

Unit 1.1 Circular Economy – Causes and Context of Current Challenge

1.1.1 Environmental crisis – past and current world trends

1.1.2 Stakeholders – who have the power to make a change

1.1.3 Education – engineers of the future

1.1.4 Conclusions

1.1.1 Environmental crisis – past and current world trends

- ▶ 1.1.1.1 Facts
- ▶ 1.1.1.2 Reasons for current situation
- ▶ 1.1.1.3 Possible solutions

1.1.1 Environmental crisis – past and current world trends

▶ 1.1.1.1 Facts

1.1.1.1. Environmental crisis - Facts

- ▶ Earth – pale blue dot (C. Sagan).
- ▶ Third planet from the sun.
- ▶ 4,57 billion years old.
- ▶ The only place in the universe with life on it that we know.
- ▶ Although it is very likely that the life exists also at other „worlds“, this worlds are not reachable with our current knowledge.
- ▶ What makes the Earth habitable? It is at the right distance from the Sun (liquid water), it is protected from harmful solar radiation by its magnetic field, and it has the right chemical ingredients for life that we know, including water and carbon.



Figure 1. William Anders's photograph of the Earth taken from the Apollo 8 spacecraft in 1968. Credit...William A. Anders/NASA

1.1.1.1. Environmental crisis - Facts

“Look again at that pale blue dot. That's here. That's home. That's us. On it everyone you love, everyone you know, everyone you ever heard of, every human being who ever was, lived out their lives. The aggregate of our joy and suffering, thousands of confident religions, ideologies, and economic doctrines, every hunter and forager, every hero and coward, every creator and destroyer of civilization, every king and peasant, every young couple in love, every mother and father, hopeful child, inventor and explorer, every teacher of morals, every corrupt politician, every "superstar," every "supreme leader," every saint and sinner in the history of our species lived there-on a mote of dust suspended in a sunbeam”.

Carl Sagan

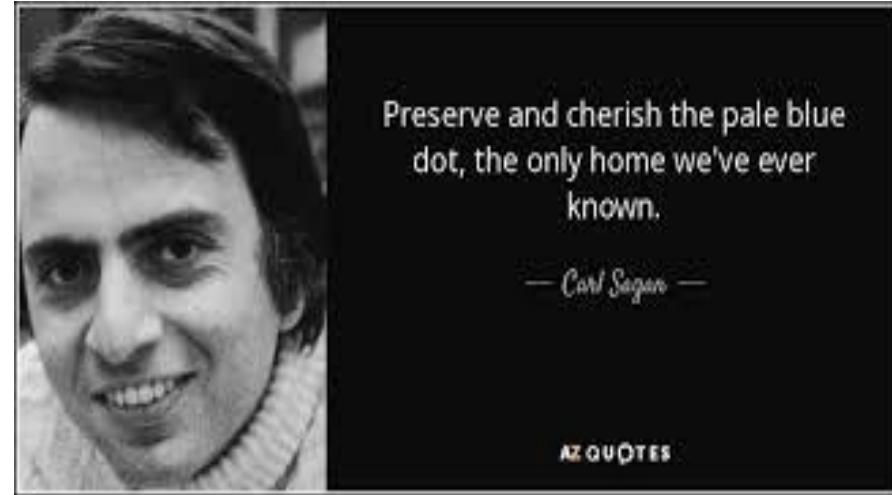
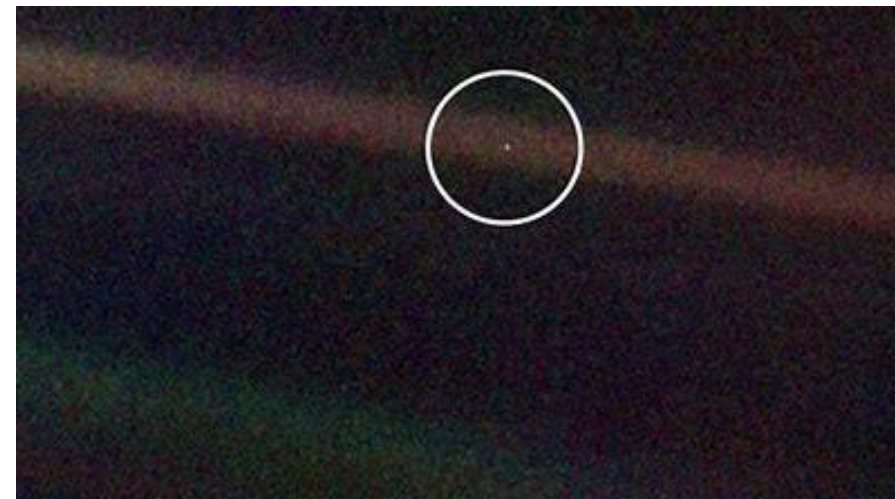


Figure 2. Carl Sagan and one of his quotes



1.1.1.1. Environmental crisis - Facts

- ▶ Earth Overshoot Day (Day of ecological debt) is the day on which humanity uses all natural resources available in one year and enters in to ecological debt to future generations.
- ▶ Earth Overshoot Day in 2021 was July 29th.
- ▶ Overshoot day 2021 for the following countries was:
 - ▶ France – May 11th
 - ▶ Greece – May 22nd
 - ▶ Italy – May 15th
 - ▶ Lithuania – April 7th
 - ▶ Slovenia – April 30th
 - ▶ Spain – May 12th

