

# The Limits to Growth: Sustainability and the Circular Economy

## Lecture 12: Summary and Outlook

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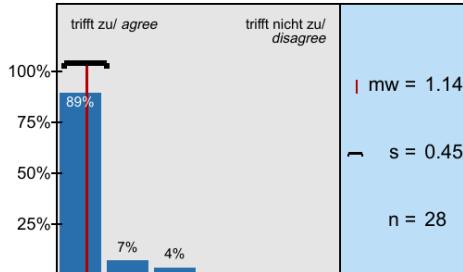
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## **NEWS/UPDATES**

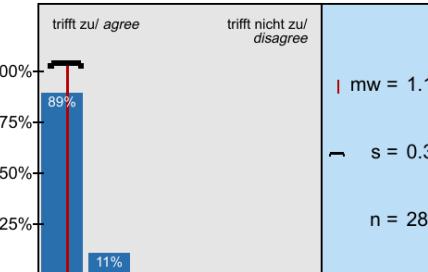
# Course Evaluation Results

## Feedback

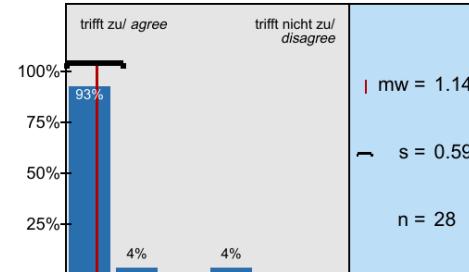
Der inhaltliche Aufbau der Lehrveranstaltung ist logisch und nachvollziehbar.



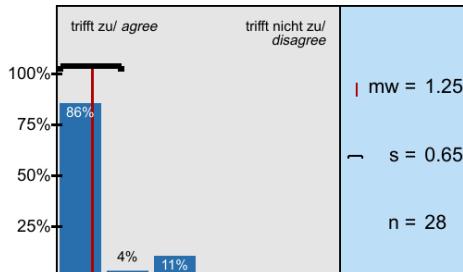
Der / dem Lehrenden ist es wichtig, dass die Studierenden etwas in der Lehrveranstaltung lernen



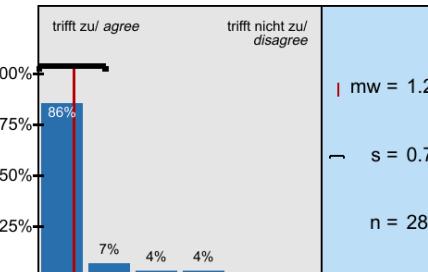
Die / der Lehrende vermittelt den Stoff anschaulich und verständlich.



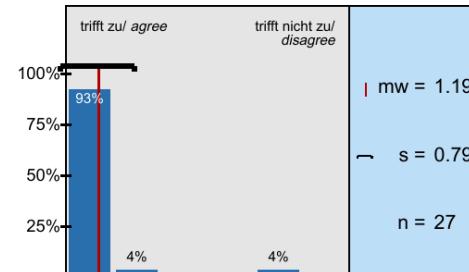
Die / der Lehrende kann auch schwierige Sachverhalte gut erklären.



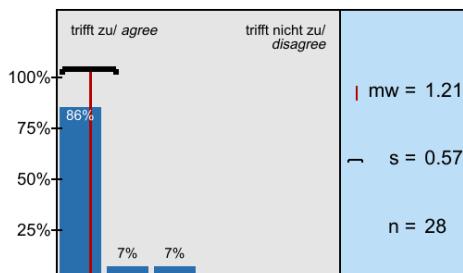
Ich werde zum Midenken motiviert.  
*I am encouraged to think for myself.*



Ich kann die in dieser Lehrveranstaltung behandelten Inhalte und Methoden beschreiben und erläutern.



Die Lehrveranstaltung gibt einen guten Überblick über das Themengebiet.



# Course Evaluation Results

## Feedback

5.1) Was hat Ihnen an der Lehrveranstaltung besonders gut gefallen ? (Nur innerhalb der Berandung schreiben!)  
*Which elements of the course did you like in particular? (Please do not write outside the borders.)*

- Das es möglich ist direkt Feedback zu geben und Fragen stellen zu können.
- Dass es dieser Veranstaltung überhaupt gibt. Gute Vorbereitung/Aufbereitung des Stoffes. Das Duo aus Referent und zusätzlicher Betreuung im Hintergrund. Die reibungslose Technik. Die Möglichkeit analog/digital/asynchron zu lernen.
- Mir gefällt die Interaktivität durch z.B. die Umfragen aber auch die kurz Präsentation oder Einschätzung zum weiteren Verlauf des Klimas.

# Course Evaluation Results

## Feedback

- 5.2) Was hat Ihnen an der Lehrveranstaltung nicht gefallen ? (Nur innerhalb der Berandung schreiben!)  
*Which parts of the course did you not like? (Please do not write outside the borders.)*

- Ich finde die Live-Vorlesungen persönlich besser als das MOOC Konzept. Mir fällt es in den Vorlesungen leichter sich zu konzentrieren.
- Ich finde die Zielgruppe nicht besonders klar definiert. Dachte, dass wären Leute, die schon ein tieferes Verständnis für die Materie haben, aber die Übungen sind ja oft eher auf eine Bewusstwerdung für die Problematik aus - ist das Seminar dann doch eher für einen ersten Einstieg gedacht?  
Mich hat sehr gestört, dass es so wenig mündliche Beteiligung gab.  
Und dafür könnt ihr jetzt nichts: Aber da der Anspruch im Vergleich zu meinen anderen Veranstaltungen relativ niedrig ist, hab ich mich insgesamt weniger mit dem Stoff beschäftigt als mir eigentlich lieb ist - aber der Zeitdruck im Studium ist einfach so groß, dass da wenig Spielraum bleibt.
- MOOC

