.org/wiki/File:Baseline_water_stress.jpg – CC BY-SA 4.0.
2. Kgbo – https://commons.wikimedia.org/wiki/File:Closed_Wivenhoe_Dam_and_spillway,_August_2020.jpg – CC BY-SA 4.0.
3. Arian Zwegers – <https://www.flickr.com/photos/azwegers/6226842732> – CC BY 2.0.

We only have one Planet

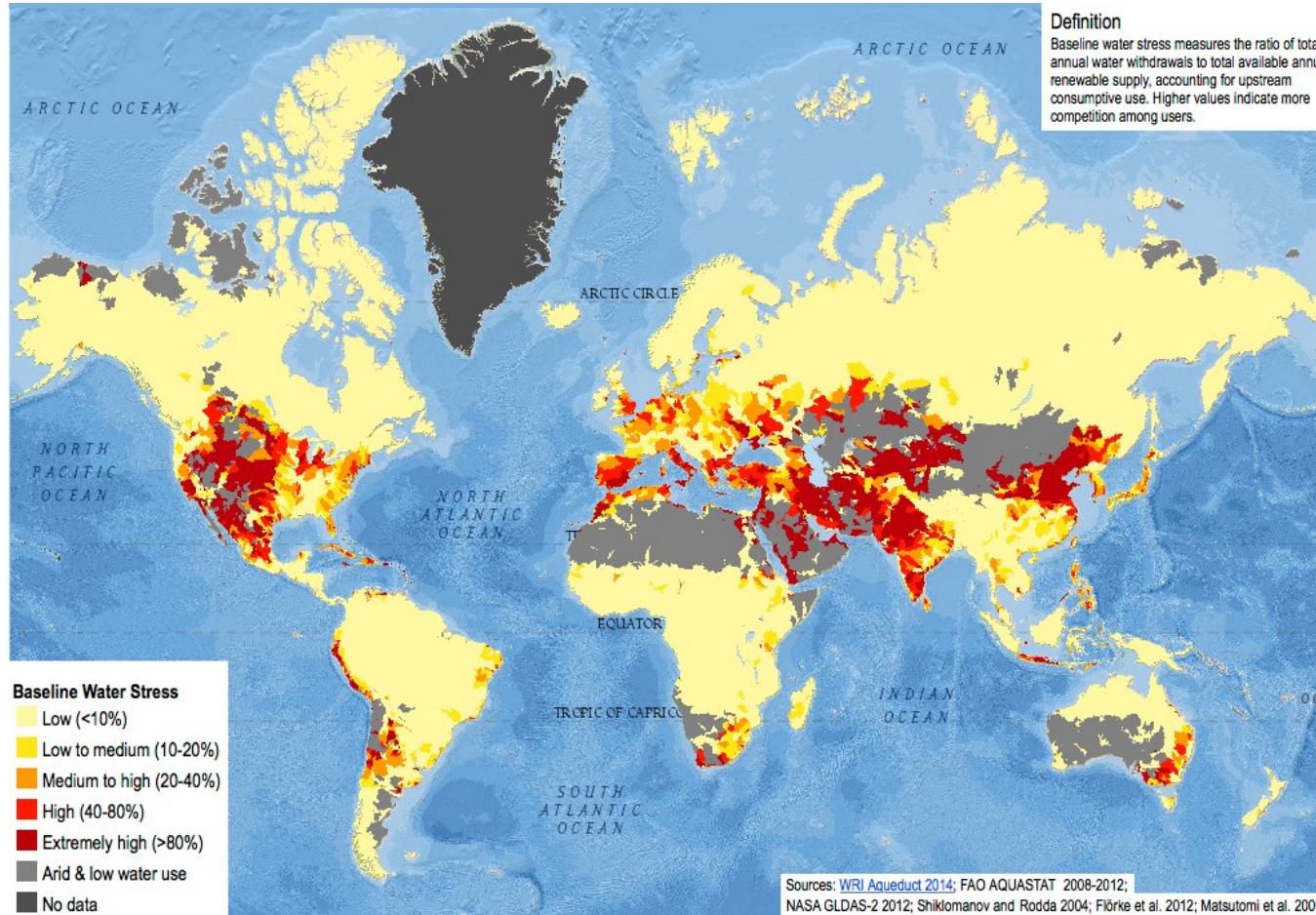
Resource Wars – Water



1. Sampa – https://commons.wikimedia.org/wiki/File:Baseline_water_stress.jpg – CC BY-SA 4.0.
2. Kgbo – https://commons.wikimedia.org/wiki/File:Closed_Wivenhoe_Dam_and_spillway,_August_2020.jpg – CC BY-SA 4.0.
3. Arian Zwegers – <https://www.flickr.com/photos/azwegers/6226842732> – CC BY 2.0.

