TRAINING LESSON 12 - Part 1

Title	- Digitalization and sustainability
Part of the training course referred to in this lesson	X Part 1 General information about sustainability and CE Part 2 Specific Information about: □ Wood sector □ Plastic sector □ Agrifood sector
EQF level	3 level
Where the lesson was tested	//
General Learning objective(s) according to the Bloom Taxonomy https://cft.vanderbilt.edu/guides-sub-pages/blooms-taxonomy/	□ **Create** Produce new or original work (design, assemble, construct, investigate, formulate) □ **Evaluate** Justify a stand or decision (appraise, argue, defend, critique, select, support) □ **Analyze** Draw connections among ideas (differentiate, organize, relate, compare, distinguish, test, experiment) X **Apply** Use information in new situations (execute, implement, solve, use, demonstrate, operate) X **Understand** Explain ideas or concepts (classify, discuss, describe, identify, locate, translate) X **Remember** Recall facts and basic concepts (define, duplicate, list, memorize, repeat)
Specific learning objective(s)	- *To understand how digitalization can be important for sustainable development* - *To understand what "digital sustainability" is and to analyze its advantages*
Cognitive, socioemotional and behavioural outcomes	**SDG 9 - Industry, Innovation and Infrastructure**

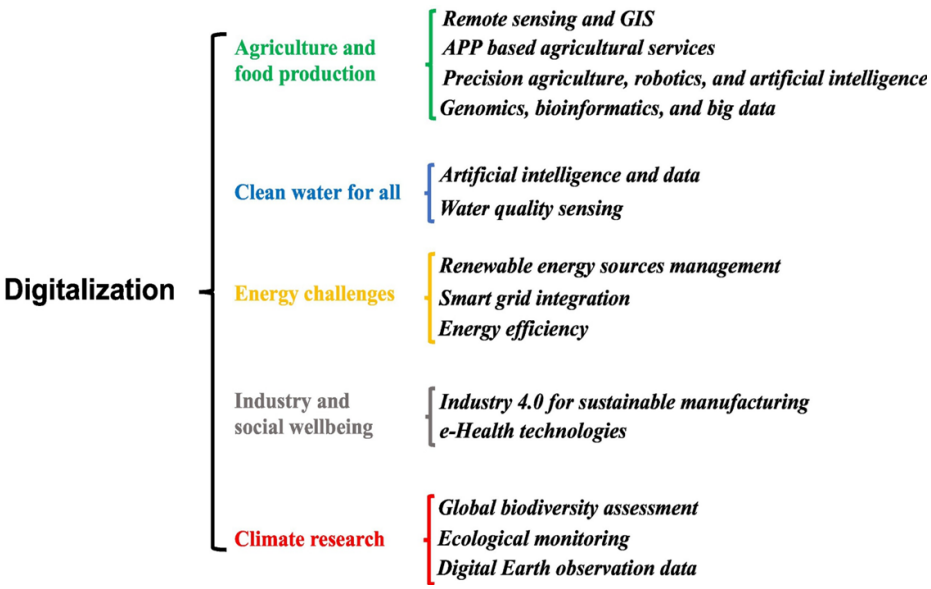
based on https://www.unesco.de/sites/default/files/2018-08/unesco_education_for_sustainable_development_goals.pdf	Cognitive learning objectives: the learner is aware of new opportunities and markets for sustainability innovation, resilient infrastructure and industrial development. Socio-emotional learning objectives: the learner is able to understand that with changing resource availability (e. g. peak oil, peak everything) and other external shocks and stresses (e. g. natural hazards, conflicts) their own perspective and demands on infrastructure may need to shift radically regarding availability of renewable energy for ICT, transport options, sanitation options, etc. The learner is able to argue for sustainable, resilient and inclusive infrastructure in their local area. Behavioral learning objectives: The learner is able to work with decision-makers to improve the uptake of sustainable infrastructure (including internet access).
Green skill(s) addressed	☐ Creative problem-solving X Forward-thinking x Monitoring skills x Analytical skills x Lean production ☐ Maintenance and repair skills x Pollution prevention x Eco-design X Management skills ☐ Impact quantification ☐ Life-cycle management x Science skills ☐ Waste management ☐ Environmental auditing ☐ Ecosystem management ☐ Other_____
Duration	20 min
Structure and content of the lesson	**Lesson „Digitalization and sustainability“ consist of three main topics:** **Topic 1: Benefits of Digitalization** **Topic 2: Digital solutions** **Topic 3. Artificial intelligence** **Introduction** Digitalization is anywhere and everywhere. But how does it really impact us? Please watch the video here https://www.youtube.com/watch?v=e_UjR4KW4KI Digitalization is important to mitigate pollution and assure sustainable development. Digital technologies **increase sustainable attitudes toward the**

environment and emphasize green companies' importance.

