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Sustainability of the ICT Infrastructure in the context of CSR Reporting of the Universities

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Executive Summery

With the rise of information technology, the usage of related IT equipment is increasing day by day. While ICT can help to tackle the emerging climate crisis, the issue of the negative impact of ICT equipment and operation often remains unnoticed. In addition, if any organization does consider the adverse effects of ICT, the lack of efficient CSR reporting makes it difficult to be visible to the outer world. If it's any educational institution, the focus in CSR reports is mostly on education and research-related work, where ICT sustainability can be a valuable addition as ICT is linked strongly with research and education. So, this research aims to investigate how higher educational organizations deal with the negative impacts of ICT and how to improve the CSR reporting of related activities.

The research used qualitative research methodology with a deductive approach and thematic analysis. The case organization in this research is Aalborg University, renowned for working on sustainability agendas. The data for the study was collected by conducting semi-structured interviews among different ICT and CSR authorities of the university, which gave proper insights into sustainable activities. In addition, a conceptual life cycle assessment was conducted for the core ICT equipment of the university to establish the reasoning for the negative impact of ICT and potray as a possible tool for quantification of impacts for better reporting.

The study found that the ICT activities within Aalborg University match different sustainability factors, which helps to deal with the negative impacts of ICT. Also found that there are opportunities to improve from a sustainable point of view and for that quantification of both positive and negative impacts, datafication to find the better solution is necessary. In addition, this quantification will also improve the CSR reporting of the activities as that will be more relatable with facts and figures rather than just a story. The research findings will benefit higher education organizations, telecoms, and other kinds of organizations to work on their sustainability strategy as the core ICT infrastructure is the same for all.

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1 . Introduction

With the changing global climate, the world is going through the record warmest years, and the situation will only worsen if adequate steps are not taken. This climate crisis has many consequences, like more frequent and intense droughts, storms, heat waves, rising sea levels, melting glaciers, etc. As climate change worsens, dangerous weather events become more frequent or severe. To tackle the crisis in the future, all the possible stakeholders need to come forward, and no stone should be left unturned. Global leaders meet at the UN global climate conference each year to discuss and agree on different issues that should be done to protect the environment. It brings responsibilities for all the related stakeholders like industries, organizations etc. So as an important stakeholder, organizations should do their part to make the world more sustainable. Already many organizations are integrating sustainability at the top of their agenda.

With the advancement of information technology, the need for ICT hardware equipment is growing gradually and will not decrease anytime soon. Among all the issues, organizations often ignore the carbon footprint and emission of ICT hardware components throughout the life cycle, including manufacturing, usage, and disposal. Universities are not an exception in this case. Universities sit at the core of learning, innovations, and research which require a good amount of digital connectivity along with the equipment. For example, all Danish universities are connected to a network in Denmark. The Research Network connects the Danish universities and research institutions directly with each other, with other research networks worldwide and the Internet in general. To ensure this connectivity, IT infrastructure is needed in all the universities in Denmark and abroad, including data centers, firewalls, servers, access points, etc. So a massive amount of IT equipment is used behind all kinds of educational and research activities. Even though IT equipment contributes to creating sustainable friendly solutions, there are also negative environmental effects from manufacturing, usage, and end-of-life stages of equipment. To be more sustainable in activities, universities should also consider the footprint and emission of the internal IT equipment, which also brings opportunities to be more accurate on the whole sustainability reporting.

The core of the organizational promotional activities is the corporate social responsibility reports, which portray the organization's overall image. Organizations try to highlight the core values in the report so that more acceptance can be gained to society. Currently, most organizations are getting concerned about sustainability issues and have started to follow sustainable practices by integrating them into the organizational core value, and this applies to universities as well. Universities have started to be more sustainable, and such practices are mainly focused on innovation and common sustainability practices, like promoting sustainability research, doing activities related to sustainability, etc. Then comes the question of how sustainable the technology behind this research and overall activities. Investigating it will open new scope to extend the reporting areas in the universities' CSR reports.

Organizations operate under guidelines and rules that serve as the basis of legitimacy. So one reason why emission-reducing steps from ICT could be lacking is that the organization does not see it as legitimate; hence, parameters to measure the environmental sustainability of ICT are missing. So, the research aims to find out by a case study, how legitimate the university activities are for environmental sustainability and how it contributes to decision-making along with sustainability reporting. The Triple Bottom Line framework will be used to understand the importance of measuring the impacts of ICT equipment on environmental sustainability. The Legitimacy theory will be used to understand the view of the university on the environmental sustainability of ICT equipment and check how the case university is doing so that the legitimacy of the activities can be checked. So, to investigate these issues, the formulated research questions of this research are,

How are higher education organizations doing in terms of environmental sustainability in the context of ICT infrastructure?

- How does measuring ICT's emissions and footprint impact decision-making and CSR reporting?

The report starts with discussing the literature about sustainability, negative impacts of ICT on the environment, related frameworks and policies to ensure ICT sustainability, relation with corporate social responsibility, how the university is related, and the ICT infrastructure for inter-university connectivity. Later the theories used in this research are explained, ending with a conceptual framework to operationalize the research. Next, the methodology is elaborated with a research design strategy and data collection methods. After this section, the research findings are written, leading to the analysis and discussion.

2 . Literature Review

This chapter explains the importance of sustainability and how ICT negatively impacts it. Later the policies and frameworks to tackle ICT emission is mentioned and discussed why organizations should react to these. Next are corporate social responsibility issues and the universities' relation with CSR. In the end, the vastness of the education and research network is explained along with the sustainability ranking of universities in Denmark.

2.1 What is Sustainability?

Sustainability means meeting the present's needs without compromising future generations' ability to meet their own needs (Nations, n.d.). It means that resources are limited and should be used sparingly and wisely in order to preserve enough for current and future generations without lowering their standard of living. There are three main pillars of sustainability which are environmental, social, and economical. The environmental pillar includes protecting biodiversity, efficient use of natural resources, use of renewable resources, efficient waste management, reducing CO2 emissions, etc., whereas the social pillar consists of inclusion, empowerment, values, social justice, etc., and the economic pillar talks about economic viability, profit, and growth (Simon, 2022). Even though the three pillars cover separate areas, they are linked with each other. If there is environmental and economic sustainability, then living condition is viable until any social unrest, again environmental and social sustainability can make life bearable until

getting out of money; finally, economic and social sustainability can make life equitable but until environment degrades to the unlivable point (Guion, 2020). So, all the pillars are related to each other, which often makes things difficult to be fully sustainable. For example, making things environment friendly can cost more in the production, resulting in more expensive than the other similar featured products. In that way, ensuring economic sustainability is challenging, which can also be defined as the contradiction between the sustainability pillars.

2.2 Why is sustainability important?

As a result of the population growth worldwide, our need for resources is growing, but the resources are finite and exhaustible. With our activities, we are causing a negative impact on the environment, increasing greenhouse gases. If more sustainable decisions are not taken, we won't be able to protect our planet's ecosystems or carry on as we already do. It's conceivable that humanity will run out of fossil fuels, many animal species will go extinct, and the atmosphere will be permanently harmed if detrimental processes are kept up without any changes (TWI, 2022).

In addition, without acknowledging and minimizing the harm we cause to the earth every day, we will not be able to preserve our standard of living or the health of its ecosystems. A more sustainable future is essential as natural resources are essential to human commerce, daily life, and existence, and neglecting sustainability could cause natural resources to run out (Dittman, 2019). There will be more landfills springing up everywhere, more animals going extinct as a result of deforestation and pollution, an increase in respiratory illnesses, harsher weather (drier and hotter summers, colder and harsher winters, more tropical storms), rising sea levels, worsening living conditions for lower-income communities as a result of more trash, worse air, and so on (Inspire, 2022). If we don't learn to live sustainably, these and other effects will occur.

Furthermore, for all businesses in all sectors, paying attention to environmental, social, and governance (ESG) challenges is also becoming increasingly important because of the significant need for sustainability. According to the most recent McKinsey

Global Survey, 83% of C-suite executives and investment experts think that five years from now, ESG projects will produce greater shareholder value than they do now (McKinsey, 2020). Additionally, according to Accenture's research on responsible leadership, businesses with strong ESG performance had operating profits that were, on average, 3.7 times larger than those of businesses with weaker ESG performance (Accenture, 2020). The most common factor among all businesses is the usage of ICT in the operation of the business as all the companies have to use it in this modern era. But during the ESG impact calculation, the underlying ICT infrastructure is often not considered, which might have a noticeable impact on the environment and society.

2.3 Sustainability issues with ICT

For many years, the environmental impact of the ICT infrastructure went unchecked. However, its impact is significant and garnering attention. Most of the direct repercussions of ICTs are negative and originate from the manufacture, usage, and disposal of hardware. They do not differ much from the environmental effects of many other products, but they do provide a number of unique challenges in terms of resource use, emissions, and waste disposal. Most ICT equipment consists of numerous components, such as microchips, semiconductors, printed circuit boards, liquid crystal displays, and batteries (Plepys, 2002). The emission impact of ICT can be divided into three parts which are scope 1, scope 2 and scope 3. Direct emissions from resources that the corporation owns and controls are considered scope 1 emissions. In other words, a series of actions taken at the corporate level directly cause emissions to be discharged into the environment (Bernoville, 2022). Indirect emissions from the production of energy that has been obtained from a utility provider are known as scope 2 emissions. In other words, all GHG emissions from the use of bought energy, steam, heat, and cooling that are emitted into the atmosphere (Bernoville, 2022). And All indirect emissions that take place upstream and downstream in the reporting company's value chain are included in scope 3 emissions, for example, the emission during the production of any equipment caused by the manufacturer.

During the use phase, ICT devices consume electricity. For example, on a normal working day, a typical medium-sized PC consumes roughly 1 kWh. A typical office computer is projected to be in use for more than 2000 hours each year (20 percent in active mode and 80 percent in sleep mode) (Zurkirch & Reichart, 2000). There has been much concern about the entire usage of electricity by office equipment. Some projections indicate that office, telecommunications, and network equipment would account for a significant amount of total electricity demand (Berkhout & Hertin, 2004). Even in the worst-case scenario, Communication Technologies could use as much as 51% of global electricity in 2030 (Andrae & Edler, 2015).

Another area of concern is the disposal of ICT hardware. Because current product design does not usually allow the separating and recycling these metals without further treatment, only a very small proportion of ICT hardware is currently recycled. In 2019, the world generated 53.6 Mt of e-waste and the global generation of e-waste grew by 9.2 Mt since 2014, where only 16% went through recycling (Forti et al., 2020). Waste Electrical and Electronic Equipment (WEEE) or E-Waste refers to obsolete, unwanted Electrical/Electronic devices that have reached the end of life. As per United Nations Environment Programme (UNEP) report, by the year 2020, E-Waste raised by 500% from old computers, while the rate of discarding mobile phones was 18 times higher compared to 2007 levels (*Waste from Electrical and Electronic Equipment (WEEE)*, n.d.). Broadly, E-waste consists of plastics, glass, printed circuit boards, ceramics, rubber, ferrous and non-ferrous metals, and elements like lead, mercury, cadmium, silver, gold, platinum, etc. 95% of this waste is headed towards urban slums of developing countries for disassembly by an informal sector (Gupta, 2014).

In an average year, 24 million computers have become obsolete in the United States and only about 14% (3.3 million) of these will be recycled or donated (Hanselman & Pegah, 2007). We do not care about what happens when our laptop dies and just stop considering it. The reality is that it either decomposed in a landfill or in developing countries. The children there wrestle its components apart by hand and melt toxic bits to discover traces of valuable metals like gold.

Additionally, developing countries build an E-Waste trade network for imported old gadgets. They use a number of workers, collectors, segregationists, middlemen, scrap dealers, and recyclers to disassemble components, reuse the functioning components, and recycle the non-functional components using unprofessional methods like burning or acid dipping (Ukessays, n.d.). Solid wastes eventually end up in rivers after being burned and other pollutants are disposed of, including wasted acids and other chemicals. This led to a severe problem with water contamination, a threat to human survival because water is a supply that we depend on (Ukessays, n.d.).

Today, the global aviation industry and the ICT sector both generate 2 percent of total CO2 emissions (Sphera, n.d.). Therefore, it's crucial to research the following topics related to green IT: implementing information technology's whole lifecycle in a way that is a resource- and environmentally friendly, controlling substances that are, for example, poisonous, dangerous, rare, expensive, or maybe difficult to recycle and making sure that used hardware and equipment systems are closed-looped in terms of energy use, logistics, disposal, and recycling (Sphera, n.d.).

Thus, green IT ensures that computing resources are used effectively. It is renowned for its capacity to save energy across the whole economy and for having the power to quickly and significantly alter all facets of business, society, and politics. Green IT comprises a diverse range of businesses, including hardware manufacturers, telecommunications providers, internet service providers, and logistics suppliers (server rooms, cooling and others) (Sphera, n.d.). For the better development of green ICT, different responsible authorities have already published some policy guidelines throughout the years, which will be discussed in the next section.

2.4 Policy Frameworks for sustainable ICT

Various policy-making organizations have different policies and frameworks that are working to ensure the sustainability of ICT by reducing the negative impacts on the environment. These policies play an important role as under the governing authorities, there are different countries, and organizations that eventually have to follow the

guidelines based on the agreements. So well-aimed actions from the policy-making parties will create awareness among others and force them to start sustainable ICT activities. The following policy frameworks show the importance of ICT sustainability and what are the essential things to ensure eco-friendly ICT.

2.4.1 UNFCCC

The United Nations Framework Convention on Climate Change (UNFCCC) secretariat is the UN organization responsible for assisting the international response to the threat of climate change and the parent instrument of the 2015 Paris Agreement, which has 197 Parties and almost universal membership (UNFCCC, n.d.-a). The Paris Agreement's primary goal is to limit the increase in the average global temperature this century to 1.5 degrees Celsius above pre-industrial levels (UNFCCC, n.d.-b). The 1997 Kyoto Protocol is also a pact that was derived from the UNFCCC. Stabilizing greenhouse gas concentrations in the atmosphere at a level that would preclude harmful human influence on the climate system is the ultimate goal of all three UNFCCC agreements (UNFCCC, n.d.-c).

Between two and four negotiation sessions are planned and supported by the secretariat each year. The Conference of the Parties, which takes place annually and is hosted in various cities worldwide, is the biggest and most significant. It is the largest annual United Nations conference, with an average attendance of roughly 25,000 people, where decisions are taken regarding many global areas (UNFCCC, n.d.-a). COP 26 was the first conference that included updated guidelines for the ICT sector.

2.4.2 COP26

Digital transformation methods have received attention at COP26 to accelerate quick climate mitigation and adaptation as world leaders negotiate worldwide agreements to cut greenhouse gas emissions (ITU, 2021). UN Secretary-General Antonio Guterres stated, *"Climate action tops the list of people's concerns, across countries, age and gender"* (ITU, 2021). And International Telecommunication Union (ITU) Deputy Secretary-General Malcolm Johnson mentioned: *"Climate action is now more critical*

than ever before, as has been made abundantly clear by the experts, the science, and the evidence of our own eyes and the ICT sector is one of the fastest-growing, greenhouse gas-emitting and energy-consuming" (ITU, 2021).

Among all the decisions made in the COP26 the most related are, it acknowledges that the finest available science is essential for effective climate action policy development and acknowledges that limiting the temperature increase to 1.5 °C above pre-industrial levels would greatly decrease the dangers and impacts of climate change and maintains the long-term global objective to keep the increase in the global average temperature to well below 2 °C (*Cop26_auv_2f_cover_decision.Pdf*, n.d.)

2.4.3 EU Green deal

The European Union (EU) and its citizens are given a European Green Deal in this communication. It reaffirms the Commission's commitment to addressing the environmental and climate change-related issues that will define this generation. With each new year, the climate changes as the atmosphere get warmer. Of the eight million species on the planet, one million are in danger of extinction. Oceans and forests are being depleted and polluted (UN, 2019). In response to these issues, the European Green Deal was created. It is a new growth strategy that aspires to make the EU into a just and affluent society with a cutting-edge, competitive economy that uses resources efficiently and produces no net greenhouse gas emissions by 2050 (*European-Green-Deal-Communication_en.Pdf*, n.d.). Along with protecting the health and well-being of citizens from environmental dangers and effects, it also strives to safeguard, conserve, and improve the natural capital of the EU.