# Course Evaluation Results

## Feedback

- 5.3) Welche Verbesserungsvorschläge haben Sie ? (Nur innerhalb der Berandung schreiben!)  
*What suggestions for improvement do you have? (Please do not write outside the borders.)*
- Da die Lehrveranstaltung in Englisch abgehalten wird, wäre es angenehm die Folien in deutscher Sprache zu erhalten oder umgekehrt.
  - Klarere Definition der Zielgruppe (Vorkenntnisse)  
Anspruchsvollere Hausaufgaben
  - Mehr Interaktion

## **RECAP – LTG COURSE IN A NUTSHELL**



## LTG Recap

### Sustainability - Definition



## LTG Recap

### Sustainability - Definition

*„Development that meets the needs of the present without compromising the ability of future generations to meet their own needs.“*

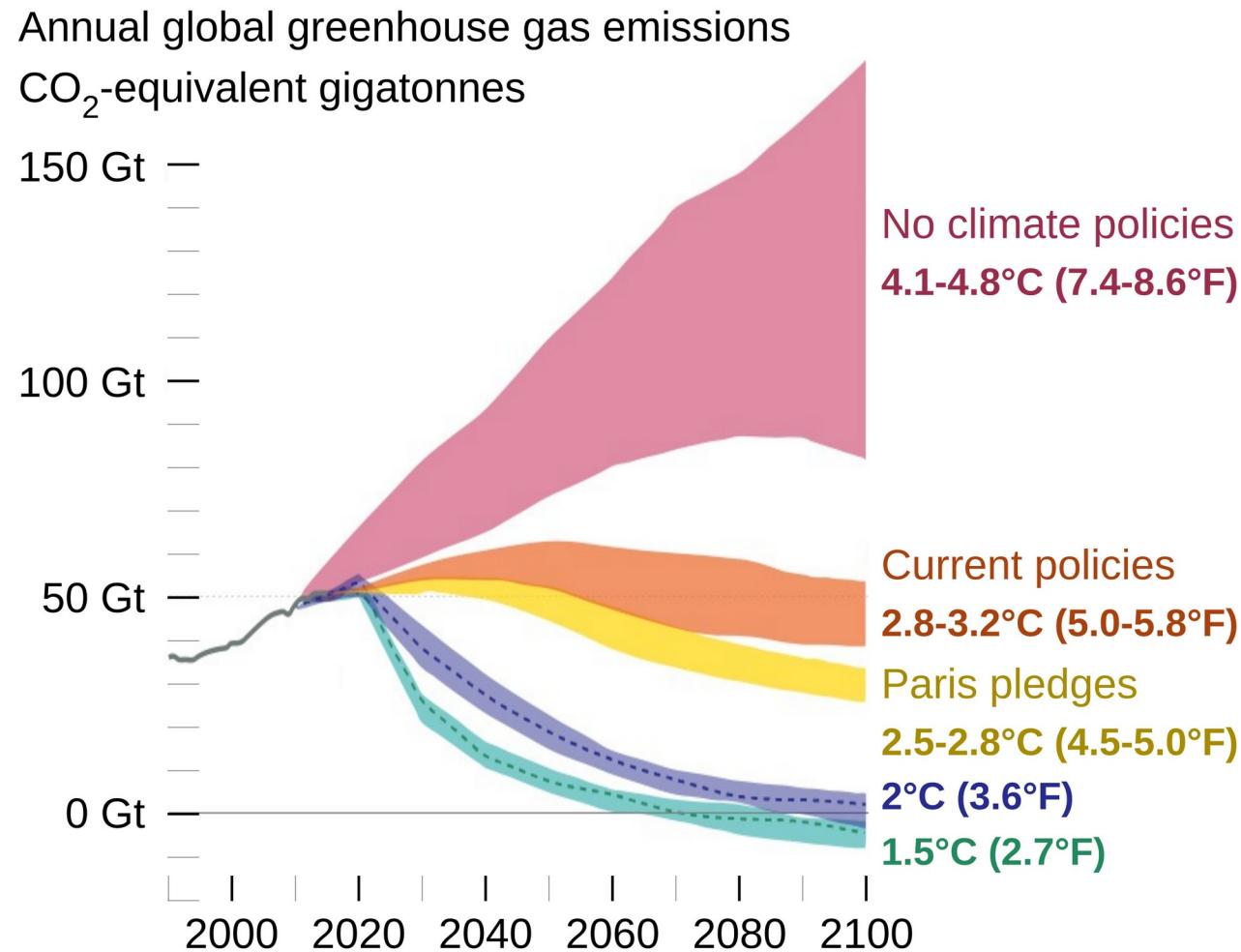
## LTG Recap

### Sustainability - Implication

**Sustainability → Consume less**

## LTG Recap

### Climate Change - Global GHG Emission Pathways (2019)



## LTG Recap

### Climate Change - 1.5°C vs. 2/3/4°C

*“If we can keep warming below **3°C** we likely remain within our adaptive capacity as a civilization, but at **2.7°C** warming we would experience great hardship. ” -*

