The Impact of Digitalisation on the Environment and Climate

Module:	*Environment*
Topic:	*The impact of digitalisation on the environment and climate*
Title:	*How does digitalisation influence our environment?*
Target group:	*Middle and high school*
Starting Point:	*The use of digital devices does not only impact our health and well-being, but also the environment. Students are often unaware of the relation between digitalisation and the climate crisis. Almost every action people take in the developed world has an impact on the environment, including our actions regarding digital devices.*
Aim:	*Students are aware that their use of digital technology has an impact on our environment. They also know how to reduce their ecological footprint.*
Implementation:	*Homework + debriefing*
Estimated Duration:	*Research as homework, debrief 1-2 lessons (or more, depending on the depth of the task and the age of students).*

More detailed content and instructions:

In this exercise, students should familiarise themselves with the topic of "environment and digitalisation" through a research task.

Homework:

The students are asked to do research on the topic *"How do digital devices affect our environment and the climate?"*
The research task should focus on the general effects of digital devices on our planet, and on the effects that students have on the planet with their own behaviour.

In line with the general topic, here are some relevant, more specific questions:

- How many resources does the production of my digital devices require? How much CO^2 was used for my mobile phone, laptop etc.?
- How much energy does my mobile phone consume?
- Does it have an impact on the environment when I am on the internet?
- Do social media produce CO^2?
- Are there ways how I can counteract or avoid the negative effects?
- What may also be opportunities of digitalisation for the environment?

The students should research these questions. Depending on the desired scope of the task, one to several weeks can be given for the task, possibly with an intermediate discussion. Finally, the results are collected and discussed in class. The results can also be presented in the form of presentations or posters.

Possibilities for action:

Subsequently, alternatives can be pointed out and discussed: What can be done now?

Possible courses of action that can be discussed:

- Buy digital devices (mobile phones, laptops, etc.) second-hand or in a more environmentally conscious way (e.g., Refurbed (www.refurbed.at), Fairphone (www.fairphone.com)) in order to avoid CO^2-emissions in production.
- Take good care of digital devices so that they have a long lifespan.
- Consider whether a new device is really necessary.
- Dispose of digital devices properly – do not just throw them in the bin.

TO BE TAKEN INTO ACCOUNT:

- Depending on the class and age of students, the task might be a bit too broad. The students could therefore also focus on some of the more specific questions.
- For the **younger students** documents could already be provided, as free unguided research could be too difficult (see sources below). The focus of the research can be limited or divided into groups (e.g., mobile phone only - find out how much CO^2 your mobile phone consumes).

Background information for teachers

Risks of digitalisation for the environment:

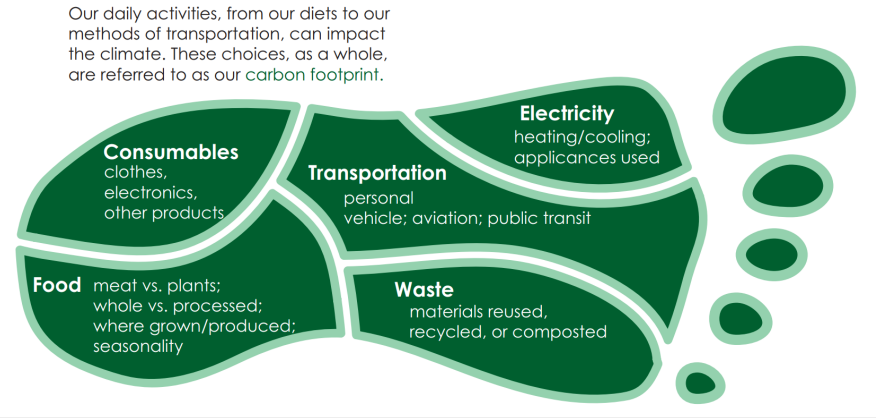
- The production of digital devices causes emissions, required rare earths have to be mined
- Disposal of digital devices
- Strengthening the tendency towards a consumption- and throwaway society

Opportunities of digitalisation for the environment:

- A more efficient use of energy
- Saving materials
- More efficient handling of pollutants
- The decentralisation of energy production: In contrast to centralised energy supply, decentralised energy supply means the provision of energy by smaller plants close to the consumer. This definition of the term thus has a geographical and a quantitative component: The decentralised energy conversion plants are located directly where the energy is needed and the energy is supplied by relatively more, but much smaller plants compared to the centralised energy supply.