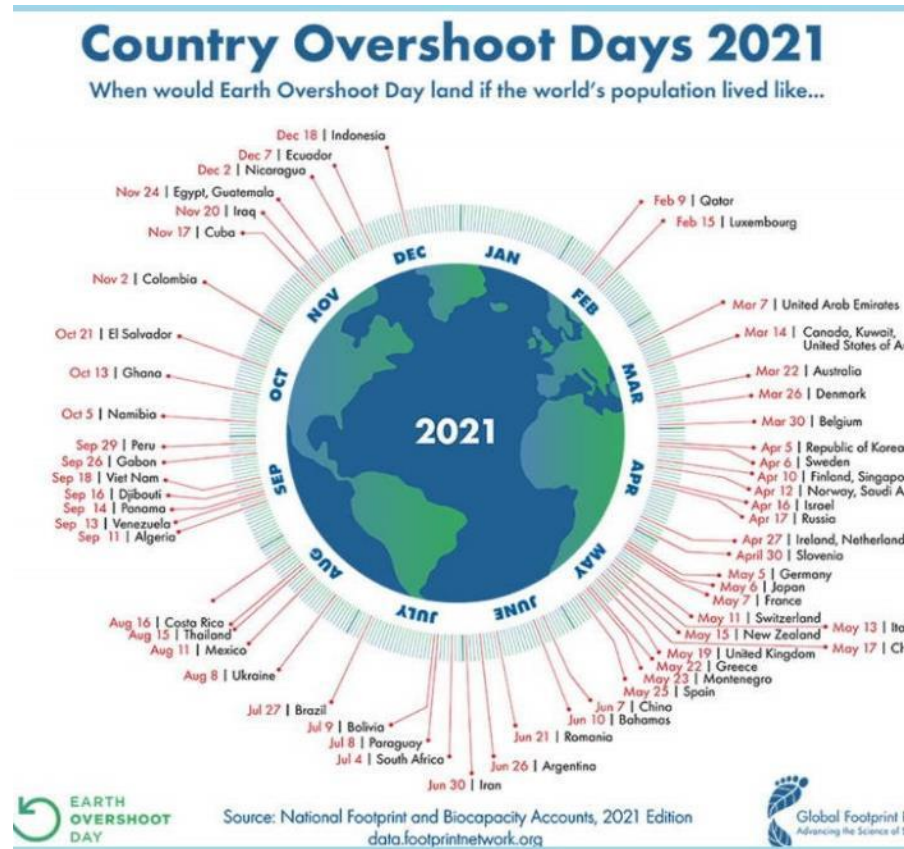


Figure 3. Country Overshoot Days in 2021¹

1.1.1.1. Environmental crisis - Facts

- ▶ Just one example of how humanity is changing the geography of earth is Aral see.
- ▶ What we see on the photo on the right (shrinking of the Aral see) is a result of human unbridled exploitation of the environment.
- ▶ Aral Sea, once the fourth largest lake in the world, is steadily shrinking due to cotton production. "Genetically modified cotton, which is the most abundant in the world, requires huge amounts of water.
- ▶ The area of the Sir Darja and Amu Darja rivers, which flow into the lake, is covered by cotton fields, which need a lot of water to grow.



Figure 4. Aral see, Photo Archive/NASA

1.1.1.1. Environmental crisis - Facts

- ▶ In the last 540 million years, five mass extinctions linked to the amount of carbon dioxide in the atmosphere and the oceans, have occurred on Earth.
- ▶ According to calculations and scientific predictions, sixth mass extinction is not far away, in fact it is already occurring.

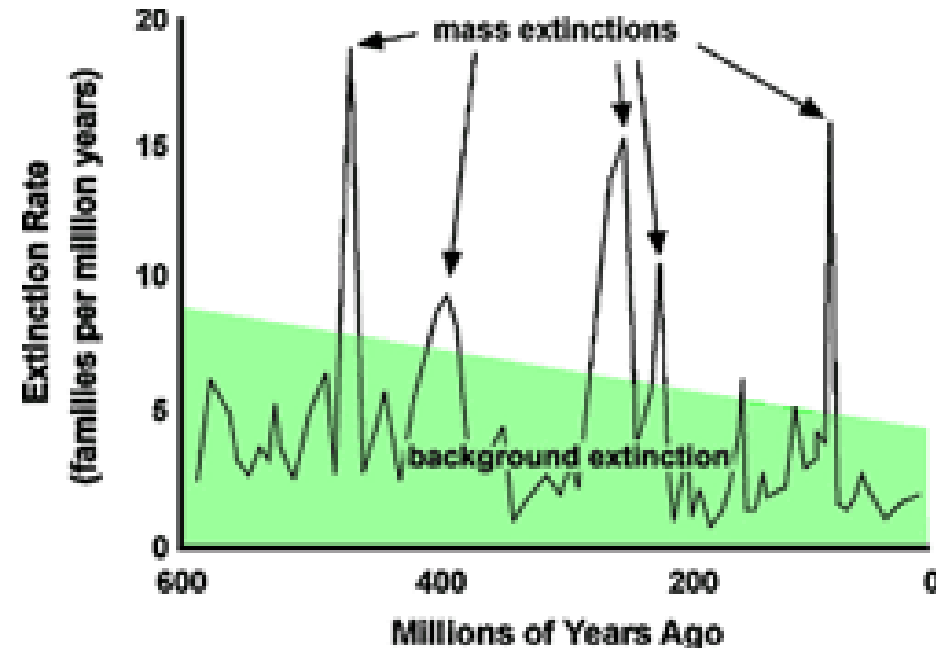
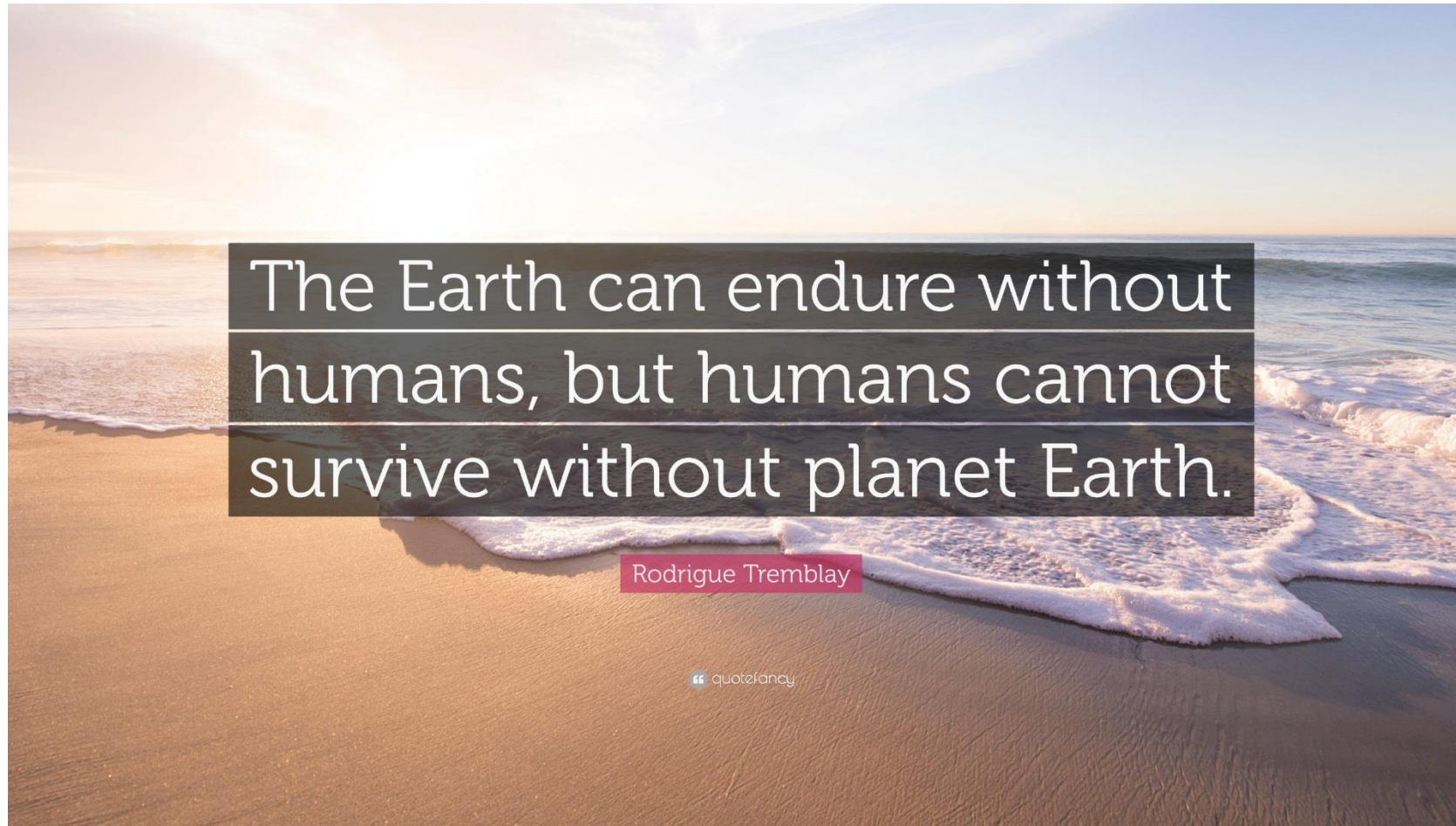