In many different areas, digital technologies are a crucial enabler for achieving the sustainability goals of the green accord. The Commission will look at ways to maximize the effects of environmental and climate change policy by utilizing digital technologies, including artificial intelligence, 5G, cloud and edge computing, and the internet of things. Additionally, digitalization opens up new possibilities for remote monitoring of air and water pollution as well as for monitoring and improving the use of

energy and natural resources. The Commission will also take into account strategies for the industry as a whole, including broadband networks, data centers, and ICT devices, to increase energy efficiency and circular economy performance. It’s important evaluate the need for greater transparency regarding how electronic communication services affect the environment, the need for stricter regulations when deploying new networks, and the advantages of supporting "take-back" programs to encourage people to return their unwanted devices like mobile phones, tablets, and chargers (*European-Green-Deal-Communication_en.Pdf*, n.d.).

2.4.4 European Green Digital Collision

The combination of digital networks, technology, and applications is an ICT solution. The term "green digital solutions" refers to ICT solutions that support environmental & climate goals. By far outpacing their carbon footprint, these ICT solutions, for instance, can reduce or prevent GHG emissions (Freitag et al., 2021). Additionally, digitalization can hasten the shift to a circular economy by, among other things, measuring, tracing, and optimizing the use of natural resources and enabling new sustainable business models, all the while enhancing the economy's resilience (Jensen, 2022).

Digitalization can help the sustainability transition, but digital innovation can also be driven by the sustainability transition, creating new chances for the digital industry to innovate and grow more competitive. In order to transition to a circular economy, the EU must develop new, digitally enabled sustainable business models and opportunities that will allow early adopters to capitalize on advantages made on international markets. The green digital transformation, which benefits society, the environment, and the economy, is based on this synergy between the green transition and digitalization (European Commission, 2022). The green deal coalition plans to take action in 1. putting money into the creation and implementation of green digital solutions that have a net positive impact across a variety of sectors and offer considerable energy and material efficiency 2. collaborating with NGOs and pertinent expert organizations to create techniques and instruments to assess the overall effect of green digital technologies on the environment

and climate. 3. co-creating, with representatives from other sectors, guidelines and proposals for these sectors' green digital transformation that benefit society, the environment, and the economy (European Commission, 2022).

The fundamental goal of the EGDC is to maximize the advantages of digitalization for sustainability, For instance, by avoiding and decreasing emissions more than the ICT sector as a whole (EGDC, 2020). In order to enable a green digital transformation of industries like energy, transport, agriculture, and construction, it is necessary to create science-based techniques to assess the reduction and avoidance of greenhouse gas (GHG) emissions by specific ICT solutions in various sectors. This will hasten their transitions to sustainability and circular economies while fostering an inventive, diverse, and resilient society.

2.4.5 International Telecommunication Union

The International Telecommunication Union (ITU) is the United Nations specialized agency for information and communication technologies – ICTs. Their responsibility is to manage emerging risks, challenges, and opportunities resulting from the rapid growth of telecommunications/ICT. The Union places a priority on improving the networks' and systems' quality, dependability, sustainability, and resilience as well as fostering users' security and confidence in the use of telecoms and ICTs (ITU, n.d.). ITU has set a few sustainability targets globally to improve the situation. Which are by 2023, improve the cybersecurity preparedness of countries with some key capabilities, increase the global e-waste recycling rate to 30%, raise the percentage of countries with an e-waste legislation to 50%, net telecommunication/ICT-enabled Greenhouse Gas abatement should have increased by 30% compared to the 2015 baseline and all countries should have a National Emergency Telecommunication Plan as part of their national and local disaster risk reduction strategies (ITU, n.d.).

2.4.6 Why should organizations react?

As described so far, the ICT equipment negatively impacts the environment if not maintained properly and the related climate institutions are getting concerned about it. When it comes to using ICT, the most common form of the user is the different kinds of organizations like corporates, educational institutes, NGOs, government organizations, etc. In this era of information and technology, all kinds of organizations need ICT equipment to keep operating as they need electrical products to deal with digital information. For organizations, ICT is mostly needed for digital data storage, retrieval, and transmission (Mohannad, 2017). Because of these needs, companies have to use a data center, network equipment, and storage devices which run as the backbone of any organizational information and communication activities. When any organization tries to be more eco-friendly, focusing on reducing the ICT effects can help to go one step ahead in achieving this goal, as ICT is not often considered in this case. By doing so, organizations can comply with the related guidelines mentioned above and with that, they can also get benefited from the corporate social responsibility point of view. Organizations can report and brand their environment-friendly activities, which can help them in their business by creating a positive image among the stakeholders.

2.5 Corporate Social Responsibility

Corporate social responsibility (CSR) is a corporate strategy that enables an organization to be socially accountable to its customers, employees, and stakeholders. Companies can be aware of their impact on society's economic, social, and environmental aspects by engaging in corporate social responsibility, often known as corporate citizenship (FERNANDO, 2022). It refers to a company's behavior that promotes economic success, observance of the law, morality, and social responsibility. CSR has four components: charitable, legal, ethical, and economic (Carroll, 1983). Profitability and legal compliance are the top requirements for being socially responsible before talking about a company's ethics or how much it supports the community in which it operates through monetary, volunteer, and in-kind contributions.

2.6 Relation between CSR and ICT sustainability

The connections between CSR and ICT can be made by human rights, working hours, safety and health concerns, psychological and physical pressure, financial difficulties, serial temporary contracts, environmental effect etc. (Hoeltl, 2015). ICT's environmental effects are one of the connections between CSR and ICT that can be categorized into three types of effects: first-order, or direct effects, which are caused directly by ICT and its processes; second-order, or indirect effects, which are caused by ICT's use; and third-order, which refers to the aggregated, medium- and long-term effects of ICT use globally (Yi et al, 2007). ICT has a wide range of second and third-order consequences in addition to its immediate environmental and social impacts. ICT's three orders have numerous social effects, including job complexity, monotonous work, skill reproduction, equal treatment for women and minorities, working conditions, health and safety, stress and work pressure, human rights, or partially irresponsible working conditions (e.g. electronic components production conditions, working conditions in mines, health risk for workers recycling electronic waste) (Martinuzzi et al., 2007).

Along with the effects of ICT, come the social responsibilities of the corporates. Corporations whose business is solely based on ICT, like telecom and IT companies, are well-progressed in the ICT sustainability reporting as part of their CSR activities. By following the policy guidelines mentioned above, telecoms are trying to report their carbon emissions and planning for net zero emissions. For example, Telia is the first telecom company in the Nordic region to issue a green hybrid bond. The proceeds from these bonds have been divided into two groups: 1. Energy Efficiency: Swedish fiber growth transforms networks 2. Green digital solutions lessen customers' environmental impact through IoT (Telia Company, n.d.). Additionally, they have established carbon-neutral operations starting in 2020 and a defined objective of achieving zero waste in their own operations, including network building and maintenance, by 2030 (Telia Company, n.d.).

Another example is Deutsche Telekom places a high priority on reducing emissions and has specific goals in this area. Their data center in Biere is one of the most

energy-efficient data centers in the world, and their objective is to lower scope 1&2 emissions by 90% by 2030 and scope 3 emissions by 25% per user by 2025 (AG, n.d.). But then comes the question, will it be executed properly or is it enough? In addition, the other corporations that are not solely based on ICT infrastructure but use Infrastructure internally, are they considering the environmental impact of ICT in their CSR report? Are they well aware of their footprint? These questions bring the discussion of greenwashing, bias in CSR reports, exclusion of ICT, etc.

2.6.1 Greenwashing by the corporates

The CSR reports about ICT sustainability are often full of irrelevant data because of the difficulty of measuring the ICT infrastructure's sustainability. Companies are increasingly adopting "go green" strategies to differentiate themselves from rivals. As a result, the ideas of sustainable marketing and reporting have gained importance. Sustainability reporting is the process of measuring, revealing, and being accountable to internal and external stakeholders for organizational performance toward the objective of sustainable development, according to the (Global Reporting Initiative, 2011). Companies utilize green marketing as a tool to compete in the international market. The phrase "green is the new black" is used frequently in today's world of sustainability. Companies abuse the technique of "green marketing" to create a fictitious "green brand image" in the eyes of customers and investors. This is nothing but greenwashing. A study found that marketers prioritize profits over environmental concerns. As a result, marketers must consider factors other than their own financial success (Brennan & Binney, 2008).

Companies are increasingly using eco-labels and certifications to highlight their efforts to save the planet. Still, a study found that these certifications and labels, even those issued by experts, cannot stop "greenwashing" and can only help knowledgeable consumers form opinions about a given brand (Parguel et al., 2015). Another study claims that although there are little differences in environmental strategies and programs across different businesses, there are differences in how well they are carried out (Ramus & Montiel, 2005). Overall, the literature analysis points to some sort of discrepancy between

the company's CSR performance and its communications, primarily greenwashing (Aggarwal & Kadyan, 2011). If we look at tech giants, as part of a bigger goal to eliminate its whole carbon footprint by 2050, Microsoft pledged in 2020 to become carbon neutral by 2030 and the business has put $1 billion into a new endeavor to use carbon capture technologies to help worldwide suppliers and customers lower their carbon footprint (Smith, 2020). These objectives appear to be impressive. On other high-emitting businesses, however, have minimal attempts to reduce the impact. In actuality, the oil and gas sector has long taken advantage of carbon capture technology to boost earnings by selling the CO2 it has captured to other businesses to refuel depleted oil fields. In addition, tech firms frequently understate their CO2 emissions. According to a recent study, a sample of 56 significant IT businesses decided not to report more than 50% of their greenhouse gas emissions in 2019 (Amos, 2022). This calls into question the accuracy of Microsoft's net-zero emissions starting point.

Apple has a comprehensive corporate environmental protection plan. The business has already made significant efforts to meet its sustainability objectives. Even though Apple seems to have excellent intentions, the company's products cause a lot of pollution. Given that just 20% of the world's 50 million tonnes of electronic garbage are recycled, Apple's marketing campaign for yearly gadget upgrades is more beneficial to their bottom line than the environment (Amos, 2022).

Amazon declares that it plans to get all of its energy from renewable sources by 2030 and will have no carbon emissions by the year 2040 (Amazon, 2019). Of course, the decision to become carbon neutral by a major global firm like Amazon would greatly impact efforts to decarbonize the economy. Sadly, it appears that the pledge might be false. However, the statement does not explain how Amazon can achieve zero environmental impact or how it will obtain all renewable energy by 2030. More importantly, the plans primarily address Amazon's internal operations, excluding the worldwide supply chain's carbon impact, which makes up 75% of the company's total carbon footprint (Consumer, 2019). Hence it opens a question about their strategy related to greenwashing or not.

2.6.2 Bias in CSR reports

Reporting on corporate social performance (CSP) is becoming common practice for businesses worldwide to meet stakeholder and societal expectations for corporate social responsibility (CSR). (Wood, 2010) stated that CSR reporting primarily demonstrates a firm's CSP. CSP represents the quantifiable impacts and outcomes of a firm's CSR initiatives.

Companies emphasize the publication of gains and triumphs, or "good news," in their CSR reports despite the importance of negative CSP disclosures for transparency. It is presumed that this is due to their concern that publicizing setbacks, failures, or unmet objectives could jeopardize their credibility and, in the case of publicly traded companies, their financial performance (Mishra & Modi, 2013). According to studies, negative information is highly diagnostic, as individuals perceive it to be more typical of performers who fall into negative categories (Skowronski & Carlston, 1989). However, research on the effects of two-sided messaging has shown that providing positive and negative information favors people's perceptions of the source's credibility (Kamins & Assael, 1987).

2.6.3 Exclusion of ICT

Even though ICT plays a vital role in operating all kinds of business, the CSR reporting of ICT infrastructure sustainability is limited to ICT-focused businesses only (telecom, hardware, software companies etc.). Other corporates don’t necessarily consider their ICT infrastructure footprint for their CSR reporting. The primary reason behind this can be the focus of the business that the companies have. It’s always easier to highlight the features of core products to the clients so more profits can be gained. For example, Zinc group is a leading entertainment marketing agency and cares about its sustainability throughout entertainment marketing as it’s their core service (Zinc, 2022). But here, they don’t mostly consider the ICT infrastructure used behind the scenes. Also, for example, sustainability reporting of the fashion industry is solely based on fashion materials, and the use of ICT there is often ignored. Another reason can be most of the

people working for the CSR reporting are not from technical backgrounds, so they are usually unaware of the footprint of the ICT. The environmental effect of ICT is often not visible, and thus it's contributing to being excluded from the CSR reporting. The same goes for universities where the core activity is the research and education.

2.7 University Social Responsibility

More than ever before, the concept of corporate social responsibility is gaining ground today. The way businesses treat their clients and employees, as well as their lack of care for how their operations affect the environment and the natural world in general, have all contributed to the development of this interest (López et al., 2015). Apart from advancing the economy, corporate social responsibility also includes a moral and ethical obligation to people and the environment. Due to the breadth of interest, numerous terminologies describe the idea of university social responsibility in different circumstances. Common phrases like "community involvement," "community outreach programs," "civic engagement," "public engagement," and "society university stakeholdership" all refer to the same idea by expressing different facets of the act of university social responsibility (Esfijani et al., 2012). The well-known phenomenon of corporate social responsibility, or CSR, is also known as university social responsibility, or USR. It was first used to emphasize the moral and ethical dimension of the services educational institutions provide to society through training and development (Alshuwaikhat & Abubakar, 2008). The concept creates a concern about its differentiating characteristics as it emphasizes the moral and ethical attitude of universities rather than educational ones, explaining the specific obligation of universities towards society(Ali et al., 2021). So, universities also have a responsibility for society, environment same as corporates.

2.7.1 USR and ICT sustainability

Higher education institutions are expected to go above and beyond their basic duties of developing students, developing research, engaging the community, and

adapting these activities to the concept of USR. The social responsibility of organizations is concerned with economic, legal, philanthropic, and moral responsibilities. Most universities in the modern world are conscious of the ecological impact and have taken the required steps to match these consequences with social responsibility and sustainability goals. The top concerns for universities today are reducing ozone-depleting compounds, reducing the use of petroleum products, concentrating on systems powered by recyclable natural resources, and raising staff and student knowledge of environmental issues with social ramifications (Hosny et al., 2015). Among all the activities related to environmental sustainability, the work to assess the own ICT infrastructure of the universities is something that hasn't been done that much before, so it lacks proper literature. Most of the literature contains the use of ICT in sustainable CSR reporting but doesn't ask for the sustainability assessment of the ICT itself. Hence it opens an opportunity for contributing to this area. Usually, universities are part of a large education and research network that interconnects many universities in the same network nationally and globally. So, it requires a huge amount of underlaying backbone infrastructure that keeps running all the activities. So, it's not just a university located in a place using its own infrastructure; rather, it's the usage of immense infrastructure running behind all kinds of education, research and innovation. This is nothing less than any telecom infrastructure which has a noticeable effect on the environment. For this reason, universities should also be concerned about the environmental effect of ICT infrastructure. The following section will elaborate on how this research and education network function from the ICT infrastructure point of view.

2.8 University and Research Network

In this era of information and technology, it's important to stay connected and have easy access to universities worldwide. European universities are already connected with a network for a smooth research and education experience. The infrastructure running behind to do so is equipped with a large operational setup and activities. The backbone infrastructure and services are nothing less than any telecom infrastructure as

they are almost similar. Most European universities are connected with GEANT association, a central organization, and NREN, a national-level connectivity for all countries.

2.8.1 GEANT Association and NREN

The GEANT Association works in collaboration with National research and education networks (NRENs) to run the projects and provide services. NRENs are dedicated internet service providers to support research and education institutes within their own country worldwide. The focus of NRENs is to ensure high-quality network connectivity and services by connecting the universities with each other (GEANT, 2021a). GEANT works with different areas, including implementing technical projects, network, services, community engagement, enabling scientific discoveries and easy knowledge sharing to address society's challenges.