Topic 1: Benefits of Digitalization

The move from the analog world to a digital one during the last few decades greatly accelerated processing power and communication speed, which facilitates information and data sharing. During digitalization, stakeholders and anyone, in general, are greatly empowered through vast amounts of information at their disposal. Boosted information availability not only assists stakeholders in learning about the available product or service features but also in sharing goods and services. ''*It was once common among friends and family to share things, but with digitalization, a community practice has become a profitable business model that initiates lower consumption, efficient use of resources, increased flexibility, and hence, a more sustainable society*'' (Sezen Aksin-Sivrikaya and C.B. Bhattacharya, 2017).

The globalization of digitalization is having the effect of making an increasingly higher number of services and products to become more environmentally friendly and sustainable. This not only transforms how individuals use their expenditure but also the way businesses are conducted especially in the education and healthcare sectors. As the concerns on climate crisis rise, digitalization makes an idea of a 'shared economy' possible. Digitalization enables owners and renters to come together through online platforms and companies to share cars, accommodations, bikes, household appliances, and more. Sharing might be a solution to overconsumption and has potential environmental benefits through efficient use of resources.



Source: Maria E. Mondejar, Ram Avtar, Heyker Lellani Baños Diaz, Rama Kant Dubey, Jesús Esteban, Abigail Gómez-Morales, Brett Hallam, Nsilulu Tresor Mbungu, Chukwuebuka Christopher Okolo, Kumar Arun Prasad, Qianhong She, Sergi Garcia-Segura, Digitalization to achieve sustainable development goals: Steps towards a

	Smart Green Planet, Science of The Total Environment, Volume 794, 2021, 148539, ISSN 0048-9697, https://doi.org/10.1016/j.scitotenv.2021.148539 Benefits of digitalization: - optimization of energy and natural resources - reduced operational costs - increased productivity - increased transparency - predicts environmental disasters Maria E. Mondejar, Ram Avtar, Heyker Lellani Baños Diaz, and others (2021) explain how digitalization brings a new set of tools that have to be carefully balanced to ensure smart application and their green character. Advancement and fabrication of electronic devices are exhausting limited resources and generating e-waste (unwanted electronic products, not working, and nearing or at the end of their "useful life") that is being barely recycled (Ahirwar and Tripathi, 2021; Dhir et al., 2021). In light of the life-cycle and advancing e-waste recycling technologies is an urgent need. The essentiality for better infrastructure is another issue that may widen the gap between developed and developing areas instead of narrowing it. It is important to ensure infrastructure and equal internet access to achieve the comprehensive goal of reducing inequalities and poverty, leveling with the need to provide digital education. **Topic 2: Digital solutions** Digital solutions in agrifood could help not to waste water, different sensors and remote control assure that all needed materials can be given on time. The removal of pollutants, impurities, and salts all require their own unique processes that have to be integrated with each other. Traditionally, these forms of plants have relied on generalization instead of accuracy meaning that they oversize their facilities and overtreat, which ultimately increases capital expenditures. In addition, failure to adequately maintain instrumentation and controls ends up in inaccurate readings that impact the ultimate product of the water quality. Digitalization with different possibilities to detect and monitor water, and temperature level makes it easier to grow food in a sustainable way. Maria E. Mondejar, Ram Avtar, Heyker Lellani Baños Diaz and others (2021) define „Digital Sustainability is understood as the effort of developing and deploying smart technologies to secure sustainable economic growth while considering and integrating the SDGs. It is essential to create a Smart Green Planet that provides resources while protecting the environment and health of all the planet's inhabitants.

Picture summarizes which SDGs can specifically and holistically be addressed by the different sectors.

Picture: Maria E. Mondejar, Ram Avtar, Heyker Lellani Baños Diaz and others (2021) *https://www.sciencedirect.com/science/article/pii/S0048969721036111*

Digitalization of genomes has empowered us to spot, isolate, and selectively breed for traits that are drought resistant, pest resistant, have the next yield, and so on. Genome-assisted breeding in legumes has resulted in the production of high-quality seeds that are more stress-tolerant, productive, and have the next nutritional content. Wheat, barley, and rye have similarly seen improvements in plant growth and yield-related traits to assist continue with the pressures related to a growing population.