Figure 5. Mass extinctions on Earth²

1.1.1.1. Environmental crisis - Facts



1.1.1 Environmental crisis – past and current world trends

▶ 1.1.1.2 Reasons for current situation

1.1.1.2. Environmental crisis - Reasons

- ▶ Reasons for the environmental crisis?
- ▶ Reasons for the sustainability crisis?

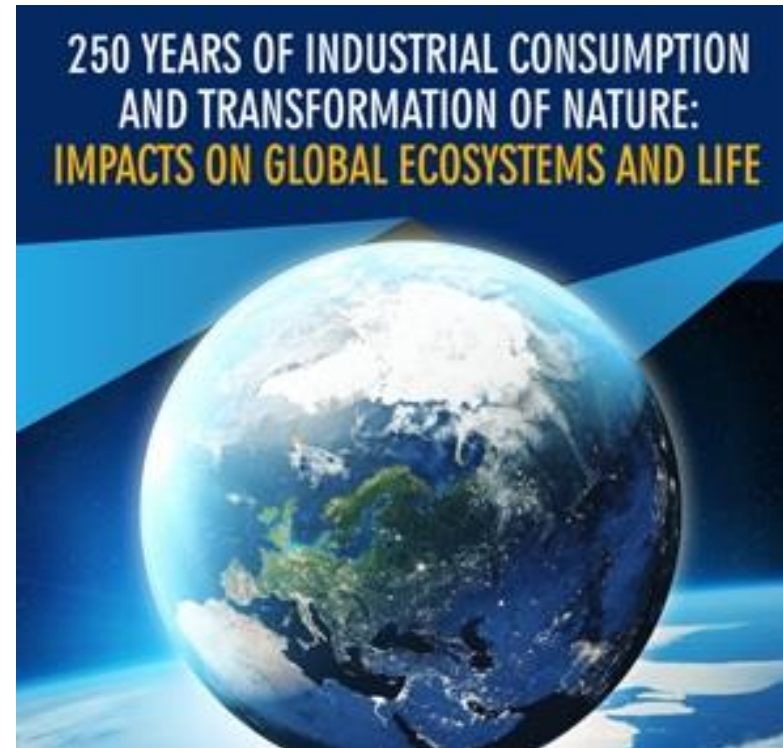


Figure 6. Book about industrial consumption and transformation of nature³

1.1.1.2. Environmental crisis - Reasons

Sustainability!

- ▶ In the 21st century, it refers generally to the capacity for Earth's biosphere and human civilization to co-exist.
- ▶ Three different dimensions of sustainability are distinguished:
 - ▶ environmental,
 - ▶ social,
 - ▶ economic.

(<https://en.wikipedia.org/wiki/Sustainability>)

The Three Spheres of Sustainability



Figure 7. Sustainability Assessment by the University of Michigan⁴

1.1.1.2. Environmental crisis - Reasons

- ▶ Reasons for the sustainability crisis:
 - ▶ World economic system(s)
 - ▶ Overproduction
 - ▶ Consumerism
 - ▶ Wrong set of values:
 - ▶ profit
 - ▶ constant growth