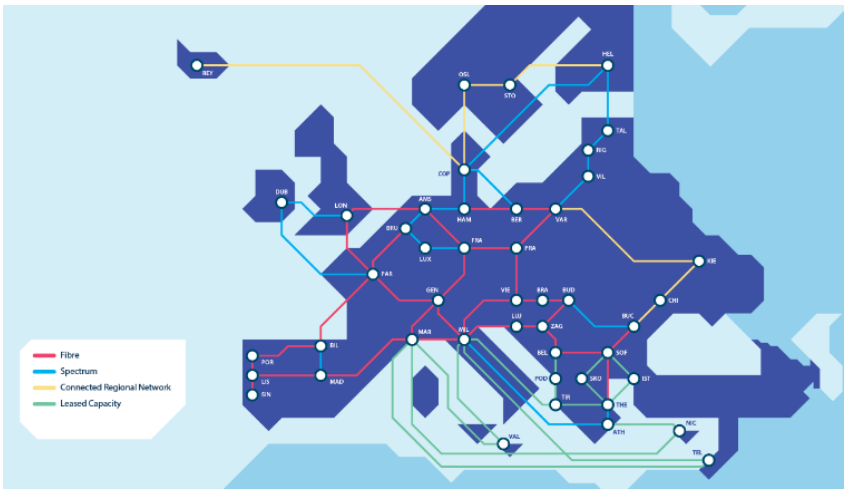
2.8.1.1 GN4-3N Project

The GN4 Phase 3 Network project (GN4-3N) is the most promising and immense project on GEANT in recent times, aiming to support the increasing connectivity need of European research and educational institutions. In this project, the latest technologies and the changed network equipment procurement procedure are being deployed. More than 50% of the European research and education institution will be under 19000km fiber connectivity, stimulating more than 60 million euros in the market for cross-border communications (GEANT, 2020). In addition, it will boost 11000km of spectrum connectivity among which 7000km are coming from the NRENs. The Chief Network Operations Officer Biam Peeters said,

"Today, we stand ready to introduce a stronger, wider-reaching, and more sustainable research and education network. I'm incredibly proud of how such a diverse group of people, from all corners of Europe, have come together to collaborate in order to make this happen." (Maurice, 2022)

The following image shows the connectivity ranges of GN4-3N Project,

Figure:2. 1 GN4-3N Project Connectivity



Note: From (GEANT, 2020)

2.8.1.2 Network

GEANT ensures high bandwidth, high speed, and highly resilient pan-European backbone by linking European researchers, academics, and students to over half the countries in the world. It carries 7 petabytes of data per day, has a backbone capacity of up to 8 terabytes per second, maintains an average of 99.99 % average availability, and has had a 30% annual increase in network traffic over the last 5 years (GEANT, n.d.)The activities in the network domain can be divided into three parts: network services, international connectivity and operations.

Network Services

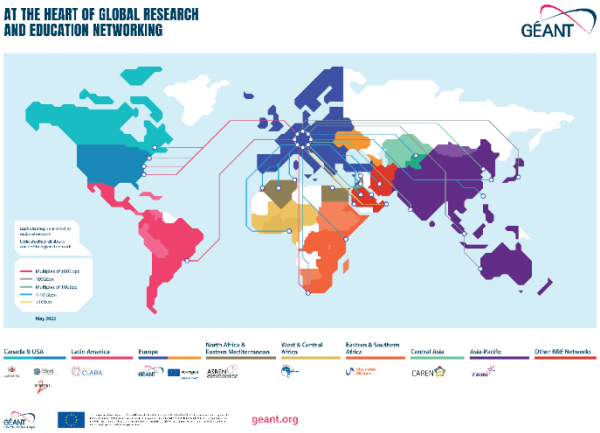
In the network management area, GEANT offers services named GEANT IP, GEANT Point to Point, GEANT Open, VPN services, eduroam, etc. GEANT IP provides IP transit for NRENs and other education institutes. The core factor about GEANT IP is that it ensures a private service for IP traffic that is separated from the general internet access. Thus, it provides speeds up to 100 Gbps, the core connectivity in intern-NERN connections (GEANT, 2021g). When the IP services are unable to provide the performance needed, GEANT point-to-point provides the solution. It allows NERN organizations to request point-to-point ethernet circuits between end points and ensures

high performance (GEANT, 2021i). GEANT Open is another network service that is designed to support interactivity between NRENs, European and International partner networks where commercial organizations can be connected as well to support public private projects as VLAN switching supports multiple interconnections on a single physical interface (GEANT, 2021h) When some of the projects require additional security in their data transmission, GEANT VPN is an important network tool to provide solution. There are two types of VPNs in use which are L3 VPN and MD VPN. L3 VPN are for many-to-many or one-to-many connections, whereas MD VPN is for multiple domains working together, for example, clusters, grids, clouds, etc. (GEANT, 2021f). Another significant network service is eduroam which provides simple, easy and secure connectivity from thousands of hotspots across more than 100 countries to provide one single connectivity point for universities, and research institutes (eduroam, 2022).

International Connectivity

GEANT has connectivity activities in Europe, the Eastern Mediterranean, Africa, transatlantic connectivity to Latin America, Asia-Pacific, Europe-China collaboration, and North America (GEANT, 2021b). The services include network performance monitoring, eduroam, real-time communications, etc. The following image shows the international connectivity coverage of GEANT,

Figure:2. 2 International Connectivity



Note: From (GEANT, 2021b)

Operations

Being one of the largest network setups, the terabyte-ready network of GEANT requires efficient operations and maintenance. The day to activities is managed by the operations center (GOC) and GOC is the primary contact point for the subscribers and network operations center (NOC). The actions of GOC are diagnosing network problems, repairing and maintaining, and resolving network issues by operating 24x7x365.

2.8.1.3 Security, Cloud & Identification Services

Along with the network and connectivity services, GEANT also provides other relevant services: Trust & Identity Services, Security Services, and Cloud services. Platforms like Inacademia, eduTEAMS, eduGAIN are for ensuring proper identity & access management among the users within universities, research institutes (GEANT, 2021j).

The network's security is vital for the operation; hence, GEANT has a wide variety of services in the security domain. Their vulnerability management service helps NRENs detect the exposed vulnerable resources externally and internally (GEANT, 2021e). GEANT has taken steps to increase online security by deploying digital certif icates which is called Trusted Certificate Service (TCS). The main certificates that are available are SSL, Grid, Client, Code Signing, and Document Signing (GEANT, 2021d). In addition, GEANT has also introduced NeMo DDoS software for anomaly detection and analysis, which can be installed locally by NRENs to enhance traffic visibility (GEANT, 2021k). Currently, GEANT is working to put the software within the GEANT network so that no installation will be required later. They also have a Firewall on Demand service that allows authorized users to create and disseminate filters on the data traffic. Because of this, it’s possible for NRENs to control and monitor the backbone which ensures precision, speed, convenience and simplicity of the network filtering (GEANT, 2021c)

As everything is shifting to cloud gradually, so the cloud services are also an important part of GEANT. They provide a wide amount of cloud support by IaaS+ Framework 2020 by OCRE, which is in conjunction with OCRE (Open Clouds for Research Environments), an EC-funded project for the easy access of cloud to the

education and research institutes (GEANT, 2022). It supports 40 European countries with 473 commercial cloud contracts that reduce the institutes' cost and complexity as no tendering is required, huge discounts are available, and advantageous terms and conditions are offered (GEANT, 2022).

2.8.2 The Danish Research Network

Being connected with the European network, Denmark has its own research network and related services to ensure proper connectivity within the country. Being established in 1987 and having 90 institutions connected, the research network connects Danish universities and research institutes directly with each other and with other global research networks (DeiC, 2021). The network is based on optical fibers, so bandwidth upgrade is more straightforward, the network cannot be intercepted remotely and the reliability is high (DeiC, 2021). The network is connected internationally by 2 gateway points, NORDUnet and GEANT, whereas NORDUnet works for digital connectivity in the Nordic region and GEANT is for Europe (DeiC, 2021). The following image shows the connections within the Danish Research Network,

Figure:2. 3 Danish Research Network

Note: From (DeiC, 2021)

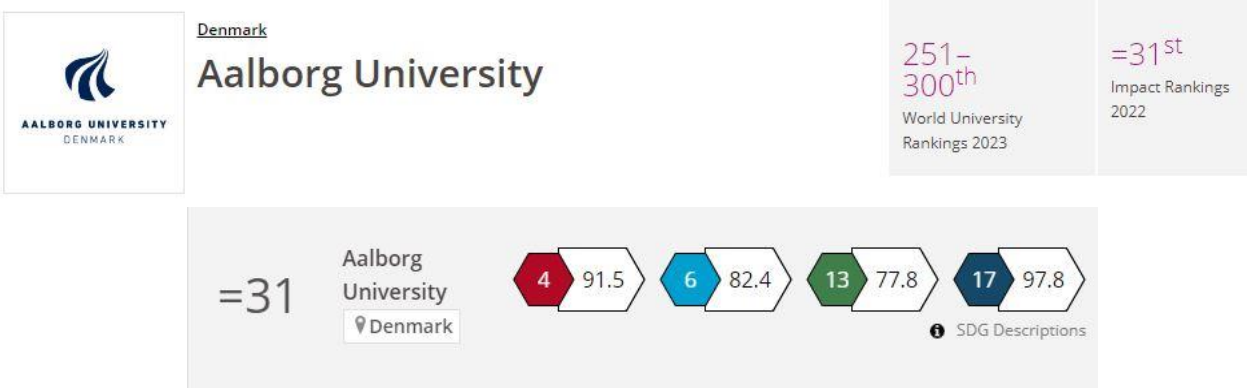
2.9 Sustainability Ranking of Danish Universities

Rankings are important as it involves the documentation and reporting of different activities. The university has to decide which ranking to participate in and submit data accordingly. The literature discusses two kinds of popular rankings for danish universities.

2.9.1 Times Higher Education impact rankings

In the 2022 Times Higher Education impact rankings, Aalborg University is ranked 251-300th worldwide and ranked 31st in the impact rankings. (Time Higher Education, 2022). In the impact ranking, it secured 4th place in quality education and ranked 17th in the climate action SDG.

Figure:2. 4 Times Higher Education ranking



Note: From (Time Higher Education, 2022)

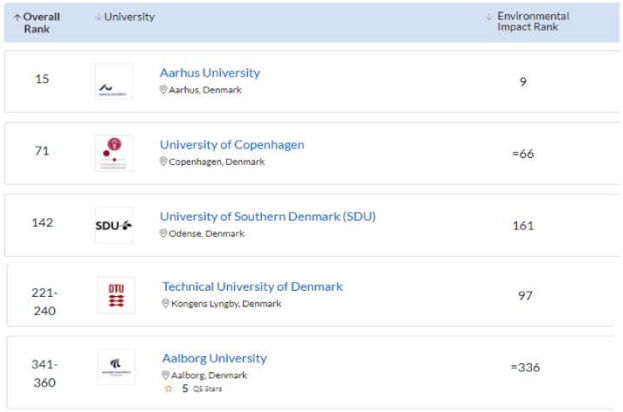
2.9.2 QS world university ranking

QS world university ranking has published its first-ever sustainability ranking for 2023, where 5 Danish universities made the list and the University of California Berkely ranked number one (QS, 2022). The Danish universities which came into the list are Aarhus University, University of Copenhagen, Southern University of Denmark,

Technical University of Denmark, and Aalborg University. In the sustainability ranking, Aalborg University with an impact rank of 336 is in the number 5 among the Danish universities and between 341-360 worldwide (QS, 2022).

The ranking also published performances on environmental impact for sustainable institutions, education, and research. In all these categories, Aalborg University is in the 5th position in Denmark, scoring 33.4 for sustainable institutions, 9.9 for sustainable education and 30.4 for sustainable research. In both categories, Aarhus University is ranked 1 in Denmark (QS, 2022).

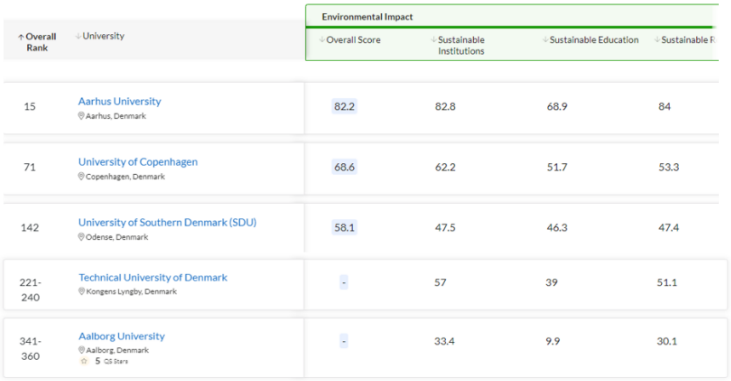
Figure:2. 5 QS Sustainability Ranking



Overall Rank	University	Environmental Impact Rank
15	Aarhus University Aarhus, Denmark	9
71	University of Copenhagen Copenhagen, Denmark	=66
142	University of Southern Denmark (SDU) Odense, Denmark	161
221-240	Technical University of Denmark Kongens Lyngby, Denmark	97
341-360	Aalborg University Aalborg, Denmark 5 QS Stars	=336

Note: From (QS, 2022)

Figure:2. 6 QS Sustainability Performance Assessment



Overall Rank	University	Environmental Impact			
		Overall Score	Sustainable Institutions	Sustainable Education	Sustainable R
15	Aarhus University Aarhus, Denmark	82.2	82.8	68.9	84
71	University of Copenhagen Copenhagen, Denmark	68.6	62.2	51.7	53.3
142	University of Southern Denmark (SDU) Odense, Denmark	58.1	47.5	46.3	47.4
221-240	Technical University of Denmark Kongens Lyngby, Denmark	-	57	39	51.1
341-360	Aalborg University Aalborg, Denmark 5 QS Stars	-	33.4	9.9	30.1

Note: From (QS, 2022)

3 . Theoretical Background

To match the scope of the research, different theories were checked based on the organizations' corporate social responsibilities and environmental issues. From a CSR perspective, stakeholder theory could be an option as the theory is for organizational management and business ethics concerning different entities. But this research is more focused on the internal CSR strategies of the organization. Furthermore, the Carroll theory of CSR was also an option. This theory provides the four categories in a pyramid that a CSR strategy can follow. These are Economic as the main base, then legal, ethical, and philanthropic in this order. The issue with this theory is that it suggests economic factors as the main factor, which contradicts the baseline of this research as it focuses on the environmental part. Finally, stakeholder theory explains the importance of all the organization's stakeholders. But it goes more with corporate governance with different stakeholders, whereas corporate reporting is the best fit for this research.

So, the Legitimacy theory will be used in this research to explain the CSR reporting issues of the ICT infrastructure for organizations or universities. Legitimacy theory helps explain organizations' behavior in implementing and developing voluntary social and environmental disclosure of information to fulfill their social contract that enables the recognition of their objectives. So, to gain legitimacy, organizations need to disclose information related to environmental issues through CSR reports. The more information can be released, the better for the organization. It fits the research as the core problem identified by this research is that ICT infrastructure is not often considered in CSR reports. According to the literature, the legitimacy theory is most frequently used to explain environmental and social disclosures (Campbell et al., 2003). Moreover, the legitimacy theory has an advantage over other theories in that it offers disclosing strategies that organizations may use to justify their existence, which may be empirically tested (Gray et al., 1995).

Along with the theory, the Triple Bottom Line framework will also be used to understand environmental factors in terms of ICT infrastructure and to measure the impacts. The triple bottom line framework explains that instead of one economic bottom

line there should be three, including social and environmental, and suggests that impacts for these three factors should be measured. Based on the legitimacy theory, more information should be released, the measured data of these three factors for ICT infrastructure can add value, and thus the framework fits this research.

3.1 Legitimacy Theory

The Legitimacy theory is derived from the organizational legitimacy concept, founded by Dowling & Pfeffer (1975). The theory is defined as *"Legitimacy is a generalized perception or assumption that the actions of an entity are desirable, proper, or appropriate within some socially constructed system of norms, values, beliefs, and definitions"*(Suchman, 1995, p.574). According to Setiawan et al. (2021), information disclosure is strategy businesses use to demonstrate that they operate according to society's ideals and are socially responsible. The responsibilities placed on businesses nowadays include not only monetary gain but also a consideration for the environment and the community, as well as presenting a favorable image to obtain or maintain social legitimacy (Patten, 2002).

According to the theory, there are three types of legitimacy, which are Cognitive, Moral and Pragmatic. Cognitive legitimacy is understanding the need to perceive new values so that it's possible to get an advantage in the industry. The basic definition of cognitive legitimacy is how well an organization carries out its operations from the perspective of its stakeholders (Suchman, 1995). This research talks about perceiving sustainability as a value. Moral legitimacy means when the rules are in accordance with an ethical belief. To practice sustainability in activities, it's important to believe in it first. And pragmatic legitimacy is the assessment of the value that will be provided to the stakeholders. This is the practical assessment by internal and external stakeholders of the organization. Here it relates to assessing own sustainability value is needed before providing to the stakeholders. By this assessment, the area of improvement will arise, in this case which is reporting of ICT infrastructure sustainability. *According to* (Idowu et al., 2013)*, "First of all, the organization needs to attain a cognitive legitimacy, which is*

intended to expand its moral legitimacy that justifies its social existence, and therefore, in order to ensure its own survival (in context with internal and external legitimacy), the organization is involved in the construction and development of its pragmatic legitimacy."