*Prof. Michael Mann*

## LTG Recap

### Environmental Pollution - Horrible Waste Management



## LTG Recap

### Dwindling (Non-)Renewable 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"*

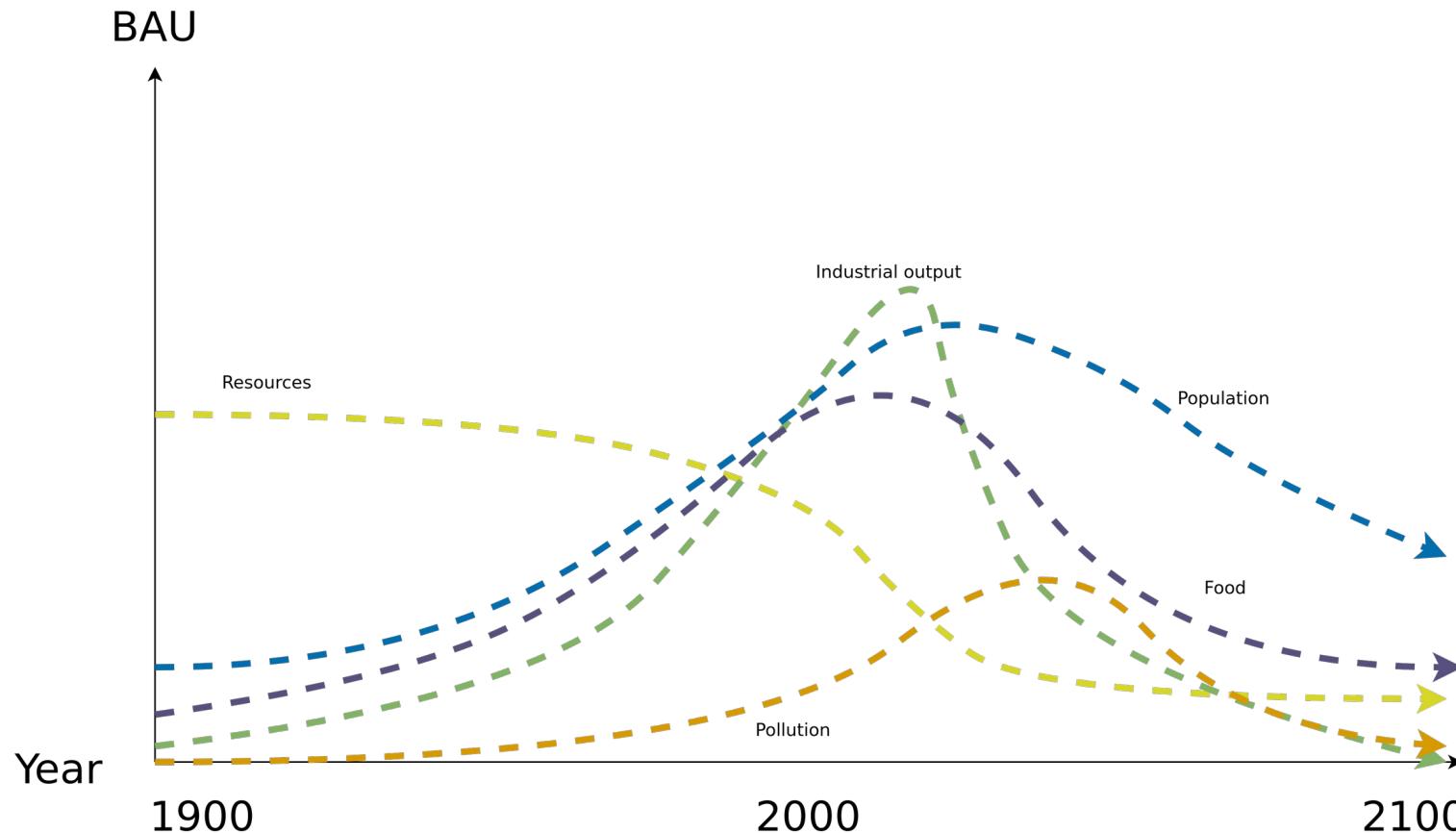
## LTG Recap

### 3 Key Challenges of the 21st Century

- 1) Climate change / adaption to climate change
- 2) Environmental pollution
- 3) Dwindling non-renewable resources