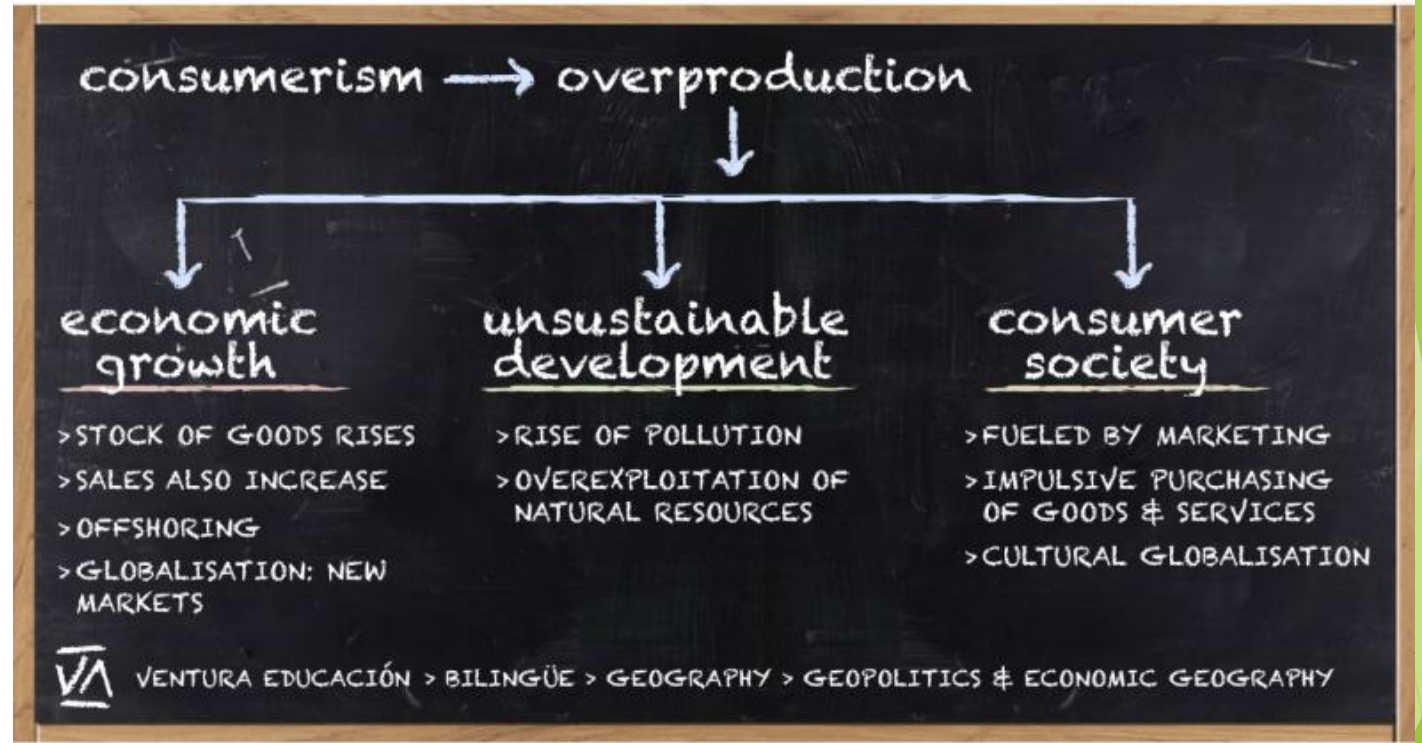
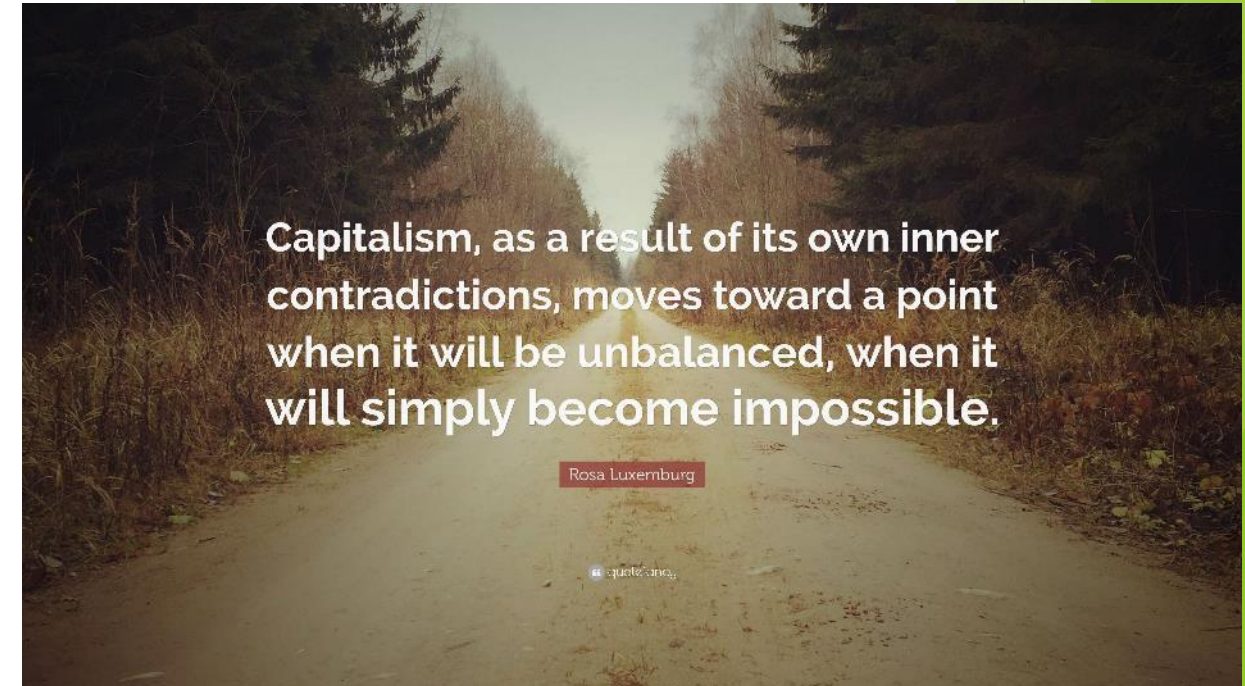


Figure 8. Consumerism – Overproduction⁵

1.1.1.2. Environmental crisis - Reasons

World economic system

- ▶ Capitalist culture promotes the accumulation of capital and the sale of commodities, where individuals are primarily defined by their relationship to business and the market. (https://en.wikipedia.org/wiki/Culture_of_capitalism).
- ▶ Because of the current economic system the basic and most important values are not seen any more.



1.1.1.2. Environmental crisis - Reasons

- ▶ **World economic system**
 - ▶ Capitalism (neoliberalism, etc...),
 - ▶ The most important value is money,
 - ▶ Nothing else matters,
 - ▶ A person is just a number, one of manyworkers and consumers...
- ▶ We do not ask ourselves important questions:
 - ▶ What is really important for the environment
 - ▶ What is really important for the society
 - ▶ What is really important for me

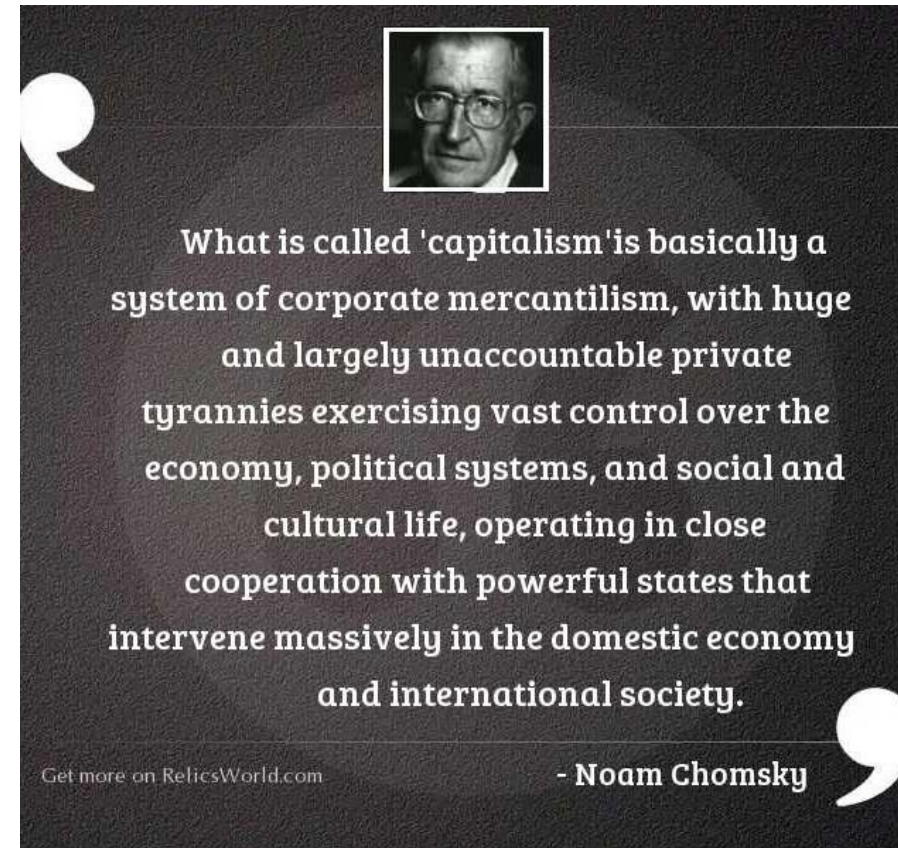


Figure 9. Chomsky about capitalism⁶

1.1.1.2. Environmental crisis - Reasons

Overproduction

- ▶ Consequence of the current economic system is overproduction.
- ▶ Mindset is: produce – sell – profit.
- ▶ Profit is the most important value.
- ▶ Capitalism produces not to meet human needs first & foremost, but to make a profit⁷.