There are four phases in the legitimacy life cycle: establishment, maintenance, extension, and defense. Establishing legitimacy means the beginning stage when the standards and values are about to be set. This phase represents the early stages of development. It tends to revolve around issues of competence, particularly financial. Still, the organization must be aware of socially constructed standards of quality and desirability as well as perform in accordance with accepted standards of professionalism (Hearit, 1995). For example, an organization can set its value by focusing on sustainability, and then society will legitimate its activity based on the value set. Maintenance of legitimacy means that organizations must adapt to society's changed expectations. Community expectations are not considered static but change over time, requiring organizations to be responsive to the environment in which they operate. For example, 20 years back, environmental sustainability was not considered for counting the reputation of organizations, but now it's an important part. Extension of legitimacy is needed when an organization enters a new market or changes the way of relating to society. For example, the extension of legitimacy from a sustainability perspective can be done by ensuring the addition of different factors, like ICT infrastructure. Lastly, defending legitimacy means protecting it from internal and external threats. There might be incidents for which the organizational reputation and value might be at risk.

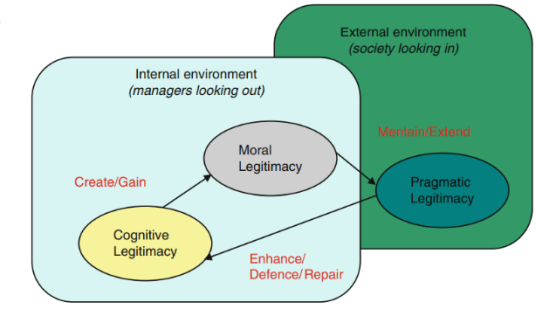
The stability of the organizational legitimacy activities depends on four factors. These factors are organizational management quality, the allocation of resources efficiently, the solidarity of normative standards, and increasing the visibility of socially responsible activities (Idowu et al., 2013). Complying with these factors makes one organization stable from the legitimacy point of view. The research will focus on finding out whether the case organization's activity complies with these factors for analysis and findings. In this research, organizational management quality means how importance is given in terms of sustainability from organizational management perspective; allocation

of efficient resource means the procedures and plan to ensure the efficient resource in the context of sustainability; solidarity of normative standards means the as usual common sustainable practices, norms and increasing the visibility means the procedures to publish the sustainable activities for better reach.

In addition, based on the theory there are two different environments of the organizations from a legitimacy perspective. These are external and internal. The external environment is when society looks in from the outside, and the Internal environment is when managers look out by staying within the organization. This research will count the Internal environment only to see how the case organization thinks about ICT sustainability and its relation to CSR reporting along with decision-making.

Furthermore, there are relations between legitimacy and Corporate Social Responsibility. Companies engage in CSR in a variety of ways and with different goals, according to Untung (2008). This demonstrates a growing understanding that, for a business to expand sustainably, it must maintain social and environmental goals in addition to financial ones. Disclosure of CSR in annual reports is one way for companies to build, maintain, and legitimize the company's contribution from an economic, social, and environmental perspective(Guthrie & Parker, 1990). So, CSR plays a vital role in gaining legitimacy. In terms of this research, the CSR reports about ICT sustainability might help to gain more legitimacy with respect to the overall sustainability of the organizations. This is missing now from most of organizations, including those that gained legitimacy based on sustainability. So, it opens the opportunity to investigate and show that there are ways to improve CSR reporting.

Figure 3. 1 Legitimacy Theory



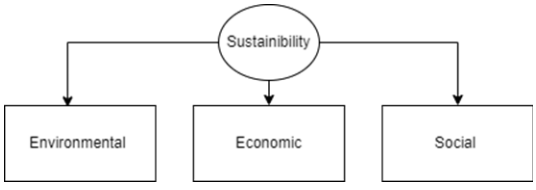
Note: From (Idowu et al., 2013)

3.2 Triple Bottom Line Framework

The triple bottom line framework based on corporate social responsibility will be used as the theoretical framework of the research. John Elkington introduced the triple bottom line concept for the first time (Elkington, 1998). One of the foundations of corporate social responsibility is the concept of the triple bottom line, which results from the paradigm of sustainable development and is based on the search for balance between three dimensions: environment, economy, and society. TBL posits that, instead of one bottom line, there should be three: people, planet and profit. His point was that businesses should prepare three distinct bottom lines. The first is the usual metric of corporate profit, the second is some assessment of how socially responsible an organization has been throughout its operations, and the third is a measure of how environmentally responsible it has been. A more detailed explanation is that the triple bottom line describes the creation of goods and services using non-polluting processes and systems that conserve energy and natural resources, are economically viable, safe, and healthful for employees, communities, and consumers, and are socially and creatively rewarding for all working people.

The research considers the environmental impact of the ICT equipment of the organizations. Based on the framework, these impacts are needed to be measured. The social, environmental and economic correlation is also a part of the discussion, as there are questions about the feasibility of all these three factors being maintained together. Eventually, all the outputs using this framework can be used for better decision making and thus, the CSR reporting can help to enhance the legacy of the organization's activity.

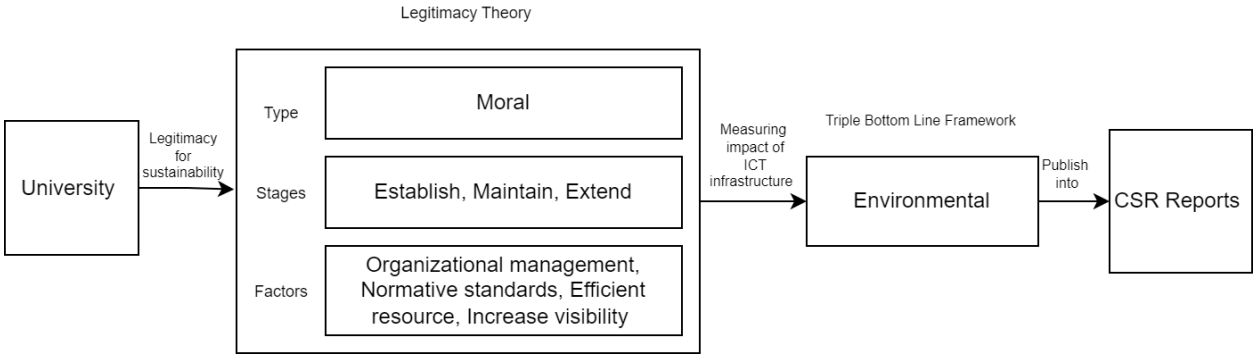
Figure 3. 2 Triple Bottom Line Framework



3.3 Conceptual Framework

The conceptual framework explains how the research will be structured with the theory and framework. Universities as a part of society, try to legitimize themselves according to society's needs through different activities. As society's important demand is sustainability, universities try to align with the need in different phases. This research will try to find out how legitimate the university activities are from the ICT infrastructure sustainability point of view. In addition, all the components from the legitimacy theory will be linked with components from triple bottom line framework to understand the importance of measuring the environmental impact of the ICT infrastructure. When these data can be measured, it's possible to add them to CSR reports, which will eventually help comply with the legitimacy theory's components. Thus, the relation between ICT sustainability and CSR reporting will be analyzed from the organizational legitimacy point of view. Finally, the research will also try to understand the impact of sustainable ICT infrastructure on the decision making during the legitimization process.

Figure 3. 3 Conceptual Framework



4 . Methodology

This chapter discusses the methodologies and tools used to answer the research question. It starts with the research design, which explains the methods and approaches used. Afterward, the interview questions are mentioned, and data collection details are explained. The strategy to collect primary and secondary data, the interviewee information and data collection tools are explained in the data collection.

4.1 Research Design

The current literature provides a general discussion about the importance of ICT sustainability, but it lacks sufficient empirical evidence. In addition, the relationship between ICT sustainability and CSR is rarely researched from the organizational perspective, let alone from universities. As universities are part of the broader research and education network, so the impacts are enormous. This research will only focus on Aalborg University to make the research more feasible. Furthermore, the ICT infrastructure won't be used to measure the impact of the environment. Instead, some equipment will initially be picked to get the idea in a small portion: router, switch, access point and server.

The research will use both qualitative and quantitative methodologies. Qualitative thematic analysis will be used to determine the legitimacy of the activities in ICT sustainability and its relationship with CSR reporting and decision-making. For this, the semi-structured interview method will be used, and primary and secondary literature will be used for the analysis. The questions are for 3 different university departments: ICT infrastructure, Annual sustainability reporting and ICT Purchase department.

Interview Question:

All the questions contain elements from the theoretical framework, which will help to analyze appropriately. Establishing, maintaining and extending legitimacy is ensured in the questions from the organizational management, normative standards, efficient resources and visibility point of view, which defines the stability of legitimacy.

The paraments considered environmentally friendly are low and green power consumption, use of recyclable materials, end-of-life treatment, focus on long life cycles, and product-service systems. Different questions were formulated for different interviewees.

Table 4. 1 Interview Questions

Theme	**Sub Theme**	**Question**
Establish	Organizational Management	Do you follow any SDGs when working with IT infrastructure? / Do you follow any SDGs when reporting sustainability? / Do you follow any SDG when purchasing IT equipment? / How does AAU contribute to achieving 70 percent national emission reduction by 2030?
	Normative Standards	Do you have any common practices to make the IT infrastructure environment-friendly? / What are the essential things considered to add to the sustainability report? /

		What are the procedures for purchasing IT equipment? / What are the management's priority activities when trying to be more sustainable as a university?
	Efficient Resources	Are you using environmentally efficient energy or prioritizing low energy consumption for the IT equipment? / Does environment-efficient IT infrastructure in terms of energy add value to the sustainability report? / What are the criteria for choosing efficient IT equipment during purchase? Do you follow any green labeling? / How does the management evaluate the eco-friendliness of activities? Are there any metrics?
	Increasing visibility	Do you publish reports related to how eco-friendly the IT infrastructure is? / Do you add the environmental footprint of ICT equipment in the sustainability report? / Do you consider the emission footprint of the products while purchasing? / What are the ways currently to make the sustainability progress visible to others?
	Organizational Management	How university supports ensure that the IT infrastructure is environmentally friendly? / How does the university prioritize the documentation of sustainable activities? / What's the priority of the university? Cost or eco-friendly? / Are we using green energy and are any steps taken to save energy while using IT infrastructure?

Maintain	Normative Standards	Do you ensure low maintenance and high reliability of the IT hardware? Do you have SLA with vendors for the maintenance? / Can having a standard SLA help to improve the overall performance? / Do you have any SLA with vendors regarding purchases? If yes, do they provide eco-friendly products? / How the IT department contributes to the overall sustainability agenda of the university?
	Efficient Resources	Do you ensure the long life span of the products? Is using refurbished products an option? / Will using refurbished products be a good addition to the sustainability report? / Do you also buy refurbished products? If yes, what are the standards that should be maintained? / How do you see the practice of Circularity for IT equipment at our university? Is there any way to ensure less consumption?
	Increasing visibility	Do you think publishing reports about using refurbished products and proper disposal will create a positive reaction among the stakeholders? / How can reporting about sustainable disposal and products help the university? / Do you consider documenting if you purchase anything eco-friendly? / Do you quantify the impact of IT? Do you think it will be beneficial if it can be done?
		Do you have any plans for the future to make IT infrastructure more eco-friendly? /

Extension	Organizational Management	Do you plan to add other new things for the next report? / Do you have any plans to ensure that more green products are purchased? / Which area of IT infrastructure should be emphasized most to make it greener?
	Normative Standards	How do you handle the equipment after the end of your life? / What do you think about reporting the end-of-life treatment of hardware? / Is the end-of-life treatment have any impact on purchasing? / Are there any policies/ strategies for more user engagement so that they can efficiently use IT equipment?
	Efficient Resources	Will measuring the emission rate and footprint of own internal IT infrastructure be helpful for decision-making? If yes, how? / Will measuring the emission footprint of its own internal IT infrastructure help to be more transparent in the annual report? / If you want to know the emission rate and footprint, do you only rely on the data provided by the vendor? / How will the knowledge of internal IT infrastructure emission rate and footprint impact on decision making?
	Increasing visibility	Will publishing these emission reports will be better for the university? / How to make the practice of green ICT infrastructure more visible in the annual reports? /

		How can the purchase procedure info for eco-friendly products be more accessible to all? / Will publishing the internal IT infrastructure emission rate and footprint publicly ensure the transparency of the university?

Life Cycle Assessment:

In addition, the quantitative part will be done by conducting a conceptual Life Cycle Assessment (LCA) of ICT equipment used in the internal infrastructure of the university to quantify the impacts and see which life cycle stage has the most impact. It will help to analyze the findings from the interviews by co-relating with an empirical point of view. LCA is a method to assess the environmental impacts of a product, including both goods and services quantitatively, throughout its whole life cycle: from "cradle," when raw materials are extracted from nature, through the stages of production and use, to "grave", i.e. its final disposal back in nature (ISO, 2006). LCA is a combination of 4 steps: Goal and scope definition, Inventory analysis, Impact assessment, and Interpretation.

The goal of the conceptual LCA-based study is to assess the potential environmental impacts of the core equipment within ICT infrastructure with the purpose of analyzing the significant inputs of materials and energy and their emissions during the manufacturing, usage and end-of-life of the product. For this research, only the routers, access points, servers and switches of the university will be analyzed. The findings will be related to the sustainability and CSR factors based on the theoretical background of the research. For this, the focus will be on scope 1 and scope 2 emissions as these are in the university's control. The analysis will be cradle-to-grave but without the transportation stage.

The data for the analysis will be extracted from the LCA database "Sustainable minds." The datasets will be analyzed in the sustainable minds web platform. The use stage includes the electricity consumption for the operation of the selected equipment based on average values for the different units. Data about that power consumption will

be gathered from product documentation and a scenario of 5 year use period will be considered.

For the impact assessment, the impacts on the environment will be categorized in different areas. These are Acidification, Climate Change, Freshwater eutrophication, Ozone depletion, Abiotic resource depletion, and Ionising radiation. The impact categories selected for this study are based on the International Life Cycle Data system recommendations.

Finally, based on the output, the findings will be interpreted in the context of the theoretical background of the research. The output will provide insight into the manufacturing, usage and disposal stage from the environmental impact perspective. The findings of the life cycle assessment will be co-related with the interview findings as an empirical support. In addition, the findings will also be portrayed as a possible way of quantification of impacts so that CSR reports can be improved.

4.3 Data Collection

For the literature data collection, different kinds of scientific search engines were used to develop the literature review and theoretical framework. Google Scholar, Lib Genesis, AAU Primo, etc. are the notable ones. The works of literature were taken from renowned journals like ScienceDirect, IEEE Xplore, Springer, etc., and different published reports by organizations like BCG, PwC, KPMG, Deloitte, UN, EU Commission, etc. While searching, the more used keywords were “Sustainability,” “ICT infrastructure,” “CSR reporting,” “Carbon footprint,” “Emissions,” “Universities,” etc. The keywords were combined and matched to find relevant information. A total of 120 journal articles, book chapters, and reports were downloaded and selected 90 to use in this research. The resources were prioritized based on the relevancy of the analysis with this research.

For the interview, the interviewees from IT infrastructure, IT purchase and Sustainable report departments were selected based on the research scope. The research data service center named CLAAUDIA was also contacted, and they nominated the

interviewee of IT infrastructure as their representative. After getting the interview appointment, the online meetings were scheduled using Google Meet and each interview lasted approximately 30 minutes. The interviews were recorded using OBS software by taking the interviewees' consent; the scripting was done using Descript free version software. The following table represents the interviewees of the research.

Table 4. 2 Details of the Interviewees

Interviewee	Related Affiliation	Details
Tim Kirketerp	Team Lead, IT Services Representative, CLAAUDIA	Works for the deployment and operation of all kinds of IT infrastructure and relevant projects in the campus.
Jimmy Skovgaard	IT Purchase	Works for the purchase of IT equipment.
Heidi Simone Kristensen	Editor, Annual Sustainability Report Member, Ranking Committee	Associate Professor of Dept of Planning and works for the sustainability report and ranking of the university
Flemming Koch	IT Director, AAU IT Services	Plays the decision maker role for IT services from the management and technical perspective
Per Bach	Infrastructure and Support Manager, AAU IT Services	Plays the decision maker role for IT services from the management and technical perspective

For the conceptual life cycle assessment, the database from Sustainable Minds was used. For this purpose, the student license was bought for 6 months as this is the minimum duration. The necessary data about the equipment were gathered from the university facility management with the help of the IT Lead of the university. The

information that was gathered from the facility management is the total number of different equipment, the energy consumption per unit and the manufacturer. The info for specific model names was also requested, but that was not possible to collect because of privacy issues and the lack of documentation from the university side. The energy source info to run the equipment was also collected from the facility management. As the specific model names were not possible to collect and the raw material names of the equipment that the university use are not available online, the input was given by following data of similar electric equipment available online. The amount of raw materials was also inputted with estimated amounts by taking inspiration from other similar kinds of devices. The assessment considered manufacturing, use and end-of-life stages, and the transport stage was skipped because of the lack of data.