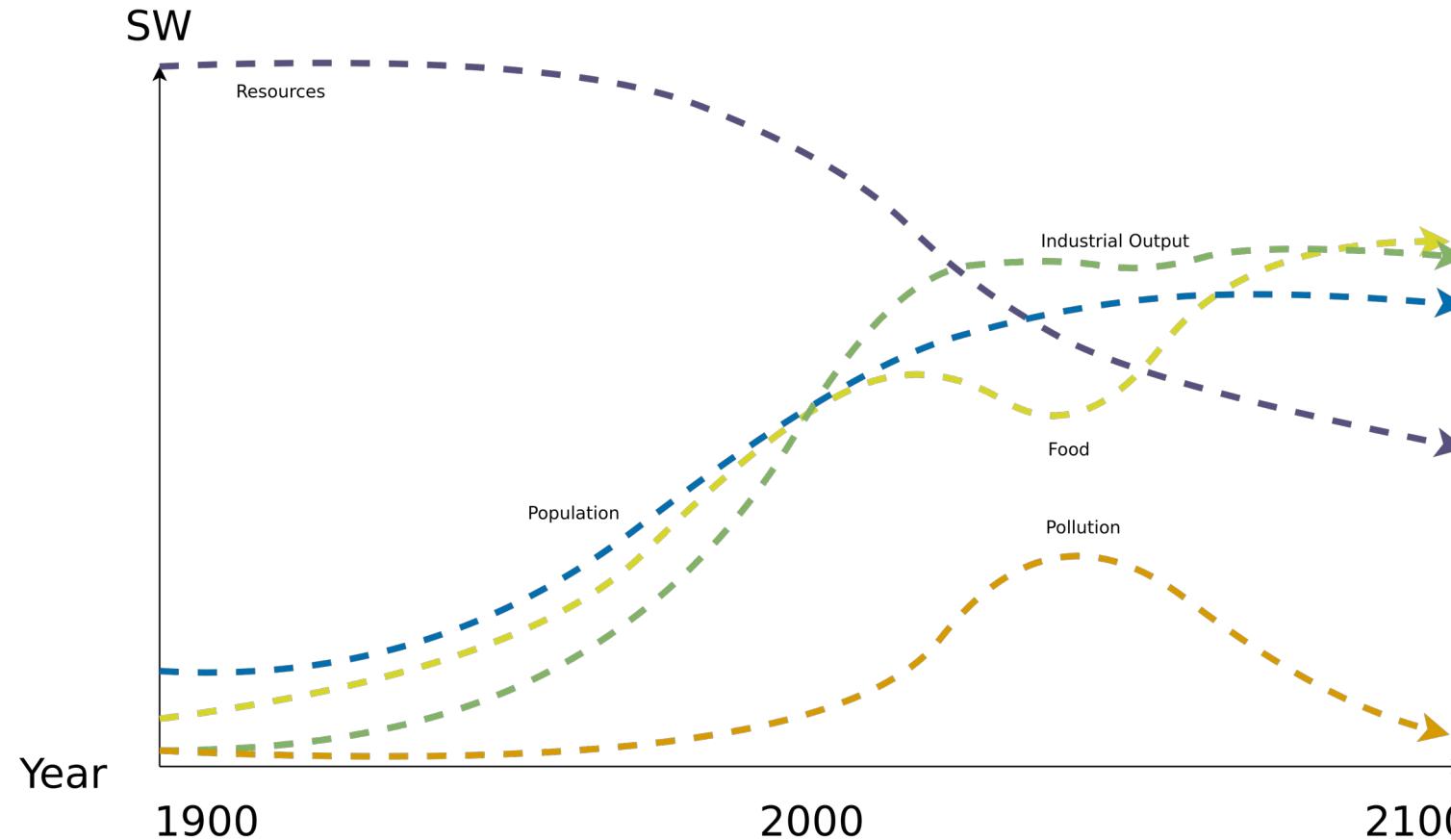
## LTG Recap

### World3 Standard Run - Business-as-Usual (BAU)



## LTG Recap

### World3 - Stabilized World (SW)



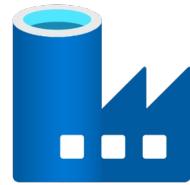
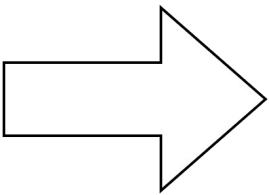
→ Population stabilizes in the twenty-first century, as does human welfare on a high level

# LTG Recap

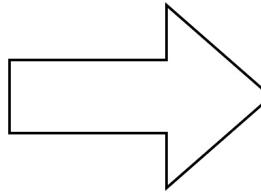
## Linear (Industrial) Economy



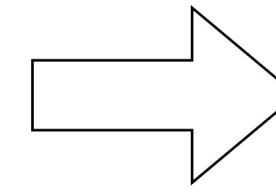
### RESOURCES



### MANUFACTURING



### DISTRIBUTION



### POINT OF SALE

GLOBALIZED INDUSTRIALIZED PROCESSES

**NATURAL RESOURCES** (Water, Energy, Materials) and Human Resources (Labor and Skills) are used to produce manufactured **objects** (infrastructure, buildings, equipment, durable projects).

GLOBALIZED DISTRIBUTION LOGISTICS

**COMMERCIALIZATION** at the factory gate or at point of sale these objects are put to use (sold, leased, rented, sold as service)...

## LTG Recap

### Circular Economy



## LTG Recap

### Performance Economy - Definition

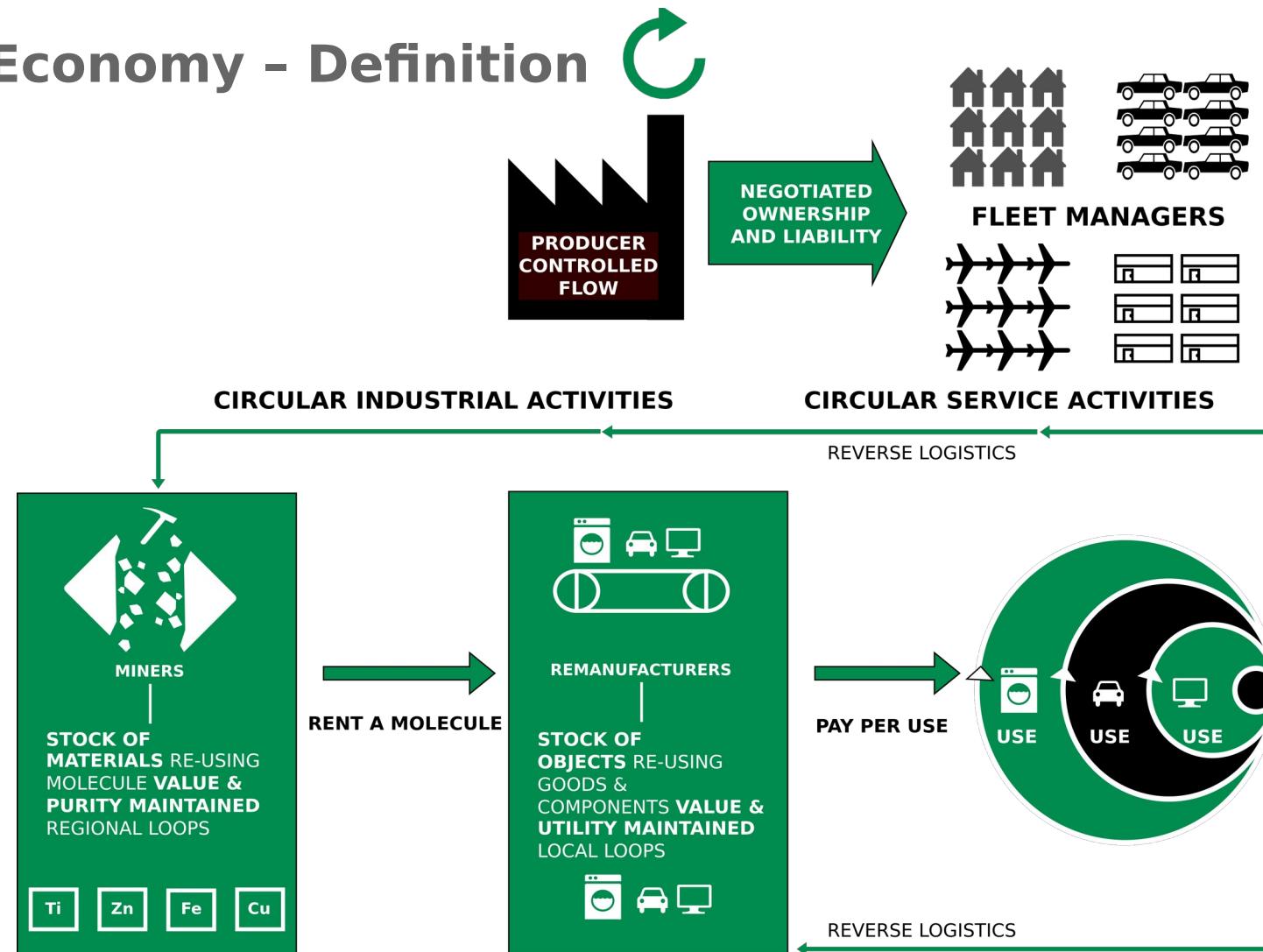


Image adapted from Walter R. Stahel (2019) – The Circular Economy: A User's Guide.