Figure 10. Understanding overproduction⁷

1.1.1.2. Environmental crisis - Reasons

Consumerism

- ▶ Consequence of overproduction is consumerism.
- ▶ We buy to satisfy our endless needs.
- ▶ We buy without asking important questions:
 - ▶ How and where have the raw materials been grown, produced.....?
 - ▶ How and where have the goods been produced?
 - ▶ How many kilometres has the product travelled?
 - ▶ Why is the price of the product so low?
 - ▶ What will happen to the product when I stop using it?



Figure 11. Clothes in Chile desert⁸

1.1.1.2. Environmental crisis - Reasons

Values

- ▶ Because of the current economic system, the basic and most important values are not seen any more.
- ▶ Wrong set of values:
 - ▶ profit
 - ▶ constant growth



Figure 12. Capitalism⁹

1.1.1 Environmental crisis – past and current world trends

▶ 1.1.1.3 Possible solutions

1.1.1.3. Environmental crisis - Possible solutions

We cannot solve our problems with the same thinking we used when we created them.

A. Einstein



Figure 13. Albert Einstein

1.1.1.3. Environmental crisis - Possible solutions

- ▶ We can not solve sustainability problems, which we created with technology, using just technology.
- ▶ Multiple transdisciplinary and holistic approaches should be developed.
- ▶ Circular economy is one of such approaches, which introduces new view and approach to the material flow.

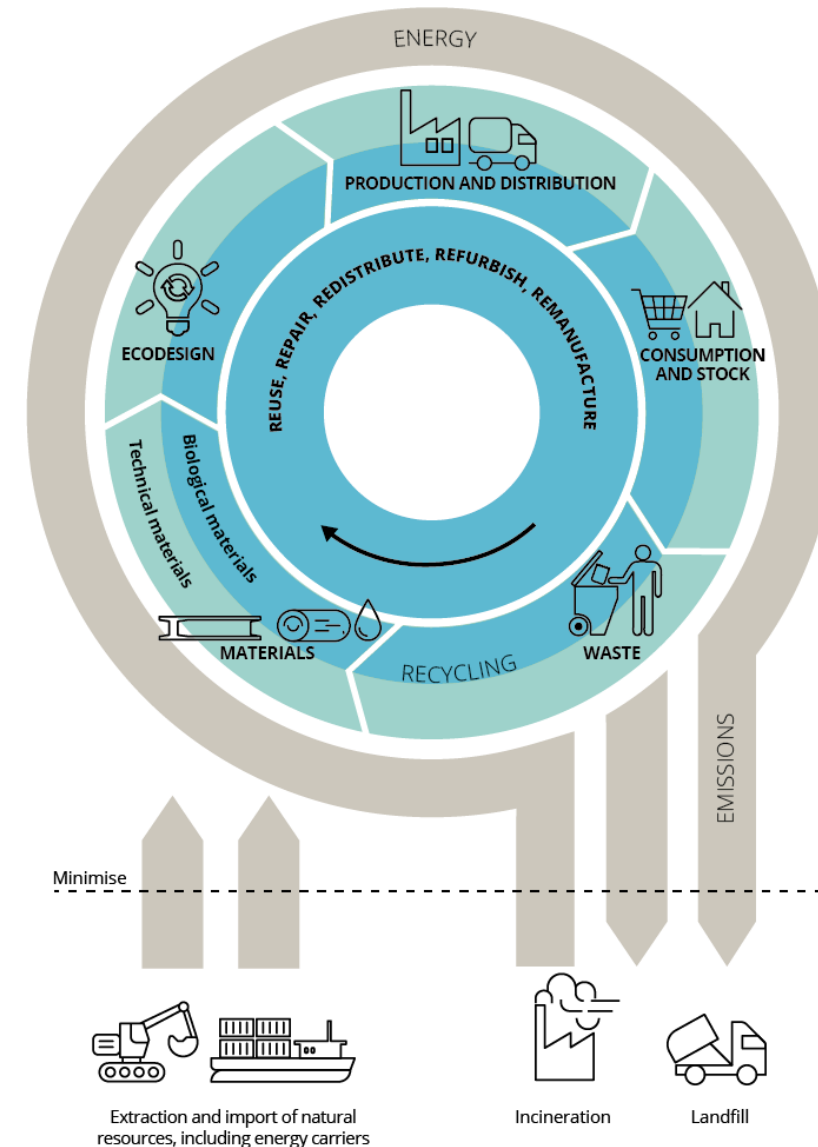


Figure 14. circular-economy-system-diagram¹⁰

1.1.1.3. Environmental crisis - Possible solutions

- ▶ Vision:
 - ▶ Balanced world
 - ▶ Balanced development
 - ▶ Balanced growth
- ▶ Changes in:
 - ▶ Our attitude towards nature
 - ▶ Our attitude towards society
 - ▶ Our attitudes towards ourselves
- ▶ How?
 - ▶ Education

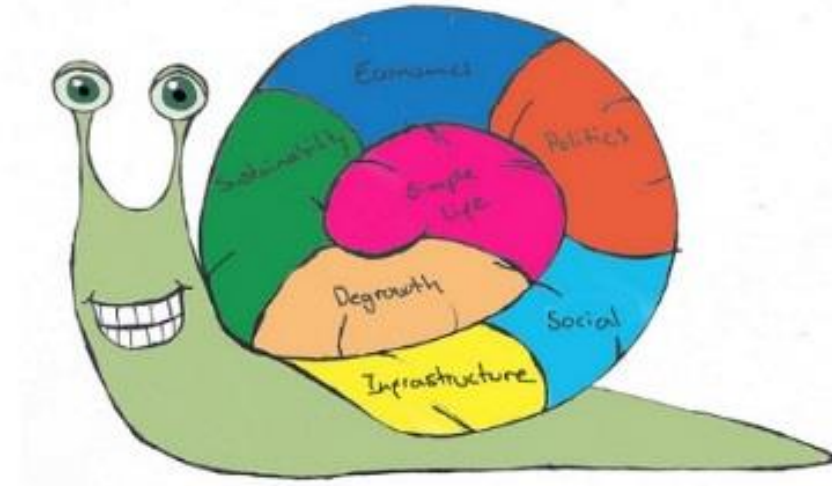


Figure 15. Degrowth¹¹

1.1.1.3. Environmental crisis - Possible solutions

- ▶ What is a measure of a successful company, country?
- ▶ High GDP? High economic growth?
or
- ▶ Balance between:
 - ▶ Healthy environment,
 - ▶ Healthy people,
 - ▶ Healthy society,
 - ▶ Balanced GDP?