For the assessment, the following information was used for the equipment for a 5-year life cycle,

Table 4. 3 List of the Equipment for Life Cycle Assessment

Equipment	Amount	Electricity Consumption	Manufacturer
Router	59	200 w/unit	Cisco
Server	400	500 w/unit	HP, Dell, Lenovo, Supermicro and custom build
Network Switch	541	90 w/unit	Cisco
Access Point	1600	35 w/unit	Cisco

In the manufacturing stage of the server, router and switch, assembling laptop from the database was used because network equipment assembling data was unavailable. For the access point, the assembling data of a keyboard was used for the analysis. The list of considered elements for each piece of equipment is given below,

Figure 4. 1 Element used for the Life Cycle Assessment

Firewall		59		
Part	Laptop computer	1	200	g
Part	Cable, network cable, cate	1	15	g
Part	Light emitting diode, LED	8	5	g
Part	Plugs, inlet and outlet, for n	1	15	g
Part	Diode, glass-, SMD type, si	1	100	g
Part	Integrated circuit, IC, mem	1	100	g
Part	Resistor, wirewound, throu	1	100	g
Part	Transistor, SMD type, surfa	1	200	g
Part	Glass fibre, filler	1	50	g
Part	Epoxy resin insulator (SiO2	1	30	g
Part	Polyester resin, unsaturate	1	30	g
Part	Electronics for control units	1	50	g
Part	Capacitor, electrolyte type,	1	30	g
Part	Printed wiring board, throu	1	200	g
Part	Integrated circuit, IC, logic	1	100	g
Part	Integrated circuit, IC, mem	1	100	g
Part	Polypropylene resin	1	30	g
Part	Tin, primary	1	50	g
Part	Nickel, primary	1	100	g
Part	Manganese, primary	1	100	g
Part	Magnesium, primary	1	100	g
Part	Lead, primary	1	100	g
Part	Chromium, primary	1	50	g
Part	Cadmium, primary	1	10	g
Part	Tellurium, semiconductor-g	1	100	g
Part	Silver, secondary, at precio	1	100	g
Part	Platinum, secondary	1	50	g
Part	Palladium, secondary,	1	100	g
Part	Gold, secondary, at precio	1	10	g
Part	Copper, primary	1	500	g
Part	Aluminium, production mix	1	1000	g
Part	Steel, electric, un- and low-	1	200	g
Part	Cast iron	1	300	g

Network Switch		541		
Part	Laptop computer	1	500	g
Part	Cable, network cable, cate	1	15	g
Part	Light emitting diode, LED	8	5	g
Part	Plugs, inlet and outlet, for n	1	15	g
Part	Diode, glass-, SMD type, si	1	50	g
Part	Resistor, SMD type, surfac	1	50	g
Part	Glass fibre, filler	1	40	g
Part	Epoxy resin insulator (SiO2	1	50	g
Part	Electronics for control units	1	100	g
Part	Capacitor, electrolyte type,	1	30	g
Part	Printed wiring board, surfac	1	150	g
Part	Integrated circuit, IC, logic	1	50	g
Part	Integrated circuit, IC, mem	1	50	g
Part	Polypropylene resin	1	30	g
Part	Tungsten, production mix	1	40	g
Part	Tellurium, semiconductor-g	1	30	g
Part	Manganese, primary	1	40	g
Part	Magnesium, primary	1	50	g
Part	Nickel, primary	1	50	g
Part	Tin, primary	1	100	g
Part	Lead, secondary	1	100	g
Part	Chromium, primary	1	30	g
Part	Cadmium, primary	1	30	g
Part	Tellurium, semiconductor-g	1	10	g
Part	Silver, secondary, at precio	1	30	g
Part	Platinum, production mix	1	10	g
Part	Palladium, production mix	1	20	g
Part	Gold, secondary, at precio	1	10	g
Part	Copper, primary	1	500	g
Part	Aluminium, production mix	1	1000	g
Part	Cast iron	1	300	g

Server		400		
Part	Laptop computer	1	1000	g
Part	Cable, network cable, cate	1	15	g
Part	Cable, data cable in infrasti	1	20	g
Part	Light emitting diode, LED	8	15	g
Part	Plugs, inlet and outlet, for n	1	20	g
Part	Transistor, SMD type, surfa	1	15	g
Part	Glass fibre, filler	1	50	g
Part	Epoxy resin, liquid	1	30	g
Part	Electronics for control units	1	200	g
Part	Printed wiring board, surfac	1	300	g
Part	Integrated circuit, IC, logic	1	50	g
Part	Integrated circuit, IC, mem	1	30	g
Part	Tungsten, production mix	1	30	g
Part	Tin, primary	1	30	g
Part	Nickel, secondary, from ele	1	50	g
Part	Manganese, primary	1	40	g
Part	Magnesium, primary	1	50	g
Part	Lead, secondary	1	30	g
Part	Cadmium, primary	1	30	g
Part	Tellurium, semiconductor-g	1	10	g
Part	Silver, secondary, at precio	1	10	g
Part	Platinum, secondary	1	10	g
Part	Palladium, secondary,	1	10	g
Part	Gold, secondary, at precio	1	10	g
Part	Copper, secondary	1	50	g
Part	Aluminium, production mix	1	100	g
Part	Stainless steel, austenitic	1	100	g
Part	Steel, electric, un- and low-	1	50	g
Part	Cast iron	1	100	g

Access Points		1600		
Part	Keyboard, standard versior	1	100	g
Part	Cable, network cable, cate	1	15	g
Part	Light emitting diode, LED	2	10	g
Part	Transistor, SMD type, surfa	1	40	g
Part	Connector, clamp connecti	1	20	g
Part	Electronics for control units	1	50	g
Part	Printed wiring board, surfac	1	100	g
Part	Electronics for control units	1	50	g
Part	Printed wiring board, surfac	1	50	g
Part	Integrated circuit, IC, logic	1	20	g

5 . Findings

The findings chapter shows the output from the interviews taken and from the conducted life cycle assessment for a few pieces of equipment of the case university.

5.1 Interviews

The research found essential insights for the analysis and discussion from the semi-structured qualitative interviews. The findings from the interviews are categorized into three parts: IT Infrastructure, IT purchase and Sustainability Reporting.

5.1.1 IT Infrastructure:

5.1.1.1 Establish

In the establish stage of moral legitimacy, the interviewees talked about the current practices in the different areas of ICT infrastructure so that the research can find the practices which helped to establish the moral legitimacy for ICT infrastructure.

In terms of managing the ICT equipment, the IT team lead of the university said, “we follow best practices from the vendor and also from other organizations.” For the normative standards, he mentioned that “when you have to design the network, for example, for 10 years ago, then you'll have today, you'll have some legacy, you'll have something that you want to do better,” and with that, he also said that “We are looking more and more into that and equipment today is more eco-friendly than it was 10 or 20 years ago”. When he was asked about the energy used for the ICT infrastructure as part of using efficient resources, he mentioned a certificate that the university has for using 100% green energy. He also added that “we use hundred percent green energy in which 50% is wind energy and other 50% wind energy only from Denmark”. And lastly, in the increasing visibility part, he mentioned that all the activities are not documented but the recycling is, as he said, “the cycle of equipment disposal, that is documented.” When the IT director of the university was asked about the metrics/KPI to measure eco-efficient resources, he said that “we do not yet have any specific KPI for it, it's spilled into our 23

planning to set up, some KPIs. we do have some specific efforts". He also answered about making sustainable activities visible by saying, "We call it updates or something, but it's more local information we send out to everybody in the university, and there sometimes have something about the sustainability and the project."

5.1.1.2 Maintain

In this part, the interviewees answered questions by explaining how they do different activities within IT infrastructure so that it can be seen by and have an impact on the external stakeholders.

In the equipment management part, Tim mentioned that the university maintains the proper lifecycle of the equipment on their end by saying, "for many years, we have had a very good process with the whole circle of equipment." When it comes to high reliability and low maintenance, the university tries to do that; as Tim said, "we try to do that, I don't think it's documented." So, the impact of using different maintenance strategies on environmental sustainability is not documented. The university relies on internal and external resources in terms of equipment maintenance. Most of the maintenance is done by internal manpower, but for some systems, for example, the university uses an external third party in cooling systems. Tim said about it, "some equipment are maintained by ourselves, most of it is, but also some types of equipment are maintained by the third party, for example, the cooling system." He also mentioned the long lifespan of the product use: "We reuse all, all equipment that can be reused if it can run for five years or six years instead of three, we do that unless it has very power consumptions." When the question was raised about using the refurbished equipment, Tim said the university doesn't use refurbished products by mentioning, "it's not because we don't want to, but the rules about buying things." He continued by saying, "if we buy refurbished equipment, that could be a problem with service and support." Reducing consumption is also an important part of achieving the goal of circular economy, so in a question about it, the IT Director of the university, Flemming, said that "I'm not sure that the best one is to reduce the consumption. Maybe it's more refurbishment. I mean because digitalization is up for helping people". Regarding increasing visibility through the

university sustainability report about ICT sustainable activities, Tim said that “I think it would have a positive impact. I agree with you that it could have a good impact for the university to inform if we are doing something well in the IT department regarding the environment and so on.”. But he also mentioned that the ICT infrastructure is not up to mark yet saying “but we still we still have to, to localize the very good solution there because we don't have it yet.”

5.1.1.3 Extension

In this part, the interviewee stated the upcoming plans and activities that will help to extend the legitimacy of sustainability of ICT sustainability to the external stakeholders.

From the management perspective, Tim mentioned about closing down some of the equipment during off-peak hours. He said, “we are looking at closing down areas of functions during the night or during holidays or during weekends. He also mentioned a project of cooling down servers by saying, “we have a project running right now where we are testing a new technique for cooling servers with the, with the cooling, uh, directly on the CPUs and so on.” But he also emphasized that scientists need to invent manufacturing processes in such a way that less heat is produced; hence less energy will be required to cool down the equipment. He put his frustration by saying, “we are still buying all our equipment of course with the function that we need, but it also generates heat and it's stupid that we have to use equipment that also produces heat.” When he talked about having green energy in the university, he put the rest of the task to manufacturers by saying, “it made me happy to see that certificate because that's in fact the most important thing right now, because on hardware as we talked about, we are waiting good solutions from the manufacturers.”

The IT Director of the university, Flemming, emphasized on the manufacturer most to make the ICT infrastructure greener. He said, “we hopefully will see in the coming years that the manufacturers and suppliers, they might set up a kind of metric on their equipment.” He continued, “whenever I buy a new dishwasher, I can buy the one which is best from an energy standpoint, but I don't know about ICT equipment,” and

added, “I think this industry is lacking behind the automotive, behind many other industries.” He stated some of the ways to put pressure on the manufacturers. He said, “we can of course put pressure in making the equipment or the agreements with the manufacturers on an equipment and saying, we only want to buy from somebody who is sustainable, and please document to us that you are sustainable”. Some of the companies are already working on it, according to Flemming, “I've been some to some talks with some suppliers and they're saying they're going in that direction, but I think we have to be a little bit careful that it's not just some green washing.” He also talked about the buying power as a client and the political power of the nation over the manufacturers to ensure the sustainability of ICT systems. He said, “we do have some buying power and we do have some political power towards the vendors, towards the manufacturers and saying, if you want to continue deliver to the state of Denmark, you have to comply with this and that and I think kind of Denmark and more countries as well do have an obligation to put pressure on the manufacturers”.

From the normative part, Tim mentioned about sending standard practice advice to the users and some of the experiments. One of them was ensuring turning off monitors before leaving the workplace, which doesn’t save that much energy. But according to him, “we have made some measurements, does it make a difference if everybody is turning off their monitor when they leave? It's a very small amount of energy that is saved.” He also mentioned another experiment that will have a huge impact, but the decision is up to the management. He said, “by turning off every second access point on the university, we can save energy for 250,000 kroner every year. So that's a lot of energy, but we cannot do that without the management decision because it will affect how good service they are providing”. On this part, the Infrastructure and Support manager of the university, Par Bach, has mentioned that “we are going to make half of our access points without power from the evening to the next morning to save some power. And there, there are some initiatives going on right now, but we do not have specific goals for it yet, but it has to come in the near future”.

When they were asked about the impact of measuring the emission rate and footprints of internal ICT infrastructure on decision-making, they all agreed with the

importance of it. Tim said, “Yes, I think so. And more now than for two years ago. Something has happened in the world that affects this thing right now; I would say there's more focus, not only from us, but from everyone”. Agreeing with this, Flemming said, “It would be easier to decide if we should buy a new unit or we should let the old unit run for two or three more years. It would be easier to decide if we knew it was best to let it live or buy a new one and reuse components from the old one”.

And finally, when they were asked about the benefits of the university for publishing this emission rate and footprint data publicly, they gave mixed opinions. Tim said these concrete data won’t bring good for the university by mentioning, “I don't think that these concrete data will do something good. Instead, they will do something bad for the university. I believe we should work with these things”. Whereas Flemming said, “well, maybe not directly, but for instance the younger generation, your peers, you might say in your generation, I think at least amongst the Danish students, it's, it's part of their focus. And it might also impact which university they want to study at. If it's somebody. who is doing something about the climate crisis in the world, then they might pick our university instead of another one who is either hiding or not having a
focus.”

5.1.2 IT Purchase

5.1.2.1 Establish

In the establish stage of moral legitimacy, the interviewee talked about the current practices in the IT equipment purchase of the university so that the research can find the practices which helped to establish the moral legitimacy for ICT infrastructure sustainability.

From the organizational management perspective, IT purchase has to follow some standard rules as the university is a public institution. According to Jimmy, as a public institute, we are demanded by law to have several vendors and bid on it and make agreements so we cannot just shove around”. He also added these laws are made for all public institutes, which limits scope as a university by saying “we follow the agreement

that has made on behalf of all public institutes. That's in one way limits us, but also we can make some demands and follow".

In terms of current sustainable practices in the purchase, recycling is ensured. According to Jimmy, "we have an agreement with a company, special agreement with them because they take the hard drives, and they destroy it. Then they are allowed to reuse whatever they can from the rest the units".

To ensure eco-efficient equipment purchases, the university doesn't consider the green labels, emission rates, and footprint yet. But the idea is not ruled out as there is a possibility in the future to use green labels during purchase. Jimmy said, "my belief is that it's gonna be something that's gonna have very high focus and I'm sure that the government is going to issue a domain for all public institutes. We as a university, we would like to be in front of things".

5.1.2.2 Maintain

In this part, the interviewee answered questions by explaining how they do different sustainable activities within IT purchase so that it can be seen by and have an impact on the external stakeholders.

In this phase, the priority of the university was tried to be found between cost and eco-friendliness during the equipment purchase. Based on the interview, the top priorities are cost and quality. According to Jimmy, "the cost is the most important to be honest, and we have to get several offices and basically most look at the price. Of course, it's not used taking the cheapest product if it's really bad". He also added, "You also have to make sure that it keeps on working. Because even though you have a warranty, if a PC breaks down, then you have a day or two cannot work or needs to borrow a new PC and you know before you have the right software installed and so on, then you have used a lot of time."

The university is trying to ensure efficient service level agreement in terms of IT purchases. According to Jimmy, "I think we, we are just about, uh, signing a new agreement for many years to come and I think the next one will have even more focus on

something like electricity.” In terms of refurbished product use, he said, “do we buy refurbished products? No. And that's because of our agreement we have to make. An agreement has to be on specific products. So on, refurbs products, we cannot, because you'd never know what they are available. And also, from an IT point of view, we have made an image and a poll that for four or five years on each model.”

5.1.2.3 Extension

In this part, the interviewee stated the upcoming plans, and activities that will help to extend the legitimacy of sustainability of ICT sustainability to the external stakeholders.

In terms of the plan for the future, the university at this stage doesn’t have any specific plans. Jimmy said when was asked about it, “No, not, not at the moment we are still so much being looked at regarding what's the best offer we can get price-wise and quality and maintenance-wise because the cost of the unit is just out of, you have to look at the whole life cycle. The better it worked, the less downtime you have on the products, then the better it is”. In addition, he mentioned buying products in big equipment so that energy needed to transport multiple times will be saved. He stated that “we're also thinking about, what can we do about something like freight. Instead of getting by 10 things on 10 different orders and they have to deliver it 10 times.”

5.1.3 Sustainability Report

5.1.3.1 Establish

In the establish stage of moral legitimacy, the interviewee talked about the current practices in the sustainability report so that the research can find the practices which helped to establish the moral legitimacy for ICT infrastructure.