## LTG Recap

### Circular Society - CE Criticism

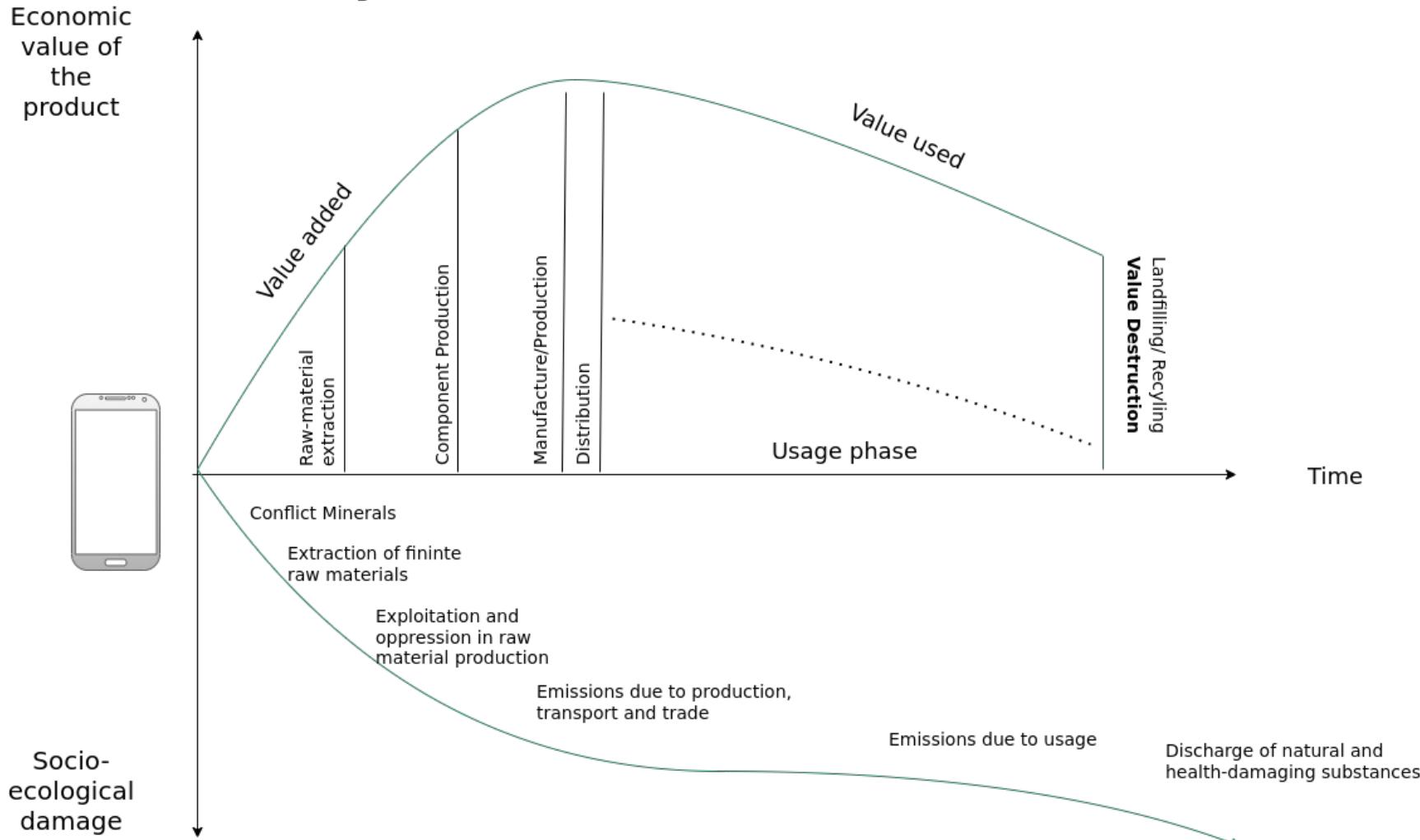


Image adapted from: M. Jaeger-Erben, F. Hofmann (2019) – Kreislaufwirtschaft - Ein Ausweg aus der sozial-ökologischen Krise? – [Link](#).

## LTG Recap

### Circular Society - CE Criticism

- Replace the LE with circularly oriented forms of consumption and production
- CE focus mostly on earned value management (“Wertschöpfungsmanagement”), product-service systems, product/business model innovations within existing power asymmetries
- Decouple economic growth and consumption of natural resources

→ **But why do we need never ending economic growth and why is it good to consume as many goods and services as possible?**

## LTG Recap

### Circular Society - CE Criticism

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- Decouple economic growth and consumption of natural resources

→ **But why do we need never ending economic growth and why is it good to consume as many goods and services as possible?**

- Alternatives:
  - Sufficiency strategies and lifestyle changes
  - Question the prevailing entrepreneurial orientation towards the shareholder concept
  - Deconstruction of existing power and hegemonic relations