Figure 16. Economic growth versus sustainable growth¹²

1.1.1.3. Environmental crisis - Possible solutions

The solution is balance between:

- ▶ Healthy environment,
- ▶ Healthy people,
- ▶ Healthy society,
- ▶ Balanced GDP!



„It has become appallingly obvious that our technology has exceeded our humanity“.

A. Einstein

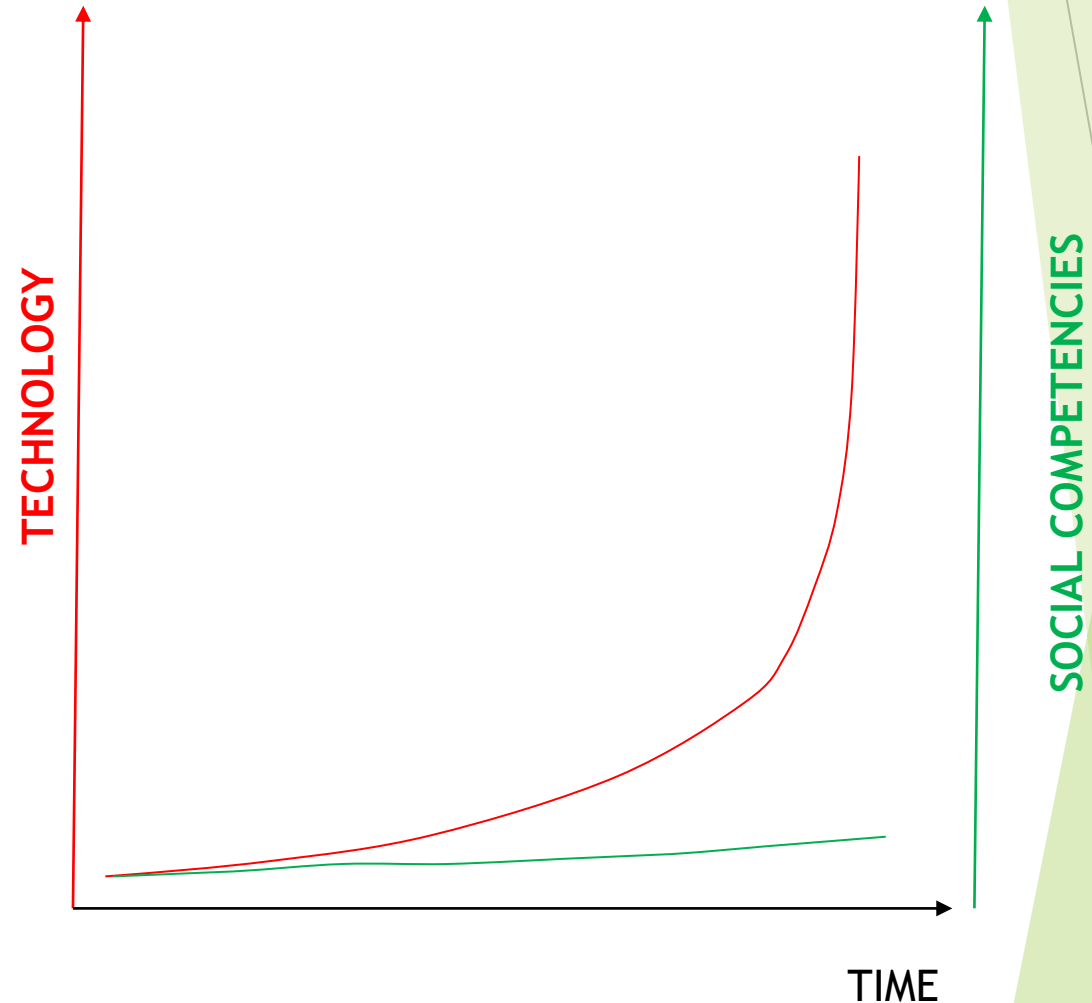


Figure 17. Technological and social development versus time according to the author of the lecture. The social competencies curve has no scientific background and it is drawn for the sake of discussion.

1.1.1.3. Environmental crisis - Possible solutions

- ▶ EU Green deal
- ▶ Circular economy

- ▶ Changes in our habits
- ▶ Changes of our values

- ▶ Thinking out of the box
- ▶ Creative and courageous ideas
- ▶ Holistic approach



Figure 18. European Green Deal scheme

1.1.1.3. Environmental crisis - Possible solutions

We are faced with very important challenges concerning the sustainability of our planet.

EU – sustainable future

- ▶ Important step forward is green deal and in the frame of it circular economy.
- ▶ First bigger step in changing of our attitude towards nature.
- ▶ Economy will get a lot of support for adopting to circular economy.
- ▶ There are a lot and it will be even more initiatives in the field of circular economy.

1.1.1.3. Environmental crisis - Possible solutions

But scientists and eco-movements think that green deal is not enough.

We have to do much more regarding our attitude towards nature!¹³

What if we promote:

- lower consumption
- local production
- homogenous textile products production
- products with longer life
- fair trade
- no child work
- 40 hours or less working week.....etc.