The annual sustainability report of the university follows all the SDGs so that the university can portray activities on all the sustainable development goals. According to Heidi, “For the report for the university, we work with all 17 SDGs. One of the reasons for that is the requirement in times higher education impact ranking”. The report contains

the data provided by all the departments where sustainable activities take place; as Heidi stated, “it's important for them, especially for the faculty to showcase research education, within specific SDGs and for our facility services, campus service, etc. They want to showcase the good stories, the good examples, of sustainability efforts.” In terms of IT equipment to make the reporting more efficient, quantification of activities is needed, according to Heidi as she mentioned, “I think one of the things that would be great to add is some more quantitative data on how much are we actually improving our energy efficiency or how.” On the issue of increasing the IT sustainability reporting she emphasized on the facts by stating, “much IT equipment are recyclable or reused because right now the reports are based on a lot of stories and it's a very good platform for storytelling. But it would be very nice if it was supported with more facts on how much is recycled, reused, or cooled down in this way”. So, the ultimate priority is on the quantification of activities that are done to ensure ICT sustainability.

5.1.3.2 Maintain

In this part, the interviewee answered questions by explaining how they do different activities within sustainable reporting so that it can be seen by and have an impact on the external stakeholders.

University has enough priority on sustainable reporting, and at this moment, the annual sustainability report is in the experiment stage to make the best out of it. According to Heidi, “it's still a work in progress. We have published two sustainability reports, which are still also undergoing a lot of changes and trying to figure out what is the right reporting cycle, what is the right format”. University also introduced a climate account to ensure more documentation and reporting of sustainable activities. Heidi stated, “there's also a lot of work been done on, on developing the first climate website for our university, which is also an area where we will try to measure and document more.” In regard to the efficient reporting of IT activities, she emphasized IT and stated, “I think it's key for sustainable development. So, so we need to take more responsibility at Aalborg University for all of the products and services that we are buying and using. But it also requires quite a significant change in, in our practice surrounding IT equipment”.

5.1.3.3 Extension

In this part, the interviewee stated the upcoming plans and activities that will help to extend the legitimacy of the university for ICT sustainability to the external stakeholders.

In terms of improvement for the future, there are plans for the annual sustainability reporting. According to Heidi, “we are still testing different ways and different formats. But one of the things that I would very much like would be to actually set up, maybe an appendix there in the report, but with measurable key performance indicators for the university within both environmental and social sustainability”. She also emphasized setting targets and measuring progress throughout the university by saying, “I hope that our organizations will become better at setting targets and measuring our progress towards those targets”. In addition, she prioritized on the data for a different kind of consumption like energy, water and different kind of uses. She stated, “I think for our sustainability website, it would also be great if we had more data tracking on energy consumption, water consumption, and different kind of uses we have. So we could also more transparently report on our consumption waste generation and management. So we showcase more on that side as well”.

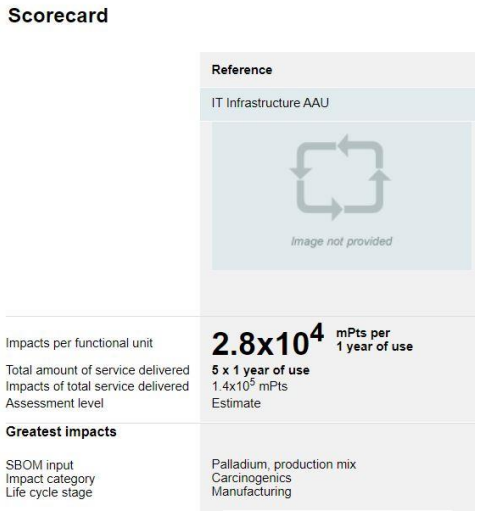
Along with these, the importance of internal communication and practice was highlighted. According to her, “I think we also need to improve our practice maybe before we start communicating externally. To actually know if we are making a difference by what we are already doing or is it just IT equipment is being recycled because we have a good system in place in Denmark”. Adding emission rates and footprints of internal IT infrastructure will create a positive impact towards reaching to the goal according to her. She said, “I think those are very important for the sustainability report to follow up on the climate targets we adopted last year.” Furthermore, the most emphasis was given to internal communication to make progress in ICT sustainability more visible. She stated, “I think first of all, we need more awareness internally because I think we might be doing something great. There are different examples, but if we are not communicating internally on these efforts and practices, I think it becomes a little bit shallow if we try to communicate externally that we are doing all of these great things and we, as employees

or students, are not even aware of that." And finally, it's important to publish the activities' publicity so that it can create an impact on others. Otherwise, there is no value in the tasks done. For example, Aalborg University is positioned 31 in sustainability in the Times higher education impact ranking. On the other hand, in the first ever published QS sustainability ranking, the position of Aalborg University is more than 300 as the university authority did not submit any data, and hence QS authority used the publicly available data. As Heidi mentioned, "I don't think we actually submitted data, but we were ranked based on what was publicly available. And that's not a great ranking for us".

5.3 Life Cycle Assessment

The findings from the Life Cycle Assessment conducted for all the university routers, access points, servers and network switches show the importance of considering the footprint of ICT equipment. It has an immense impact with approx. $2.8x10^4$ mPts per 1 year of use for per functional unit. The assessment was done for 5 years of equipment lifespan as the university's standard average lifespan of products. In this case, the overall impact per functional unit is approx. $1.4x10^5$ mPts. The manufacturing stage has the greatest impact among all the life cycle stages.

Figure 5. 1 Overall impact of the ICT infrastructure



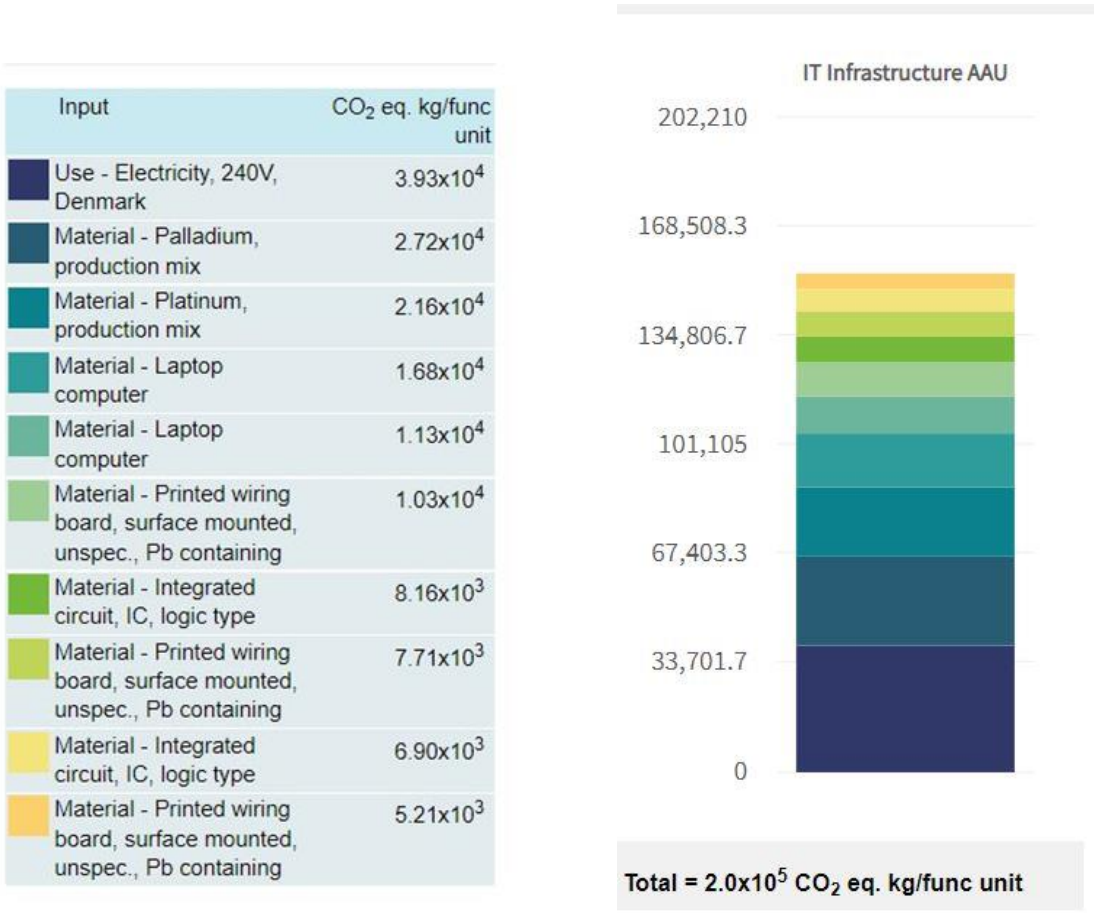
In the impact category, the IT infrastructure of the university has the highest impact on acidification, with 23.83% in terms of ecological damage and the second highest impact on global warming, with 10.42%. The impacts on Ecotoxicity, Eutrophication and Ozone depletion are 4.88%, .87% and .01% in that order. In the resource depletion part, the percentage of fossil fuel depletion is 3.83%. In addition, in regard of human health damage, the impact on Carcinogenic is 27.23%, Non-carcinogenic is 10.64%, Respiratory effects is 17.05% and smog is 1.23%. These amounts identify the negative impact of ICT on the environment which is why ICT sustainability is needed to be considered. Figure 5.2 shows the impact category.

Figure 5. 2 Impact Category

Impact category	%
Ecological damage	
Acidification	23.83
Ecotoxicity	4.88
Eutrophication	0.87
Global warming	10.43
Ozone depletion	0.01
Resource depletion	
Fossil fuel depletion	3.83
Human health damage	
Carcinogenics	27.23
Non carcinogenics	10.64
Respiratory effects	17.05
Smog	1.23

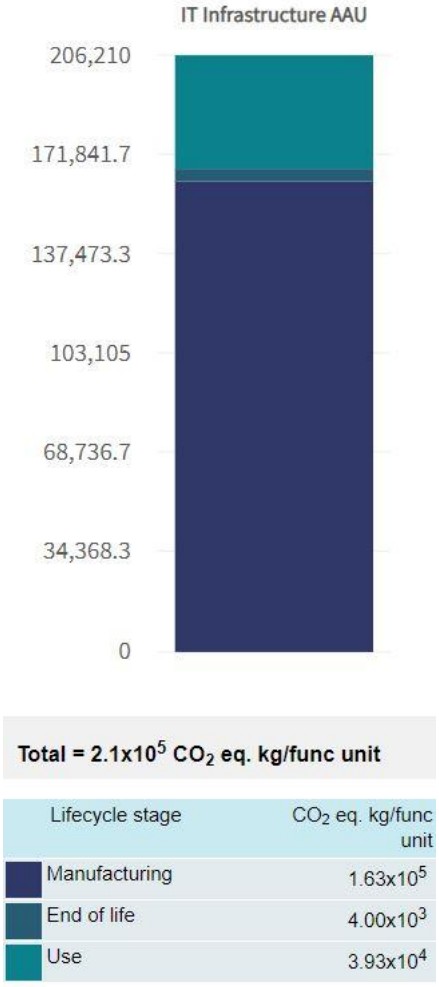
In the total impact of carbon footprint, the usage of electricity has the highest footprint, whereas the other notable ones are from the assembling and manufacturing materials of the equipment. This shows the areas to be prioritized in order to maintain ICT sustainability. Ensuring green energy and eco-friendly manufacturer will provide significant input in this case. The figure 5.3 illustrates the elements with highest impact.

Figure 5. 3 Elements with highest impact



And finally, among the equipment manufacturing, usage and end-of-life stages, the manufacturing stage has the most carbon footprint and emission impact, the second most is the usage stage, and the end-of-life stage has the least footprint. So based on the findings, ensuring green manufacturers is needed to be a high priority and then comes efficient use and recycling.

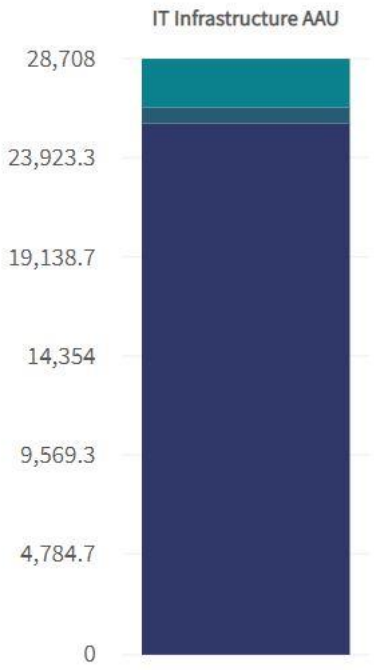
Figure 5. 4 Impacts on life cycle stages in Carbon equivalent and mPts unit



Total = $2.1x10^5$ CO_2 eq. kg/func unit

Lifecycle stage	CO_2 eq. kg/func unit
Manufacturing	$1.63x10^5$
End of life	$4.00x10^3$
Use	$3.93x10^4$

Carbon Equivalent kg/func Unit



Total = $2.9x10^4$ mPts/func unit

Lifecycle stage	mPts/func unit
Manufacturing	$2.56x10^4$
End of life	760
Use	$2.31x10^3$

mPts/func Unit

6. Analysis

The analysis chapter finds the relationship among the findings, literature, the components from the theoretical framework and the conceptual life cycle assessment. This chapter explains all the themes and subthemes from the theoretical framework.

6.1 Establish

6.1.1 Organizational Management

In the organizational management part, the university follows standard IT practices for the IT infrastructure and also receives inspiration from other similar kind organizations. In this process, the management of IT depends on maintaining the highest reliability and then comes the other issues like sustainability. University is trying to combine both as much as possible in the practices but still, many things need to be done. According to Chatterji (2017), any organization that wants to increase its value over the long run must invest in making sustainability a key node within its structure. The university also follows this path by focusing on sustainability, which aligns with the organizational management component from the theory. So, the agenda of sustainability is already established among the IT management of the university, which will be progressed in the near future.

Regarding IT procurement, the university follows certain standard rules applied to public institutions in Denmark. Because of these rules, the university can negotiate and add its own requirements during the purchase agreement, ensuring the proper recycling of the equipment after the life cycle. According to the literature, sustainability operates on agreements, much like a business. In order to hold organizations responsible, modern systems of the agreement allow them the instruments to embody their sustainability goals in contracts and monitor compliance (Muntyan, 2020). So, the purchasing department's activities from the organizational management support ensuring sustainability. This shows that the moral intention for sustainability is established among the IT purchase activities of the university.

And lastly, for the sustainable reporting of activities, the authority follows and tries to ensure all 17 sustainable development goals in the report. When it comes to ICT, the reports are about the use of ICT for sustainable development in a positive manner, not about the negative impacts of ICT on the environment. So, the annual sustainable report lacks attention on the university's contribution to tackling the negative impacts; rather, the focus is now on how ICT is helping in different projects. Based on the literature, ICT may affect the environment in both good and bad ways; ICT tools and equipment may be used to increase energy efficiency, which reduces CO2 emissions and environmental deterioration, but their production and usage can also be significant sources of emissions (Mahdavi & Sojoodi, 2021). So, reporting about both sides of the coin will improve the ICT sustainability reporting of the university.

6.1.2 Normative Standards

In this normative standards section, the research tried to find out what are the normal sustainability practices of the different ICT stakeholders of the university. In the ICT infrastructure department, the common sustainable practices ensure proper equipment recycling by having an agreement with a third party. They also ensure low power consumption of the products by running the equipment as long as it increases the consumption and becomes inefficient. The life cycle assessment concept's finding also shows that electricity and gas have the most carbon footprint for the university, so it’s important to manage efficiently, which is done at the university by using green energy. The literature says, green energy plays a key role in the energy transition due to its low environmental impact as it offers an alternative to non-renewable energy and helps fight global warming by not producing greenhouse gases or increasing carbon emissions (Collins, 2022). All activities directly involve making the ICT infrastructure environment-friendly based on the end-of-life treatment and efficient power consumption criteria. So, the normative tasks of the university IT department establish the sustainability factors.

For the IT purchase department, the normative activities prioritize equipment with more recyclable materials, a better warranty period, and quality of equipment. By doing so, they are maintaining a recycling cycle open for the products, and better quality along with a sufficient warranty period ensures a long life span of the equipment. The findings from the life cycle assessment also show the least emission for the recycling stage, which means it's being handled properly. According to the literature, recycling lessens the need to cultivate, gather, or mine fresh raw materials from the planet; consequently, the negative disturbance and damage to the natural environment are reduced (FoE, 2018). So, the normative practices of the IT purchase department of the university are established as sustainable based on the using recyclable material and end-of-life treatment factors. But there are opportunities to make it more sustainable in the coming days, which is also in the plan of the university. For example, following green labels during the purchase can be an option that the university is not doing at this moment.