# LTG Recap

## CS and CE Perspectives

	Holistic	Segmented
Optimist	<b>Reformist Circular Society</b> <ul style="list-style-type: none"><li><i>Assumptions:</i> reformed form of capitalism is compatible with sustainability and socio-technical innovations can enable eco-economic decoupling to prevent ecological collapse.</li><li><i>Goal:</i> economic prosperity and human well-being within the biophysical boundaries of the earth.</li><li><i>Means:</i> technological breakthroughs, social innovations and new business models that improve ecological health, resource security, and material prosperity for all.</li></ul>	<b>Techcentric Circular Economy</b> <ul style="list-style-type: none"><li><i>Assumptions:</i> capitalism is compatible with sustainability and technological innovation can enable eco-economic decoupling to prevent ecological collapse.</li><li><i>Goal:</i> sustainable human progress and prosperity without negative environmental externalities.</li><li><i>Means:</i> economic innovations, new business models and unprecedented breakthroughs in CE technologies for the closing of resource loops with economic value creation.</li></ul>
Sceptical	<b>Transformational Circular Society</b> <ul style="list-style-type: none"><li><i>Assumptions:</i> capitalism is incompatible with sustainability and socio-technical innovation cannot bring absolute eco-economic decoupling to prevent ecological collapse.</li><li><i>Goal:</i> a world of conviviality and frugal abundance for all, while fairly distributing the biophysical resources of the earth.</li><li><i>Means:</i> complete reconfiguration of the current socio-political system and a shift away from productivist and anthropocentric worldviews to drastically reduce humanity's ecological footprint and ensure that everyone can live meaningfully, and in harmony with the earth.</li></ul>	<b>Fortress Circular Economy</b> <ul style="list-style-type: none"><li><i>Assumptions:</i> there is not alternative to capitalism and socio-technical innovation cannot bring absolute eco-economic decoupling to prevent ecological collapse.</li><li><i>Goal:</i> maintain geostrategic resource security and earth system stability in global conditions where widespread resource scarcity and human overpopulation cannot provide for all.</li><li><i>Means:</i> innovative technologies and business models combined with rationalized resource use, imposed frugality and strict migration and population controls.</li></ul>

## LTG Recap

### Eco-Sufficiency - Definition(s)

*“Seeking enough when more is possible is both intuitive and rational - personally, organizationally and ecologically. And under global ecological constraint, it is ethical.”* - Thomas Princen

*“A set of policy measures and daily practices that avoid the demand for energy, materials, land, water, and other natural resources while providing wellbeing for all within the planetary boundaries.”* - IPCC

## LTG Recap

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**Sufficiency → All you need is less**

## LTG Recap

### Universal Basic Income - Definition(s)

“A transfer that is provided universally, unconditionally, and in cash” – World Bank

“A Basic Income is a periodic cash payment unconditionally delivered to all on an individual basis, without means-test or work requirement.” - Basic Income Earth Network

- Periodic → Paid at regular intervals
- Cash payment → Paid in an appropriate medium of exchange
- Individual → Paid on an individual basis (e.g., not to households)
- Universal → Paid to everyone
- Unconditional → Paid without means test and without a requirement to work or to demonstrate willingness-to-work

1.) The World Bank (2020) – Exploring Universal Basic Income : A Guide to Navigating Concepts, Evidence, and Practices - [Link](#)

2.) BIEN (Basic Income Earth Network) – <https://basicincome.org/about-basic-income>

**NOW WHAT?**

**NOW WHAT? → IT'S TIME TO ACT**

## Act Now Courage

*“But the opposite of hope is not despair. It is grief. Even while resolving to limit the damage, we can mourn. And here, the sheer scale of the problem provides a perverse comfort: we are in this together. The swiftness of the change, its scale and inevitability, binds us into one, broken hearts trapped together under a warming atmosphere.*

*We need courage, not hope. Grief, after all, is the cost of being alive. [...] **Courage is the resolve to do well without the assurance of a happy ending.**”*

# Act Now

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## Act Now

### Minimize/Avoid Waste - Waste Is A Human Concept

**Waste = Inefficiency**

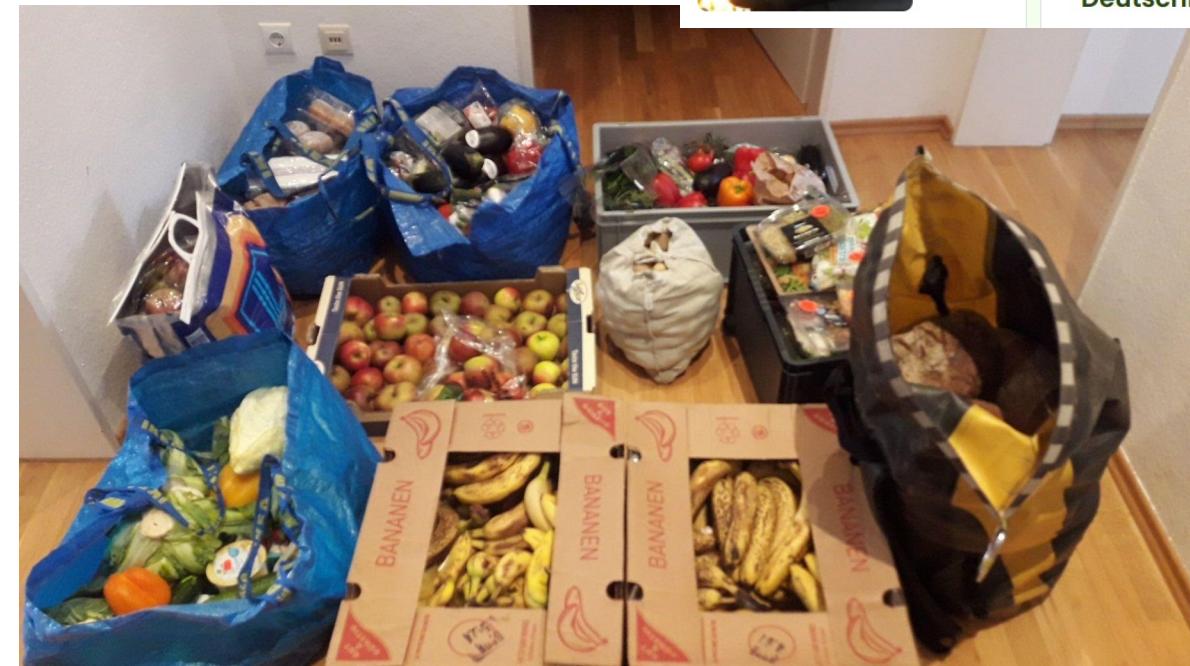
## Act Now

### Minimize/Avoid Waste - Foodsharing



### Benjamin

Benjamin ist Foodsaver:in in:  
Deutschland, Braunschweig, Niedersachsen, Europa, Clausthal-Zellerfeld



<https://foodsharing.de/>

## Act Now

### Minimize/Avoid Waste - General

- Taking responsibility (being accountable) for the trash/waste that you create and the resources that you consume
  - What is left after you have consumed the product/service?
  - Does it generate, or result in trash/waste?
  - Can you reuse it in any other way, thereby avoiding trash?
  - Is the generated waste, the implicit/explicit environmental pollution, the used resources, and so on, worth the short term pleasure?
- Zero-waste might be unrealistic
- Instead → Reduce your footprint (not only carbon) as much as possible
  - Resources, energy, pollution, emissions, etc.