We only have one Planet

Resource Wars – Water



1. Sampa – https://commons.wikimedia.org/wiki/File:Baseline_water_stress.jpg – CC BY-SA 4.0.
2. Kgbo – https://commons.wikimedia.org/wiki/File:Closed_Wivenhoe_Dam_and_spillway,_August_2020.jpg – CC BY-SA 4.0.
3. Arian Zwegers – <https://www.flickr.com/photos/azwegers/6226842732> – CC BY 2.0.

ENVIRONMENTAL POLLUTION

Environmental Pollution

Definition

„Pollution, also called environmental pollution, the addition of any substance (solid, liquid, or gas) or any form of energy (such as heat, sound, or radioactivity) to the environment at a rate faster than it can be dispersed, diluted, decomposed, recycled, or stored in some harmless form.

The major kinds of pollution, usually classified by environment, are air pollution, water pollution, and land pollution.”

Environmental Pollution

Waste



1. "Landfill at Upernivik" by ulalume - <https://www.flickr.com/photos/96649248@N00/43867280734> - CC BY-NC-ND 2.0.

2. Christian Hüpfer - <https://flic.kr/p/aKXw2F> - CC BY-SA 2.0.

Environmental Pollution

Fossil Fuels

- 3 of the 10 dirtiest European coal plants are located in Poland
- In which country/countries are the other 7 dirtiest coal plants located?
 - 7 of the 10 dirtiest European coal plants are located in **GERMANY**



1. <https://ember-climate.org/insights/research/top-10-emitters-in-the-eu-ets-2021/>

2. John Englart - <https://www.flickr.com/photos/takver/11308053925/> - CC BY-SA 2.0.

3. John Englart - <https://www.flickr.com/photos/takver/51658831095/> - CC BY-SA 2.0.

Environmental Pollution

Horrible Waste Management - Example 1



Environmental Pollution

Horrible Waste Management - Example 1



Environmental Pollution

Horrible Waste Management - Example 1

→ 2 generations profited from cheap nuclear energy

Environmental Pollution

Horrible Waste Management - Example 1

- 2 generations profited from cheap nuclear energy
- 40,000 generation will have to live with the waste

Environmental Pollution

Horrible Waste Management - Example 2



"Pollution Plastique" by Mouenthias is licensed with CC BY-SA 4.0. To view a copy of this license, visit <https://creativecommons.org/licenses/by-sa/4.0/>

Environmental Pollution

Horrible Waste Management - Example 2

- We are consuming about 2000 tiny pieces of plastic every week.



"Pollution Plastique" by Mouenthias is licensed with CC BY-SA 4.0. To view a copy of this license, visit <https://creativecommons.org/licenses/by-sa/4.0/>

Wijnand de Wit and Nathan Bigaud for the WWF (2019) – No Plastic in Nature: Assessing Plastic Ingestion from Nature to People.

Environmental Pollution

Horrible Waste Management - Example 2

- We are consuming about 2000 tiny pieces of plastic every week.
- That is a credit card every week!
- That's approximately 21 grams a month, or just over 250 grams a year.



"Pollution Plastique" by Mouenthias is licensed with CC BY-SA 4.0. To view a copy of this license, visit <https://creativecommons.org/licenses/by-sa/4.0/>