The 3Rs: Reduce, Reuse, Recycle

- About 10% of the materials used in Europe are collected and reused.
- Our daily activities, from what we eat to how we get around each day, affect **our ecological footprint.**
- Use the calculator provided by the European Union to calculate the ecological footprint of your consumption habits: https://eplca.jrc.ec.europa.eu/ConsumerFootprint.html



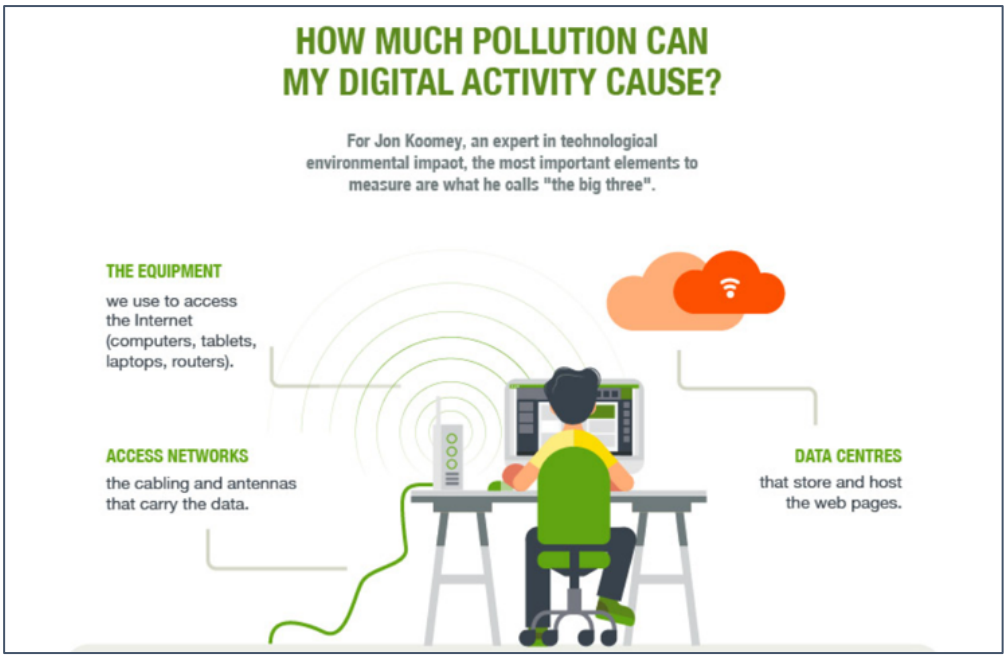
- Eco-friendly behaviour includes different types of functional behaviour such as **recycling, waste management, energy consumption** and **responsible consumption through the purchase of environmentally friendly/recycled products** or the **reduction of consumption.**
- It is often recommended that one can behave more sustainably by following these three steps:

    1. Reduce - waste reduction: First of all, it is best to produce as little waste as possible (e.g., do not use unnecessary plastic packaging; buy products such as fruit and vegetables without plastic packaging if possible; put your snack in a Tupperware box and do not wrap it in foil).
    2. Reuse: If it cannot be avoided (step 1 - reduce), then materials should be reused as much as possible (e.g., do not throw away bags after shopping, but keep them and reuse them (e.g., in the rubbish bin) or take them back with you the next time you go shopping).
    3. Recycle: If material could not be avoided and cannot be reused, then it should be recycled properly (e.g., recycle bottles or cans so that the material does not end up in the environment and can be processed correctly; metals from digital devices can be reused in new devices).