# Act Now

## Act Sustainable



# Act Now

## Act Sustainable



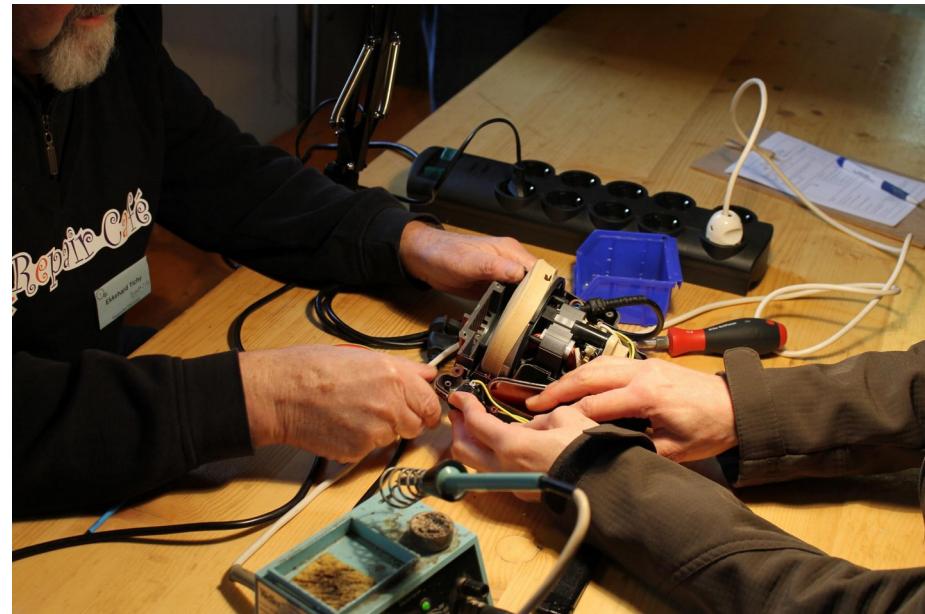
## Act Now

### Minimize Your Footprint - Sustainability

**Sustainability → Consume less**

## Act Now

### Minimize Your Footprint - Repair Cafe / Sharing / 2<sup>nd</sup> Hand



1. RaMa2016 – [https://upload.wikimedia.org/wikipedia/commons/1/17/Repair\\_Caf%C3%A9\\_Trier\\_Reparatur.jpg](https://upload.wikimedia.org/wikipedia/commons/1/17/Repair_Caf%C3%A9_Trier_Reparatur.jpg) – CC BY-SA 4.0

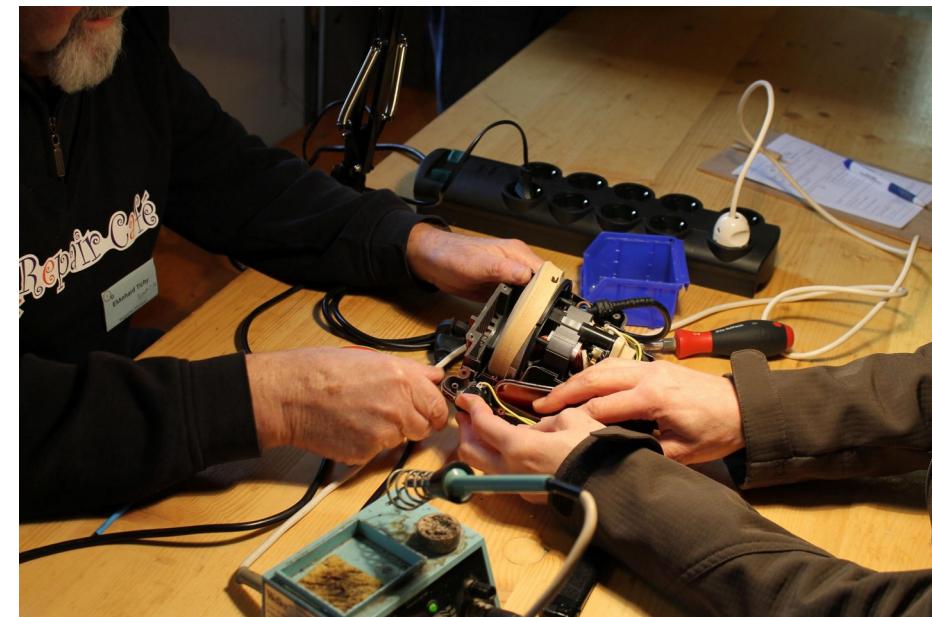
2. Ibrahim Husain Meraj – [https://upload.wikimedia.org/wikipedia/commons/9/96/Various\\_tools\\_for\\_cycle\\_repair\\_01.jpg](https://upload.wikimedia.org/wikipedia/commons/9/96/Various_tools_for_cycle_repair_01.jpg) – CC BY-SA 4.0

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The Limits to Growth – TU Clausthal