Figure 19. True price for sustainability¹⁴

1.1.2 Stakeholders - who have the power to make a change

1.1.2 Stakeholders - who have the power to make a change

- ▶ 1.1.2.1. Consumer
- ▶ 1.1.2.2. Economy
- ▶ 1.1.2.3. Politics (legislators)

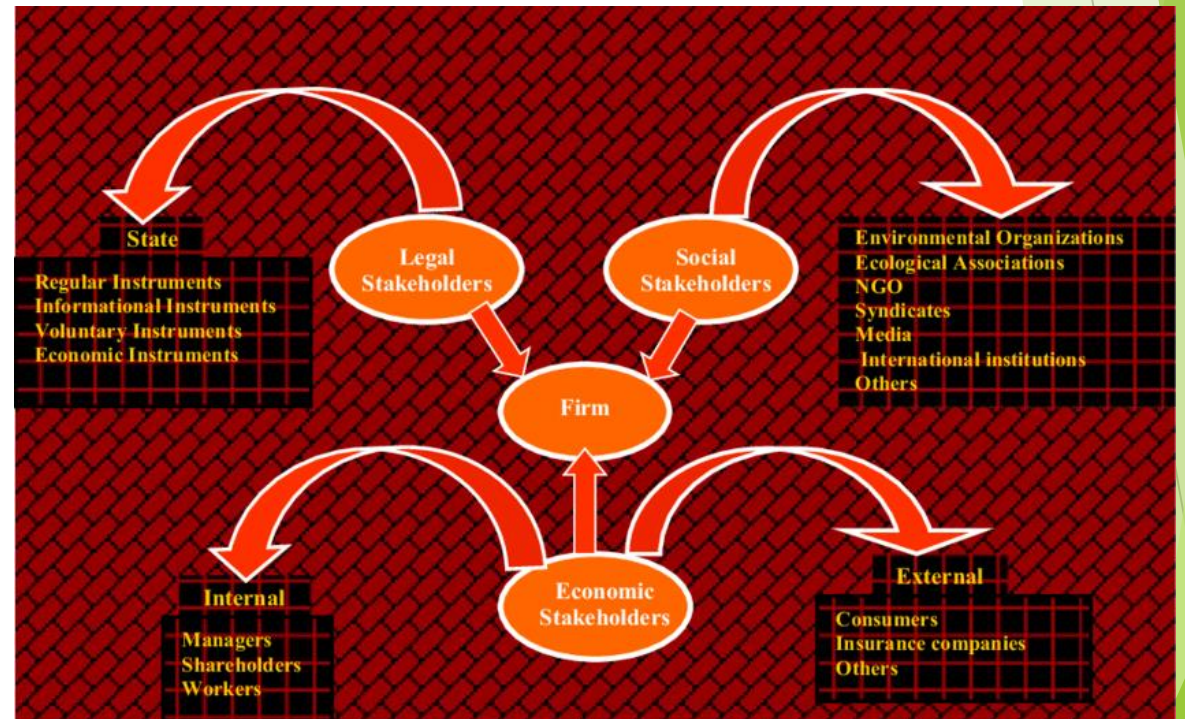


Figure 20. Environmental stakeholders¹⁵

1.1.2 Stakeholders - who have the power to make a change

▶ 1.1.2.1. Consumer

1.1.2 Stakeholders - who have the power to make a change

1.1.2.1. Consumer – a power of a consumer

- ▶ As consumers we have a power to buy or not to buy certain item or service.
- ▶ The economy depends on consumers consumption.
- ▶ With buying sustainable goods we, as consumers, have the influence on sustainable production.
- ▶ But the power of consumers is weakened by marketing and propaganda of producers of goods and by weak sustainable legislation.

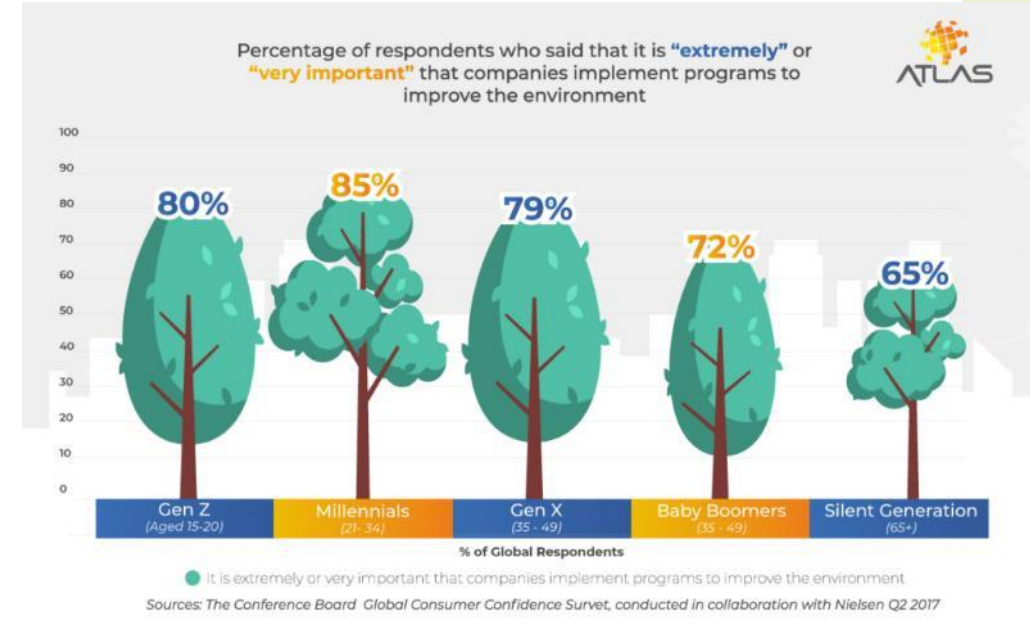


Figure 21. How different generations see the importance of sustainability¹⁶

1.1.2 Stakeholders - who have the power to make a change

1.1.2.1. Consumer – a power of a consumer

- ▶ Aware and responsible customer
- ▶ Education
- ▶ Knowledge
- ▶ Empathy

1.1.2 Stakeholders - who have the power to make a change

▶ 1.1.2.2. Economy

1.1.2 Stakeholders - who have the power to make a change

1.1.2.2. Economy – the power of economy

- ▶ The economy produces goods and has power to decide to produce sustainable goods.
- ▶ But economy depends on demand and consumption and on legislation.
- ▶ Currently the economy is still „forced“ to produce cheap, nonsustainable products since consumers are mostly buying cheap products and legislators are not changing legislation in the favour of sustainability.



Figure 22. Green economy economics¹⁷

1.1.2 Stakeholders - who have the power to make a change

1.1.2.2. The power of economy – example:

- ▶ Aware and responsible companies.

Patagonia mission¹⁸

“we’re in business to save our home planet.”



1.1.2 Stakeholders - who have the power to make a change

1.1.2.2. The power of economy – example:

Patagonia core values¹⁸



Build the best product

Function, repairability, durability. Among the most direct ways we can limit ecological impacts is with goods that last for generations or can be recycled so the materials in them remain in use.

Cause no unnecessary harm

We work steadily to change our business practices and share what we've learned. We seek not only to do less harm, but more good.

Use business to protect nature

We embrace risk and act to protect and restore the stability, integrity and beauty of the web of life.

Not bound by convention

Our success—and much of the fun—lies in developing new ways to do things.