Conventional energy grids are designed around one source of generation, like an outsized powerhouse. The demand for electricity relies on climate, climatology, and even societal habits. Detailed data modeling has empowered conventional energy grids to accurately gauge the quantity of electricity needed on any given day to stop the over or under generation of energy.

Topic 3. Artificial intelligence

Emmanuel Kwame Nti, Samuel Jerry Cobbina, and others (2022) show the importance of artificial intelligence *"to tackle most environmental sustainability issues such as biodiversity, energy, transportation, and water management"*. Biodiversity research has developed machine learning processing solutions to predict ecosystem services.

Artificial intelligence applications and machine learning models are

	increasingly used for predicting and optimizing water resource conservation. Area neural networks, expert systems, pattern recognition, and formal logic models are the most focused areas in energy. Emmanuel Kwame Nti, Samuel Jerry Cobbina, and others (2022) conclude that artificial intelligence could improve significantly towards achieving environmental sustainability in different themes such as biodiversity, energy, transportation, and water. *„Monitoring is important in leveraging artificial intelligence and environmental sustainability. However, various interventions are required to measure both the positive and negative impacts of artificial intelligence on environmental sustainability".* Smart sensors in all industries and different sectors guarantee optimization of energy and natural resources. Smart technologies optimize the transport, food, and wood sector and not only save resources but also can predict needed interventions. Prediction is important not only for meteorological interest but to save people, and animals' lives and create resilience to disasters. **Conclusion** Digitalization has been a driving force in the world of sustainability. Many of the complex environmental, social, and economical challenges are being tackled thanks to digitalization and the use of data on integrated systems. Benefits of digitalization: - optimization of energy and natural resources - reduced operational costs - increased productivity - increased transparency - predicts environmental disasters Digitalization and sustainability nowadays are working in pairs to find the best solutions to achieve the planned SDG.
References	• *Maria E. Mondejar, Ram Avtar, Heyker Lellani Baños Diaz, Rama Kant Dubey, Jesús Esteban, Abigail Gómez-Morales, Brett Hallam, Nsilulu Tresor Mbungu, Chukwuebuka Christopher Okolo, Kumar Arun Prasad, Qianhong She, Sergi Garcia-Segura, Digitalization to achieve sustainable development goals: Steps towards a Smart Green Planet, Science of The Total Environment, Volume 794, 2021, 148539, ISSN 0048-9697, https://doi.org/10.1016/j.scitotenv.2021.148539. https://www.sciencedirect.com/science/article/pii/S0048969721036111* • *Sezen Aksin-Sivrikaya and C.B. Bhattacharya. Where Digitalization Meets Sustainability: Opportunities and Challenges Springer International Publishing AG 2017 T. Osburg, C. Lohrmann (eds.), Sustainability in a Digital World, CSR, Sustainability, Ethics &*

	Governance, DOI 10.1007/978-3-319-54603-2_3 https://www.thomasosburg.de/wp-content/uploads/2017/07/SDW_Content.pdf#page=56 • *Emmanuel Kwame Nti, Samuel Jerry Cobbina, Eunice Efua Attafuah, Evelyn Opoku, Michael Amoah Gyan, Environmental sustainability technologies in biodiversity, energy, transportation and water management using artificial intelligence: A systematic review, Sustainable Futures, Volume 4, 2022, 100068, ISSN 2666-1888, https://doi.org/10.1016/j.sftr.2022.100068*
Interactive questions for R3	Digitalization hasn't been a driving force in the world of sustainability. True False X Artificial Intelligence (AI) has become an important area to tackle most environmental sustainability issues such as biodiversity, energy, transportation and water management. True X False
Keywords	**Digital era, sustainability, artificial intelligence**
Questions for reflection	1. HOW COULD YOU EFFICIENTLY USE DIGITALIZATION AND SUSTAINABILITY UNDERSTANDING IN YOUR FUTURE PROFESSION? 2. How many examples of digital and sustainable solutions fusion can you list?
Additional resources	- DIGITAL AGRICULTURE: HOW DUTCH FARMERS USE PRECISION FARMING FOR FLORICULTURE **https://www.konicaminolta.eu/eu-en/rethink-work/business/digital-agriculture-how-dutch-farmers-use-precision-farming-for-floriculture** **https://www.digitalsme.eu/what-is-sustainable-digitalisation/#:~:text=At%20DIGITAL%20SME%2C%20we%20propose,%2C%20green%2C%20and%20organic%20way.**

Icons & related info for the hints of the PowerPoint presentation	 This hint is used to indicate that there's a link to other websites with additional information.  This is used within the PPT to indicate that something important is written/ to invite the reader to pay attention to essential information.  It indicates a question for reflection
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