## Act Now

### Minimize Your Footprint - Repair Cafe / Sharing / 2<sup>nd</sup> Hand



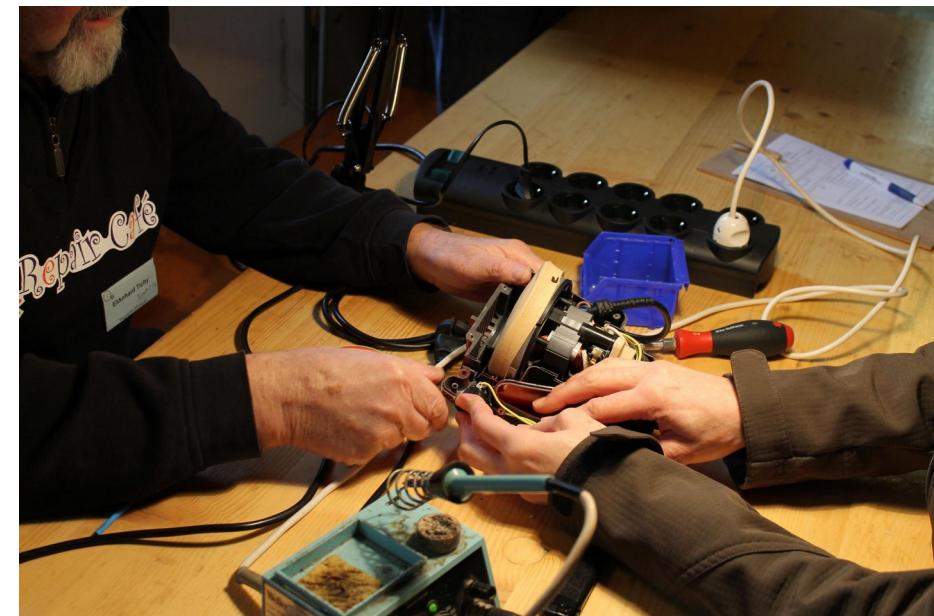
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## Act Now

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## Act Now

### Climate-Resilient Food Production

- Agroforestry → Trees/shrubs are grown around or among crops or pastureland ([Link](#))
- Permaculture → Growth of an agricultural ecosystem in a self-sufficient and sustainable way ([Link](#))
- Silvopasture → Trees, forage and domesticated animals in a mutually beneficial way
- Etc.

## Act Now

### Climate-Resilient Food Production - Garden Plot ("Kleingarten")



## Act Now

### Climate-Resilient Food Production - Urban/Balcony Gardening



1. Neitram – [https://upload.wikimedia.org/wikipedia/commons/7/71/Urban-Gardening-Demonstrationsgarten\\_der\\_Hochschule\\_Augsburg\\_01.jpg](https://upload.wikimedia.org/wikipedia/commons/7/71/Urban-Gardening-Demonstrationsgarten_der_Hochschule_Augsburg_01.jpg) – CC BY-SA 4.0

2. Bad Alley – <https://www.flickr.com/photos/badalley/3727226471> – CC BY-NC-SA 2.0

3. Ecoscapes – [https://upload.wikimedia.org/wikipedia/commons/9/9d/Condominium\\_balcony\\_container\\_gardening\\_at\\_night.jpg](https://upload.wikimedia.org/wikipedia/commons/9/9d/Condominium_balcony_container_gardening_at_night.jpg) – CC BY-SA 4.0

The Limits to Growth - TU Clausthal

## Act Now

### Activism – Fridays for Future / Extinction Rebellion / Etc.

- Short history of actions on climate change
  - Geneva, Kyoto, Copenhagen, Paris, Glasgow, etc.
  - Problem
    - → A lot of bla bla
    - → Lack of progress
    - → Policies favor business as usual instead of acting in accordance with science because they are afraid to make unpopular decisions
- **Individual activism as a response / counter movement to inactive governments**  
who ignore urgent issues (i.e., the three key challenges of the 21<sup>st</sup> century)

## Act Now

### Activism - Fridays for Future / Extinction Rebellion / Etc.

*"Climate activists are sometimes depicted as dangerous radicals, but the truly dangerous radicals are the countries that are increasing the production of fossil fuels."*

**United Nations Secretary General Antonio Guterres**

## Act Now

### Break Out of the Hamster Wheel

- Assumption → Capitalism = pyramid/ponzy scheme
- What are alternatives?
  - Cooperatives
  - gGmbH (non-profit company with limited liability under German law)
  - Cooperative communities
- Get a job that does not facilitate an unsustainable use of our planet, i.e., the three key challenges of the 21<sup>st</sup> century
- Go local (local cooperation, local consumption, local money, local sourcing of resources)
- Less expenses → less time you need to spend working

## Fun Fact

Google Search Term “sustainable business cooperative”



Ad · <https://www.aramco.com/> ▾

### Aramco Sustainable Business - Building A Better Future

We Believe In The Power Of Energy To Transform Lives And Sustain Our Planet. Find Out More

#### Sustainable Practices

Our approach to sustainability [Learn more about our initiatives](#)

#### People and Community

We put our energy to work making a difference within communities.

#### In-house Technologies

Learn about our methods for increasing safety & efficacy

#### Protecting Our Planet

Find out more about the initiatives we take to help protect our planet.

## Fun Fact

### Google Search Term “sustainable business cooperative”



- 100 companies produced more than 70% of the world's greenhouse gas emissions between 1988 and 2017

- Guess who is on the list?

- 1) China (Coal) → 14.32%
- 2) Saudi Arabian Oil Company (Aramco) → 4.50%
- 3) Gazprom OAO → 3.91%
- 4) National Iranian Oil → 2.28%
- 5) ExxonMobil Corp → 1.98%
- 6) Coal India → 1.87%
- 7) Petroleos Mexicanos (Pemex) → 1.87%
- 8) Russia (Coal) → 1.86%
- 9) Royal Dutch Shell PLC → 1.67%
- 10) China National Petroleum Corp (CNPC) → 1.56%
- 11) BP PLC → 1.53%**
- 12) Chevron Corp → 1.31%**

Blaming individuals and denying any responsibility →  
great strategy!

## Act Now

### Wales “One Planet Development”

- “One Wales: One Planet”
  - Timeframe → one generation
  - Goal
    - Wales should use only its fair share of the earth’s resources
    - Zero carbon emissions for both use and construction
- How?
  - Low Impact Development principles (applicable in Wales)
  - Prototypes / Test Communities
    - Single homes
    - Co-operative communities

# **WRAP-UP**

## Wrap-Up

- Kate Marvel: “*Courage is the resolve to do well without the assurance of a happy ending.*”
  - You do not have to be a sustainability saint → be as sustainable as possible, it still makes a difference
  - Small progress vs. no progress
  - Silence/being inactive supports the destruction of our planet (← I just checked, still no “*planet B*” available)
  - Do something instead of giving up right away
- Leading by example

# Thanks!