Environmental Pollution

Global Flows of Plastic Packaging Materials in 2013

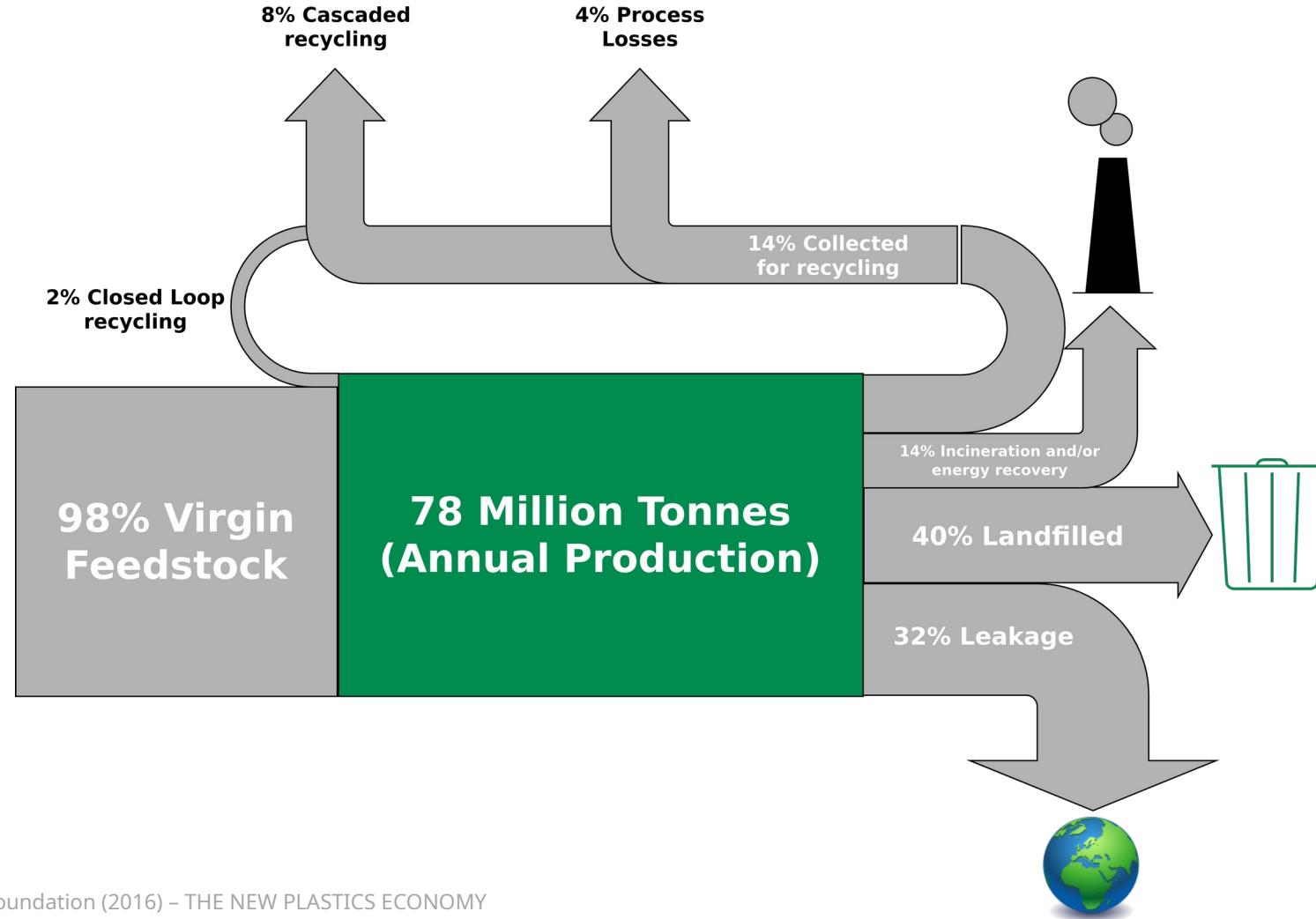


Figure adapted from: Ellen MacArthur Foundation (2016) – THE NEW PLASTICS ECONOMY

Environmental Pollution

Global Flows of Plastic Packaging Materials in 2013

- In 2050, there will be more plastic than fish in the ocean (by weight)