For the annual sustainability report, the data are collected first from different university stakeholders working on projects aligned with the sustainable development goals. After the data collection, the reporting authority combines all the data, selects which information should be published and which are not, and creates a balance so that all the SDGs are represented in the report. As the issue of the negative impact of ICT is not considered largely, it didn't come into the light of common things to be reported. Hence for CSR reporting, there are opportunities to improve the concept of ICT sustainability from different perspectives.

6.1.3 Efficient Resources

Efficient resource means using natural resources efficiently for the operation. For IT infrastructure of the university, green energy is used, which is efficient. University has a contract with an energy provider that ensures 100% wind energy, where 50% is directly from Denmark. University facility management also has a certificate from the energy provider where the energy sources are in line with EU Renewables Directive and certified by European Energy Certificate System. In addition, they also change the equipment

when it starts to consume more energy than usual. This ensures the efficient use of energy along with having efficient systems running. According to the literature, wind energy has less of an impact on the environment compared to many other energy sources. Wind turbines do not emit pollutants that might contaminate the air or water, and they do not need water for cooling (EIA, 2021). As we have seen from the life cycle assessment concept, energy is an important factor in the usage stage of the IT infrastructure. So, sustainability factors exist among the activities of IT infrastructure from the efficient resource point of view as the university is working for green energy.

In the IT purchase section, they prioritize the equipment which consumes less energy. They also ask the vendors for certain equipment by providing the specifications and mention the energy consumption label there. During the selection process of specification, the energy issue is also considered so that the most energy-efficient product can be bought. Based on the conceptual life cycle assessment finding, the manufacturing of the equipment significantly impacted the equipment's lifespan. The literature says energy efficiency improvements on products can reduce water usage, other pollutants, and greenhouse gas (GHG) emissions (US EPA, 2017). So the activities of IT purchase in terms of efficient resources has elements of environmental friendliness.

For the sustainability report, the green energy usage of the university is reported and is mentioned as an activity of the facility management as the energy source the directly maintained by them. Even though the IT infrastructure running behind of all other activities is maintained by green energy, this is not specifically mentioned as part of IT, but rather as part of overall university facilities. Still, the green energy of the university is an asset for making the ICT infrastructure more sustainable and there are scopes to report accordingly. So, the sustainability reporting activities are not directly related to IT sustainability, but there are opportunities.

6.1.4 Increasing Visibility

The visibility part tried to find out the current practices of publicity to make sustainable activities within ICT. From the ICT infrastructure, the activities are sending emails about any new projects or contributions internally so that everyone is informed. Other than that, there are still options for improvement for making it visible to others as all the activities and related impacts are not documented. The recycling activities are documented, but data on impacts from those is missing, which would be better to understand the contribution better. Based on the literature, by encouraging knowledge exchange, documentation helps to learn how procedures function and what typical project outcomes look like (Atlassian, 2022). So, the activities to spread contribution are less because of some limitations, which can be extended for better reach and understanding in the future.

The same applies to IT purchases of the university as the data on the impacts they have made by recycling the equipment or doing other activities can be improved. There are data on the recycled units, but the quantification of the impact will be more insightful and related to make the contribution more visible.

For the sustainability report, the IT infrastructure lacks visibility because it does not adequately quantify impacts from related stakeholders. As for the reporting, the data has to be submitted by the related authority, so lacking empirical data has an impact on sustainability reporting as well. The more quantified the contributions are with proper empirical evidence, the better for the reporting. According to the literature, quantified data offers an empirical foundation for reports packed with qualitative data and claims with a marketing bent and makes the criteria that make up the idea of sustainability approachable and understandable(Eka, 2021). So, there are opportunities to improve the ICT sustainability reporting by using more quantified data.

6.2 Maintain

6.2.1 Organizational Management

From the organizational perspective, the university is always engaged and cooperative in the topic of sustainability. There are activities like making smart buildings by having the priority of low energy consumption. For example, building different kinds of IoT sensors will be used to reduce unnecessary energy consumption. University also recently appointed a sustainability manager to make the activities sustainable, which shows the willingness to progress in this issue. According to the literature, hiring a sustainable manager helps an organization to control its impact on complying environmental regulations and the activities related to sustainability(Unity, 2022). So, the activities to maintain the environmental sustainability of the university are running and will grow gradually.

For the IT purchase, the management has to decide which one is the priority between cost and eco-friendliness of the equipment. In this case, the focus is more on cost. But that doesn't mean they always prefer the cheapest product. The university tries to purchase the best quality product so that it can be in operation properly for about 3-5 years. So, the topmost priorities are cost and quality. When these two priorities are met, then they also consider the factors of sustainability. Based on the literature, because the raw resources are more expensive, sustainable products are more expensive than conventional ones and this is due to the fact that they are higher quality, manufactured in fewer quantities, and have less of an impact on the environment (Gammage, 2022). So eco-friendliness for the products cannot always be maintained even though they agree it will be better if that can be done.

The sustainability reporting of ICT infrastructure was not focused on that much as it's not the core activity of the university. The core activity is research and education, which are the most emphasis on sustainability reporting. For example, different research projects related to IT sustainability and activities within the university about sustainable education are published in the report. According to the findings, the biggest sustainability

impact for the university can be gained by educating the students and doing research about it. The literature also says in-depth information and understanding are taught in higher education in order to take pupils to new areas of study (Lis, 2022). So, the prime focus is not on the ICT infrastructure from the annual sustainability report end, which is one of the main reasons for less reporting.

6.2.2 Normative Standards

For the maintenance of the IT infrastructure of the university, the focus is on low maintenance and high availability. The maintenance is done by both external and internal sources. Most of the maintenance is done by internal manpower, and some big ones, like the cooling system for the data center are done by an external provider. By doing so, the IT infrastructure ensures high availability, which is the most important thing for IT. Maintaining by the right people ensures less traveling of manpower which is efficient in both economic and environmental ways. As internal maintenance requires less traveling, which saves cost, time, and energy, and maintaining complex solutions by externals saves cost, time, and energy. According to the literature, environmentally sustainable maintenance may assist with waste reduction, emission reduction, and air quality improvement (Jeans, 2022). So, in that way, the maintenance activities of the university are eco-friendly.

Among the different practices of the IT purchase department, ensuring recycling of the product is the most normal one. University has an agreement with a third-party company that takes the equipment after the end of its life, takes out the hard disk, and destroys the hard disk. Then the third party is allowed to reuse and recycle from the rest of the unit. Based on the literature, the primary benefit of sustainable end of life management is that it lessens the impact on the environment by enhancing the quality of the air and water and helping to reduce greenhouse gas emissions (Impulse, 2022). By doing so, efficient end-of-life management of the equipment is ensured, which is an important part of being environmentally sustainable.

There is a scope of improvement of documentation of ICT activities, including maintenance, so it has impacts on sustainability reporting as well. The current practice of sustainability reports is to add quantified data, which helps to explain the issue and impact in a better way. So that people can understand properly and can be related to the story. The reporting authority expects that the quantification of ICT infrastructure will be done more in the future to be published in the reports.

6.2.3 Efficient Resources

Circularity is one of the efficient ways to make the IT infrastructure environmentally friendly. The university values circular economy a lot, but for IT infrastructure, it's got difficult to follow the full circularity to maintain the standards. University doesn't use refurbished products because they have to maintain a certain standard of equipment and refurbished equipment often doesn't comply with those standards. In addition, using refurbished products has a high probability of having problems with support and service. So, it's risky to build the system infrastructure by relying on refurbished equipment. Another important thing to get the best from the circular economy is that consumption is needed to be reduced, which is extremely difficult for IT infrastructure because of the growing need. So even though the authority believes in circularity to make the system more efficient, it's not possible because of the nature of the equipment and standards.

The IT purchase department also doesn't prefer refurbished products as they have some issues with them. These products are not available, so they might be unavailable when it's needed. In that case, it's better to take not such kind of risks for the IT infrastructure. In addition, the university is also creating a practice of using IT equipment for 3-5 years. Using refurbished products will create problems for maintaining these practices as it's difficult for a refurbished product to run for 3-5 years without repair. According to the literature, refurbished products don't give the history of the product, the lifespan remains unknown and have less warranty (M&H, 2018). So, for the greater good, the IT purchase department cannot maintain the full circularity of the equipment.

The interviewee from the sustainability reporting thinks that the circularity of the IT equipment will add value for sustainable development, and the university can take more responsibility for the products and services that we are buying. It will require a significant change in the practices surrounding IT equipment as well. The change of practice is a vital issue here as for the IT infrastructure, the change of practice involves a lot of other things, which makes the process difficult. But there are some changes as well, like using the same dock station for all the laptops so that it can be interchanged between users rather than buying a new one, usage of the same phone by others if someone left, etc. But based on the finding, there are also a lot of things that can be done to make more improvements.

6.2.4 Increasing Visibility

The visibility of sustainable activities within the ICT infrastructure does not get attention as it should. As discussed earlier, the problem is in the documentation with proper data, as most of the activities cannot be documented from the environmental sustainability point of view. So, there are lacking of visibility part. Based on the findings, the ICT infrastructure authority thinks that informing others about the good work that has been done regarding the environment will create a positive impact among other stakeholders. They also think that the quantification of activities will help in decision-making. If there was data about the ways which are more eco-friendly forms in IT in Same applies to IT purchases about visibility as there is also a gap in documentation and reporting. So eventually, the reporting of IT infrastructure sustainability is needed can be improved from the sustainability point of view.

6.3 Extension

6.3.1 Organizational Management

University management has plans for the future to operate different activities to make the ICT infrastructure more eco-friendly. They are looking to close down different

ICT facilities during the night, on weekdays or holidays, so that energy can be saved. The literature says that institutions can think about turning off the equipment that is not in use after a particular time or even revise their heating and cooling plans to enhance energy efficiency (Accruent, 2022). The university has also planned to cool down servers in a different way by directly cooling the CPU so that less energy is needed, which is in the experimental stage now. This is important as the life cycle assessment shows how immense the overall footprint for energy use is and according to the literature, in data centers, computers and cooling systems often require the most direct power, followed by storage drives and network equipment (Marcacci, 2020). So, considering the huge impact the university is already working by keeping the future in mind, which goes with the extension of the sustainability concept for the ICT infrastructure,

The purchase department has some activities in mind for the future to make the process more environmentally friendly. They are planning to order freight of products in the future so that all the products can be delivered at once rather than delivered multiple times, which costs energy, thus not environmentally friendly. They also have a plan for agreements with the vendors by prioritizing the electricity consumption to make the process environment-friendly. The findings from the life cycle assessment shows the significant involvement of manufacturers in the environmental impact of products. So, the ICT purchase activities go with extending sustainability.

From the sustainable reporting point of view, the plan is to set up an appendix in the next reports with the measurable key performance sustainability indicator, which will be helpful for all the departments in the university, including ICT infrastructure. They also prioritized setting targets and measuring the progress of all the departments within the university to improve sustainability. Furthermore, there is a plan for an energy tracking tool on the sustainability website of the university, which will also be beneficial for ICT infrastructure. So, there are scopes for ICT infrastructure to improve the visibility of sustainable activities through various reporting tools of the university.

6.3.2 Normative Standards

From the ICT infrastructure point of view, the university is trying to focus on the users to make the best use of ICT services from the environmental sustainability angle. They have already done experiments about turning off the monitors after work so that energy can be saved. But it was found that that saves a very minimal amount of energy. In addition, they also did an experiment by turning off access points during off-peak hours and the result is impressive. University can save approx. 25000 Danish kroner each year by doing so. Hence it will have an immense impact if it can be implemented in the future and turn into a normal standard.

For the purchase, the university the about to sign a new agreement for the next years and one of the priorities will be electricity consumption. So, the purchasing department is going to make normal the issue of electricity which is an important part which puts impacts the environment. Tackling the issue of electricity for the equipment will improve the overall sustainability of the procurement process. Even though the university is already using green energy, still low electricity consumption will bring overall benefits.

The research found that to improve ICT sustainability reporting, communication practices are needed to be improved. It's important to communicate properly internally before reaching out to externals. That will help to understand how we are doing and whether we are making any difference or not. When it is clear within ourselves, then it will be easier to communicate with externals as well. So the area to emphasize is the communication practice to improve the ICT sustainability reporting in the future.

6.3.3 Efficient Resources

The research has found that measuring the emission rates and carbon footprint of the ICT infrastructure will be helpful for the decision-making to make it more environmentally efficient. The interviewee from ICT infrastructure agreed that it's more needed now than two years before because of the changes that happened worldwide in recent years, and it's for everyone. They also prioritized the role of manufacturers in this

case. The finding from the life cycle assessment shows that among the 3 stages of the equipment life cycle, the most impact is on the manufacturing stage. They are hopeful that in the coming years, the manufacturer or suppliers will bring some kind of metrics for their equipment. There is a feeling among them that the equipment industry is not as progressed in terms of eco-labeling as other manufacturing industries. So, if the decision-makers already know which solution or equipment is more eco-efficient, they can plan accordingly. The research has found that currently, from the decision-making point of view, they don't know the exact way how to proceed as there is a lack of a common baseline or rules. So, measuring its own internal ICT infrastructure can be the first step so that it can help later to make the strategies based on the need.

The IT purchase authority also thinks same that the information about its own internal ICT infrastructure will be helpful in the long run. To them as well they have more responsibility in on the manufacturer side as they have more scope to improve during the manufacturing process. The opinion of both of these departments aligns with the annual sustainability reporting interviewee as well. Measuring own footprint will not only improve the reporting scope but also will help to set the targets for improving performance. As currently, the university is sort of mapping what is going on and how to progress, so measuring its own emissions and footprint will help to create the baseline.

6.3.4 Increasing Visibility

There are mixed opinions about publicly publishing the emission rate and footprint data of the university IT infrastructure. According to one point of view, it will help indirectly in a way by attracting a generation who are enthusiastic about climate change to select the university to study. Another perspective is that publishing these concrete data will create more problems than something good, even though the reason was not properly expressed. But it was mentioned that the university should work on these things internally. So, the IT infrastructure authority thinks that publishing internal emission and footprint data can be helpful, but there are also some concerns about the reputation going in the wrong direction.

From the perspective of the sustainability report, these data are essential to be published publicly because they are important for the sustainability report and follow up on the climate targets the university adopted last year. Also, it was pointed out that more awareness is needed internally to make sustainable activities more visible. It was stated that even if we do something great but don't communicate internally, then it becomes a little bit shallow when we try to communicate externally, as the students and employees are not even aware of that. So, it means the authority believes that to extend ICT sustainability, it's important to publish public reports but also, there are improvements to be done internally.

7. Discussion

The findings and analysis of the research answered the research questions of this research from different perspectives. This research tried to determine how higher education organizations are doing concerning ICT sustainability and how measuring the impacts helps decision-making and CSR reporting. The conceptual life cycle assessment shows the importance of considering the environmental effects of ICT and indicates what should be prioritized most. The findings show the impact of ecological damage, health damage, and resource depletion. In addition, points out that the manufacturing stage has the most impact, then usage, end of life stage in that order. The research also identifies that electricity usage has the most impact on the operation of ICT infrastructure in the usage stage. Here points to be noted that the manufacturing stage is a scope 3 emission which is not in the hand of the universities. Purchasing eco-friendly equipment from the manufacturers can be ensured by the universities and that will be under scope 2 emission, which is in the scope of this research along with scope 1 emission.

The study found that by figuring out the significance of sustainability, Aalborg University has taken different steps, including in ICT infrastructure which directs at answering the research question. The research found that the university already has activities in ICT infrastructure, ICT purchase, etc., which shows the willingness to progress in this area. There are also projects to maintain the sustainability factors

efficiently and to extend in the future. The sustainability factors that the university maintains in different activities are low and green energy consumption, low and green power consumption, use of recyclable materials, end-of-life treatment, and focus on long life cycles. University fulfills the low energy consumption criteria as the products with low energy consumption are prioritized during purchase and usage, which contributes to handling the equipment's manufacturing, usage stage, and the most impactful life stages. Green energy consumption is another crucial criterion that the ICT infrastructure fulfills, as the university uses 100% wind energy for the operation of the equipment. In the case of recyclable materials criteria, there priorities by the IT purchase department to the products which are easily recyclable, hence it also matches with this sustainability factor. In addition, end-of-life treatment of the ICT equipment of the university are well controlled for proper recycling, so it's sustainable for the environment. Even though the good recycling system in Denmark contributes here, still university also gets credit for maintaining it properly. Furthermore, there is always a focus on the long-life cycle of the equipment by ensuring proper maintenance and efficient support, which is environmentally sustainable in the long run. Finally, there is the use of product-service systems for the cooling system and other equipment, which ensures the eco-friendliness of the infrastructure. The ICT infrastructure of the university meets all the sustainability factors used in this research except the use of refurbished products because of the nature of requirements from the university as there are possibilities of harming the efficiency of the system by using refurbished products.