1.1.2 Stakeholders - who have the power to make a change

▶ 1.1.2.3. Politics (legislators)

1.1.2 Stakeholders - who have the power to make a change

1.1.2.3. Politics (legislation) – the power of legislators:

- ▶ Politicians (legislators) have the power to change our current nonsustainable trend. They are in power to prepare and accept rules, laws and legislation which is in accordance with sustainable progress.
- ▶ The problem of politicians is that they are just a tool in the hands of financial lobbies and that they are not courageous enough to make a change.
- ▶ The proof for that is the Environmental summit 2021 in Glasgow where politicians failed to make a significant breakthrough.



Figure 23. UN Climate Change Conference of the Parties (COP26),Glasgow, 2021¹⁹

1.1.2 Stakeholders - who have the power to make a change

1.1.2.3. Politics (legislation) – the power of legislators:

- ▶ Aware and responsible leaders, politicians, legislators.
- ▶ Not just words but actions matter:
 - ▶ UN sustainability goals
 - ▶ Green deal
 - ▶ Circular economy

Who has the power to make a change?

1.1.2 Stakeholders - who have the power to make a change

We have the power!

- ▶ We will play different roles in our life, we will be consumers, we will be a part of economy and in some cases we will have also power on decision making regarding legislation.
- ▶ In all different roles that we will play we have to act responsibly and sustainably.
- ▶ In current situation we need knowledge, awareness, responsibility and courage to make a difference.



Figure 24. My ActionsMatter²⁰

1.1.3 Education – engineers of the future

1.1.3 Education – engineers of the future

Education is the strongest tool to make a long-term and long-lasting change.

Modern education will enable us to:

- ▶ Develop competencies for the future.
- ▶ Switch from one discipline view to transdisciplinary view.
- ▶ Switch from narrow to holistic view.
- ▶ Develop a new value system.

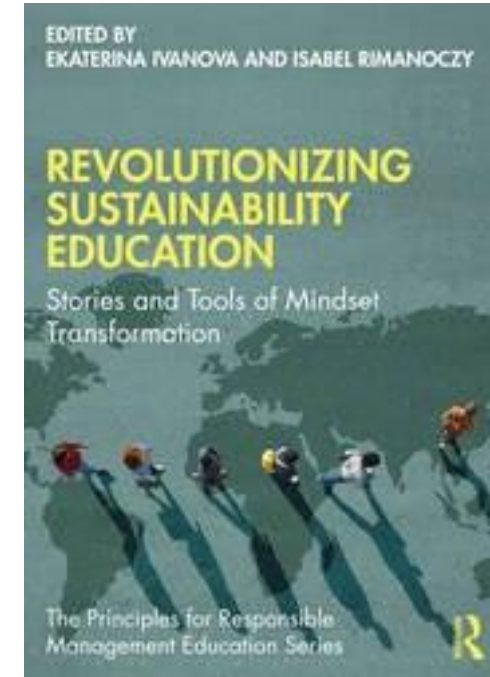
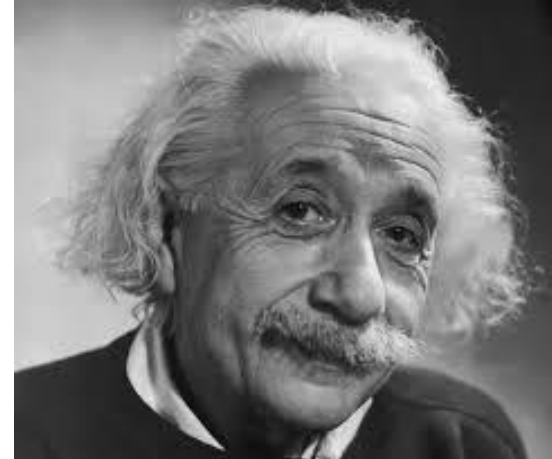


Figure 24. Revolutionizing Sustainability Education²¹

1.1.3 Education – engineers of the future

The aim [of education] must be the training of independently acting and thinking individuals who, however, see in the service to the community their highest life goal.

A. Einstein



1.1.3 Education – engineers of the future

Highly evolved and developed world needs focus on highly emotionally and socially developed human beings with high awareness who can build a better world using sustainable and holistic approach. Education is the strongest tool. We should use it!

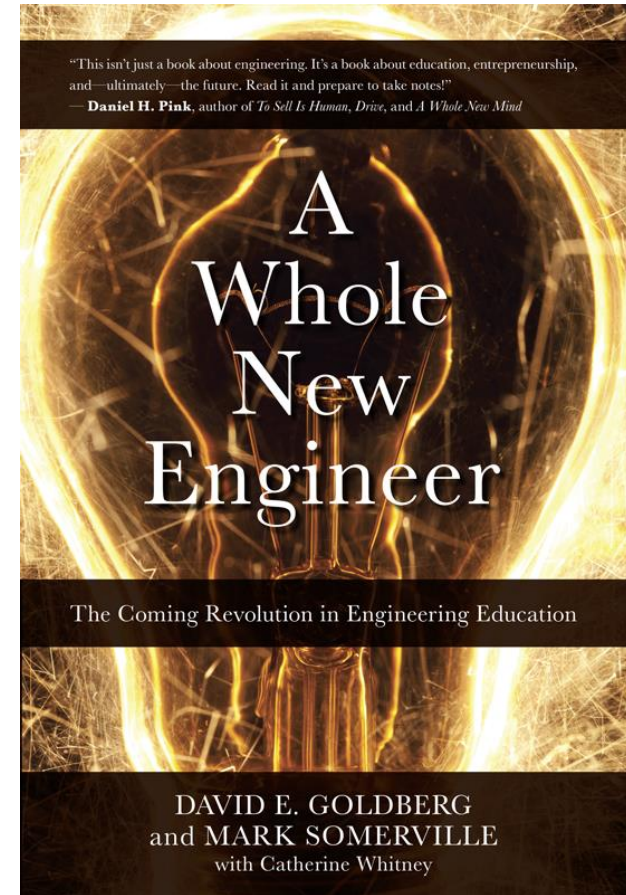


Figure 25. A Whole New Engineer²²

1.1.3 Education – engineers of the future

Engineers of the future:

- ▶ Are specialists in their field and are opened to all other fields.
- ▶ Have a transdisciplinary view.
- ▶ Act Holistically and on a long term basis.
- ▶ The work with colleagues from different disciplines is a must for them.
- ▶ Combine natural sciences, technology, social sciences, art, etc.
- ▶ Share the knowledge. Since knowledge belongs to all.
- ▶ They believe in equality in all fields.



1.1.4 Conclusion

- ▶ Your role in creating a sustainable world is extremely important.
- ▶ Circular economy is a very important step forward towards a sustainable future.
- ▶ Be courageous and search for the solutions also outside of the established practices.
- ▶ Search for the solutions with experts from other disciplines – think and act transdisciplinary.
- ▶ Be aware of all possibilities – act holistically.



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