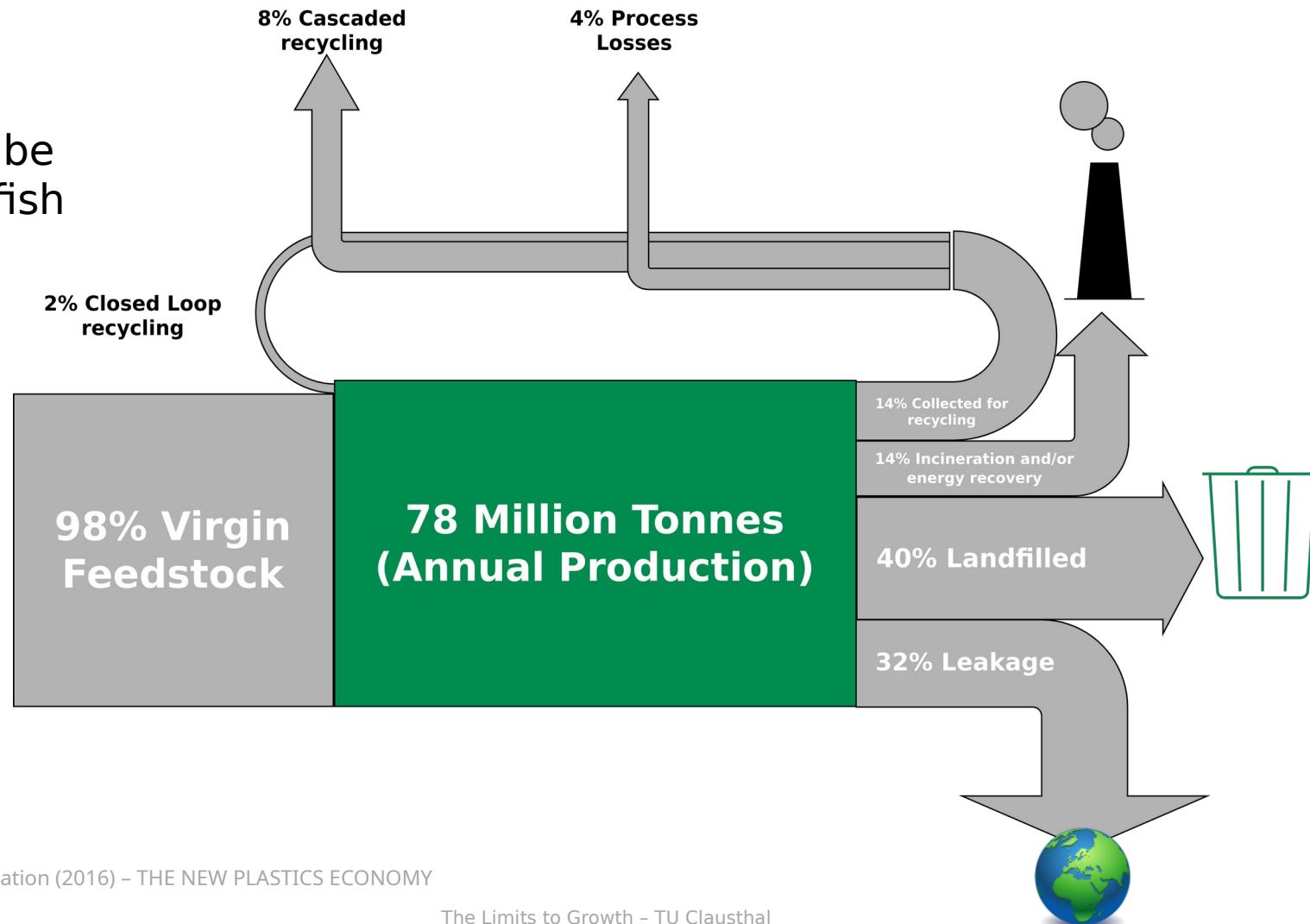


Figure adapted from: Ellen MacArthur Foundation (2016) – THE NEW PLASTICS ECONOMY

Environmental Pollution

The Limits to Recycling

- Recycling often requires a lot of energy
- Some materials cannot be recycled at all (yet)
- Impurities are challenging
- Often requires a lot of manual labor
- Recycled material often with lower quality than input material
- False sense of safety!

Environmental Pollution

The Limits to Recycling

- Recycling often requires a lot of energy
- Some materials cannot be recycled at all (yet)
- Impurities are challenging
- Often requires a lot of manual labor
- Recycled material often with lower quality than input material
- False sense of safety!

I am not saying you should stop recycling!

Environmental Pollution

The Limits to Recycling

- Recycling often requires a lot of energy
- Some materials cannot be recycled at all (yet)
- Impurities are challenging
- Often requires a lot of manual labor
- Recycled material often with lower quality than input material
- False sense of safety!

I am not saying you should stop recycling!

→ Recycling is great but it is better to make sure that we do not have to recycle anything.
→ Buying less (e.g., only the essentials) is way more effective.

*"We buy things we don't need, to impress people we don't like." -
Tyler Durden / Chuck Palahniuk*

CONCLUSION

Conclusion

- Personal carbon footprint and greenwashing
- Basic concepts and definitions related to sustainability, resources, environmental pollution
- The limits to recycling

EXERCISE E03

Exercise E03

Household Waste

- Get the largest jar that you can find (either at your own place, or ask your friends).
- Collect all the trash that you are producing in the upcoming week (except for bio-waste that is supposed to go into the green trash bin) - starting on Thursday (04.05.2023 - 00:01) until Tuesday (09.05.2023 - 23:59).
- How many days of trash can you fit into your jar?
- Submit your result according to the submission guidelines posted in the exercise sheet → [E03](#).

Additional Resources

- Baccini et al. (2012) – Metabolism of the Anthroposphere: Analysis, Evaluation, Design
- Podcast *How to Save a Planet* – “Sacrifice Zones: ProPublica Takes Us Inside America’s Toxic Hotspots (2022) – [Link](#)

Questions?