Digitalisation and CO^2 emissions

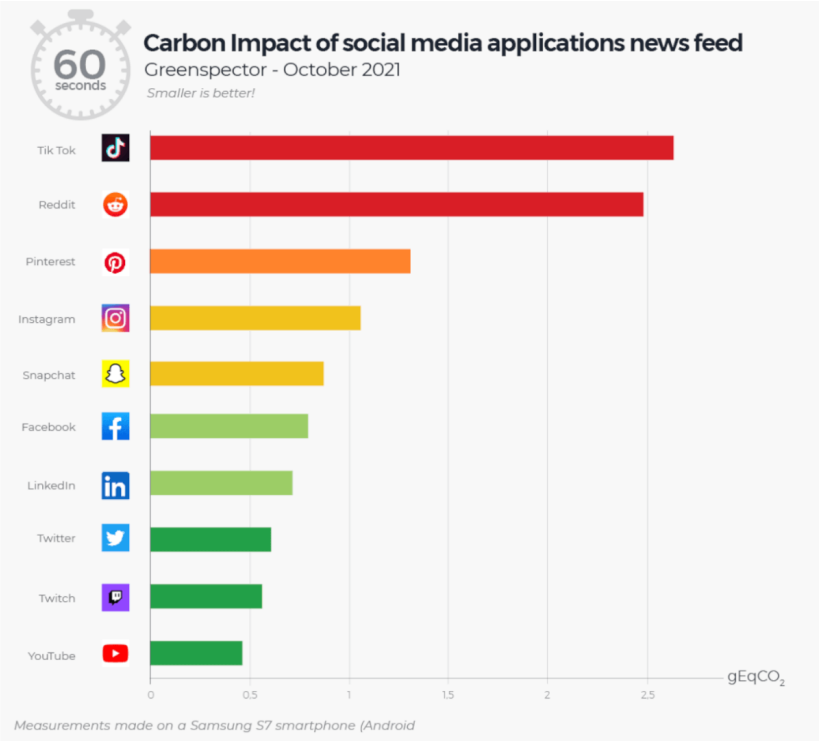
- It is true that, thanks to the internet, we often work from home which means less environmental impact from traffic.
- We also do not have to print out documents, or buy a DVD of our favourite film, and thus have a lower environmental impact by producing fewer products.
- The reduction of these more tangible forms of pollution has led to the widespread belief that digitalisation is good for the planet.
- Unfortunately, however, this is not true: In recent years, there have been more and more voices reminding us that digital pollution is just as tangible and the environment just as threatened as by other forms of pollution.
- The impact can be divided into **three main dimensions**: the **production of** the technical devices, the **practices of their use** and the **electronic waste** after their disposal.
- As the devices become smaller and the number of components increases, the effort of production becomes greater and greater. The **environmental impact of manufacturing and e-waste** has never been greater.

- According to the European Environment Agency, **10 million tons of e-waste** are produced **annually in Europe** alone.
- About **10% of the energy consumed worldwide** is used for the **operation of the internet and connected devices** as well as their **production.** The trend is rising by around 9% per year.
- According to research, if the internet were a country, it would be third on the list of energy consumption, only behind China and the USA.
- Unfortunately, most of this energy does **not** come from **renewable sources**, so that the internet, its operation, and the production and operation of the devices connected to it are responsible for **4% of the global carbon footprint.** This share is expected to **double by 2025!**
- According to the UN, 81% of the energy consumed by a computer during its life cycle is used during manufacturing, which requires an average of 270 kg of fossil fuels, 25 kg of chemicals and 1.5 tons of water.
- **Sending an e-mail** via the internet has only a small impact on the environment (0.3 - 4 gr CO^2 e). However, about **330 billion e-mails** are sent via the internet **every day**. → In transport, this would be equivalent to the CO^2 emissions of **7 million additional cars** in the world.
- The **use of digital communication channels** and **social media** also has a **significant carbon footprint**.
- An **average internet user** spends about **2.5 hours a day** using social media. Over a year, this produces about as many emissions as driving **535 km by car.**



*CO^2 e = CO^2 equivalent. This is a unit that summarises the effect of CO^2 and other similar greenhouse gases (Metzinger, 2023).

- Internet surfing is responsible for a significant part of digital carbon dioxide emissions. Loading an average website causes about 1.76 g CO^2. This means that a website with 100,000 hits per month has a CO^2 footprint of more than two tons of CO^2 per year.
- **Video streaming and music** are among the **largest contributors** to the digital CO^2 footprint, as huge amounts of energy are required to power household appliances and to power the servers and networks that host and transmit contents. Streaming currently accounts for about **63% of global internet traffic**, and **video streaming** alone is estimated to generate about **300 million tons of CO^2 each year** (equivalent to about 1% of total carbon dioxide emissions worldwide).



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