Even though many activities are going on in terms of ICT sustainability, there are still opportunities to improve. The most significant area of improvement is the quantification of environmental risks, possible solutions, and positive impacts related to ICT sustainability which will eventually help in the decision-making and reporting of the activities. Measuring the environmental risk factors that occurred by the ICT infrastructure, as shown in the conceptual life cycle assessment, will influence making the right decisions so that things can be changed. In addition, knowing the possible sustainable solutions, such as making the data storage sustainable and ensuring eco-friendly equipment; the difference between them from a sustainable point of view with

facts and figures will help IT decision-makers like IT directors to choose the right solution. In this case, there are huge responsibilities from the manufacturers as well to come up with more quantified data. On this note, most of the equipment in the university is from Cisco which is also working to make its products sustainable from material use to the recycling stage. Furthermore, measuring of own footprint will help the decision makers to create a baseline for the future. Finally, when any improvement is made in terms of sustainability, the documentation of that is essential with quantified data for better monitoring and reporting to make it more understandable and relatable. Publishing these data publicly is also better for the university in terms of rankings.

The components from the theory were also used to determine the legitimacy of ICT infrastructure activities from a sustainability point of view. The eco-friendly factors for all the establishment, maintain and extension stages of legitimacy can be drawn from the activities in terms of organizational management, normative standards, and efficient resources. Even though there are still opportunities to improve in these areas, the increasing visibility part has more options to improve by quantifying the impacts. In additoon, limiting the boundaries of legitimacy within scope 1 and 2 emissions is not greenwashing as long as organizations correctly access the level of their environmental impact on the society which is done at the case univeristy for scope 1 and 2. Instead, the IT administrators are more concerned about the greenwashing of the manufacturers or scope 3 emission as we have seen in the life cycle assessment, manufacturers play a significant role in maintaining sustainable IT infrastructure. There is no bias in the sustainability reporting as well. Currently, it’s based on the data provided by the different departments and quantified impacts get prioritized. For ICT negative impacts, that also can be reported if data is available, as that will help to achieve future targets. So the reason for excluding ICT impacts is the lack of quantification.

Moreover, the study has implications for other organizations. Firstly, the case university shows a general pattern for other higher education organizations' ICT infrastructure and the possible scope of sustainability practices as they are almost the same in nature, aim, and size. Secondly, the core ICT equipment for all other kinds of organizations is the same as the common networking principle has to be applied for any

ICT infrastructure in any organization. The differences are usually in size. So the research findings are relevant to all kinds of organizations that want to be sustainable in their ICT activities and publish them in CSR reports. In addition, among all the organizations, some are entirely based on ICT infrastructure, for instance telecom. The core network equipment in the telecom is used on a large scale to ensure efficient telecom services countrywide. The research shows the environmental sustainability issues and ways of reporting improvement on a small scale that can also be applied on a large scale like telecom, as the core infrastructure is similar. By doing so, organizations can earn a good image in terms of sustainability which will eventually help in the long run. It will also help them create a baseline for the future in the path of sustainability and allow them to follow the recommended policy frameworks.

This research has some unique inputs compared to the current literature on ICT sustainability. Firstly, the current literature is focused mostly on the positive impacts of ICT on the environment where the contribution of ICT is highlighted. There is some research on the negative effects, but it lacks when it's from an institutional point of view. This research analyses the issue from an institutional perspective contributing to the literature. In addition, current literature explains the ICT infrastructure or network systems from the telecom point of view. But this kind of infrastructure is not only confined to telecom companies or IT companies only. In this digital age, all kinds of organizations must use similar infrastructure to sustain themselves. So, the university as a case study is another addition to the literature. Universities are connected to a network internationally which requires huge ICT infrastructure, hence has the possibility of immense impacts as well and this research analyzed Aalborg University as a part of the university network. Furthermore, this research is unique in the corporate social responsibility literature from the university's ICT sustainability perspective. Current literature discusses the social responsibilities of universities related to research and education mostly, as it's the core activity of the university. So, ICT sustainability adds a new dimension to the university CSR literature. Moreover, the use of legitimacy theory to determine higher education organizations' ICT infrastructure sustainability is another contribution to the literature. The theory was not used earlier by relating to ICT

sustainability. Finally, the conceptual life cycle conducted for the university also contributes to the ICT life cycle assessment literature by providing insights into the structure of a university and its possible impacts.

The research also has a few limitations, which impact the overall findings. Firstly, the number of raw materials used in the conceptual life cycle assessment was inputted based on assumptions by taking inspiration from similar equipment. This was done as extracting exact materials without knowing the name of the used equipment model numbers was impossible. In addition, manufacturers don't publish the used materials online, so there was no option without estimating the amount. As it was a conceptual life cycle assessment to get the probable idea of the impact, this limitation does not impact greatly, even though knowing exact amounts would make the finding more accurate. Collaborating with manufacturers will open the opportunity for future research to get exact raw material data used in production so that the findings of the life cycle assessment can be more precise. Also, the scope of the life cycle assessment was limited to 4 equipment only. It be increased in further studies to make get the impact footprint of overall ICT infrastructure. In addition, the research did not count all the stakeholders relevant to the theory because that would require more time to conduct the research. As university gets legitimacy from its stakeholders from its society which includes a wide number of stakeholders like students, government, teachers, researchers, etc. In this study, the stakeholders were relevant ICT infrastructure authorities and sustainability reporting representatives. Getting in touch with different stakeholders would provide more opinions about the study, making the findings more insightful. So, all the relevant stakeholders can be involved in future studies to bring more perspectives.

8. Conclusion

In this era, while the use of ICT is increasing, the increased amount of equipment manufacturing, usage, and disposal can also negatively impact our environment. As the climate crisis is one of the biggest issues, all kinds of organizations should react from their end, and no areas should be left behind, including ICT. Even though ICT can help to tackle then climate crisis, there should still be aimed to minimize the negative impact as much as possible. To investigate how higher education organizations are doing this research has done a case study for Aalborg University and tried to find out how they are doing in terms of ICT infrastructure sustainability for scope 1 and scope 2 emissions. In addition, the study investigated how measuring the footprint of ICT infrastructure impacts on decision-making and CSR reporting of the university.

The activities within IT systems and IT purchase of the university meet different sustainable factors, which are low and green power consumption, use of recyclable materials, proper end-of-life treatment, ensuring long life cycles and use of product-service systems. In addition to current activities, there are plans to improve in the future, but for that, support from the manufacturers by producing efficient products will be crucial. Moreover, the documentation of activities with quantification of results and impact will be beneficial for corporate social reporting by making it more understandable. This kind of quantification also will help the decision-makers within the ICT infrastructure department. Knowing by facts which areas have the most damaging impacts and what are the best environmental solutions can guide the decision makers to make the right decision and will help in tracking the progress. Furthermore, measured data can also be used for the corporate social reports, which will help be transparent and might increase the university's reputation to the sustainability enthusiastic stakeholders. The conducted conceptual life cycle assessment for the university shows the importance of quantifying the impact by measuring the manufacturing of equipment that has the most negative impact on the environment and from electricity consumption during the usage stage.

This study will help organizations check their ICT sustainability factors as ICT is needed everywhere nowadays. It will also be helpful for organizations in fixing their approach to ICT sustainability as the research discusses the key elements during decision-making. In addition, the study will be relevant for organizations who want to improve ICT sustainability reporting in their CSR reports. ICT has made extensive contributions to tackling the climate crisis worldwide. Reducing negative impacts caused by ICT will bring huge efficiency to IT systems from an environmental point of view. Along with gaining efficiency, publishing the activities with quantified figures will be beneficial for the organization, the relevant stakeholders, others who want to improve, and eventually for the climate.

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Appendix

Transcript of Interviews

These transcripts were prepared by the software "Descript". They are not exactly accurate and went through the editing process for the adjustment. Interviewees were asked about their consent before recording the interview.

Interview 1

[00:00:00] **Interviewee:** Oh, you want to record it? Yeah, yeah, yeah. Okay. Yeah. Uh, but you cannot, uh, of course you have to, to uh, not to share it with with anyone.

[00:00:10] **Interviewer:** Well, it's just for like my analysis later so that I can Yes. See it and yeah. I mean, so I mean, if we start, basically it's like my from master thesis. I'm trying to, uh, find out the sustainability issues of IT equipments or IT hardware and back in, in the.

[00:00:28] So that's what like I'm trying to analyze. I have some questionaries is like said for, for analysis. Shall we start questions if it's okay.

[00:00:35] **Interviewee:** I just have to say that it is not, uh, I'm not sure I can answer everything, but I can get back to you with the answers, uh, afterwards because, uh, you should know that.

[00:00:47] We are the IT department. Mm-hmm. , but all, all physical aspects that is power, supply, fire, uh, fighting and cooling [00:01:00] is under facility management. Okay. And I have, I have asked for numbers from them, but I haven't got it yet. Uh, but, but anyway, you can interview me and I write the questions down and I can answer you.

[00:01:16] **Interviewer:** Yeah. Yeah. I mean, so basically like, I was like, I just wanted to know in the beginning how is the like infrastructure set up of the university, like in from the IT perspective, how, how it functions among three campuses. You heard how, how does it runs basically.

[00:01:33] **Interviewee:** Okay. That is more a network aspect than power supply and so on.

[00:01:37] Yeah, yeah, yeah. Well, we have an enterprise network, uh, Uh, you can say that, uh, the network in Alborg is a campus network, and in fact, it's called a campus network in, uh, in network, uh, terms. Mm-hmm. , uh, but before, but because we have more locations, [00:02:00] uh, that are, that are not small, uh, It's an enterprise network.

[00:02:07] Mm-hmm. . Yeah. So, so it consists of, uh, of a, wifi of course. And then a three-tire network with access net, distribution net and core net. Okay. Yeah.

[00:02:22] **Interviewer:** So yeah, it's like, yeah. I mean, but it's like, it's rooted in Alborg, right?

[00:02:30] **Interviewee:** Center the center is in Alborg .

[00:02:31] **Interviewer:** Do you follow like any guidelines and things like when you like work with IT infrastructure, is there any specific guidelines like SDG or something?

[00:02:44] **Interviewee:** Yeah, we, we follow best practices from, from, uh, from the vendor and also from other, what other organizations in, in this size to, uh, but of course when you have, uh, when you have, uh, [00:03:00] design the network, for example, for 10 years ago, then you'll have today, you'll have some legacy. Uh, you'll have something that you want to do better

[00:03:10] Uh, now, so we are, we are constantly, uh, working with doing things better. Yeah. Uh, so, so there's performance enough, uh, for students and, uh, scientists and, uh, also so the securities mm-hmm. is, uh, is adequate.

[00:03:29] **Interviewer:** Yeah. Okay. And like on that, like, uh, I, I, I mean cause like my research is about sustainability. So like, do you also have any common practices that you do in, when you work with IT infrastructure, like for example, maintaining some kind of things which are eco-friendly.

[00:03:48] **Interviewee:** Uh, uh, sorry, can you, can you, uh, repeat that? Uh,

[00:03:51] **Interviewer:** do you have any common practices like that you, uh, do? When I mean in terms of maintaining IT infrastructure, like from which are [00:04:00] like eco-friendly, for example, like, uh, for example, proper disposal of equipment or like maintaining some things which can be eco friendly.

[00:04:11] Oh,

[00:04:11] **Interviewee:** eco-friendly. Yeah. Yes, yes. We are looking more and more into that. Mm-hmm. , uh, of course. Uh, and, and, uh, equipment today is, uh, more eco-friendly than it was 10 or 20 years ago. Yeah. Uh, uh That's not a surprise, but, but, But, uh, the, the hurdle is that we have to be online all the time. Yeah. Because, uh, our services should be able to access for, for students and for scientists.

[00:04:47] Yeah. Uh, uh, always and from, from everywhere. Uh, That, that's not what we do, but, but that's what we, people want us to do. Yeah. [00:05:00] So, so we, it is difficult to turn a lot of things down. Mm-hmm. , uh, and also, uh, when, when, when there's not that many users on systems, a lot of them, uh, runs backup. Yeah. So they are still, uh, uh, in, they're still not idle.

[00:05:20] Mm-hmm. , uh, they do a lot of things. And in the network we have the issue that, uh, uh, uh, a lot of, uh, IOTs mm-hmm. , uh, and also critical IOTs from facility management, uh, depends on the network. Yeah. So, for example, we cannot turn the network down in the building. Mm-hmm. , uh, But anyway, uh, when you ask, uh, there has been some, uh, progress in this aspect, uh, also recently.

[00:05:54] So we are asked to, to deliver. Uh, [00:06:00] uh, some, some, uh, uh, suggested things that can be done, and we are working on that right now. Not only me, but a lot of people hedocumentationre.

[00:06:09] **Interviewer:** So I assume like university like supportive in this aspect, right? Like making things more sustainable or eco-friendly, including IT

[00:06:18] **Interviewee:** Yes, yes.

[00:06:19] And, and also, uh, uh, we, for many years we have, uh, had, uh, a very good, uh, process with, uh, with, with the whole circle of equipment. So when it's not used anymore and it should be thrown away, it is, uh, thrown away in a good, uh, way. So, so, uh, so it's, uh, reused exactly. Exactly. And that's not new that, that has been like that for a lot of years.

[00:06:51] Mm-hmm. , uh, and in fact, it is for, for most organizations in Denmark, I will say. Yeah.

[00:06:58] **Interviewer:** And like also, like, do [00:07:00] you, uh, when, when you already said you are doing some things which are eco-friendly already. And is there any proper documentation of these things, like from that perspective? Okay, we are doing these things which are kinda eco-friendly.

[00:07:13] Is there any?

[00:07:14] **Interviewee:** Yes. The, the, the cycle, uh, um, I mean the disposal of, uh, of equipment that is documented, uh, not in my apartment, but it, it is, uh, situated somewhere else. Yeah. Uh, not, not in my department,

[00:07:30] **Interviewer:** I think it's in the par department Procurement department. Yes, I think, but

[00:07:38] **Interviewee:** yes.

[00:07:39] **Interviewer:** Yeah. Okay. And on that note, like, uh, so I mean, as part of it, I mean, how do you ensure, like low maintenance? Do you ensure low maintenance and high reliability? Is, is, is it your priority?

[00:08:15] **Interviewee:** it like, yes. Yes. We, we try to do that. We try to do that, but it, I don't think it's documented.

[00:08:22] **Interviewer:** And, and how do you ensure, like do you have SLA with vendors? I mean, who, who actually does the maintenance? Is, is it like third parties or the vendors that come and maintain it, or

[00:08:34] **Interviewee:** It depends. It depends. So there, there's different solutions.

[00:08:38] Mm-hmm. , some equipment are maintained by ourself. Mm-hmm. , uh, most of it is, but also some equipment are maintained by third party, uh, windows, for example, cooling system. And, uh, and, uh, uh, Cooling system, for example, is we do not have the competences to, [00:09:00] to maintain that. So that is, uh, a partner that comes in, uh, uh, and we have a, we have a agreements with them.

[00:09:08] Yeah. Yeah. So, so, so it's, uh, it, it is a mix.

[00:09:15] **Interviewer:** And what are the things that are maintained by ourselves?

[00:09:21] **Interviewee:** Um, Most IT equipment. Mm-hmm. is maintained by ourself. Uh, so if we have a network, uh, unit that, that is defect mm-hmm. , uh, we have to, to make a, a case, uh, at, at the vendor. And, uh, they will, uh, they will come and pick up the, the unit and, uh, get back with our, get back with, uh, a new one or repair one.

[00:09:53] Okay. So, but, but, but if it is, uh, servers or storage, uh, we, [00:10:00] we, we mostly, uh, maintaining ourself.

[00:10:05] **Interviewer:** And on that, like, uh, did you think about like using refurbished products or like it's, how do you say it like,

[00:10:14] **Interviewee:** Uh, think about what, sorry?

[00:10:16] **Interviewer:** Uh, refurbished products. Like secondhand products, like, oh,

[00:10:19] **Interviewee:** yeah. No, no, because, and it's not because we don't want to, but, but the, the rules, uh, about, uh, buying things.

[00:10:29] Mm-hmm. . Are so complex that it's very difficult for us to, to, to, uh, order, order equipment from, from, uh, from, uh, not our standard window. Also, uh, if we buy refurbished equipment, that can be a, that could be a problem about service and support. Yeah. So we have, I have seen that before and that's not a good idea to, to, to use, uh, a [00:11:00] lot of money on, on, on what seems to be good but used equipment.

[00:11:05] But the, the, the manufacturer would not, uh, handle it and will not do anything about it if it is a specific,

[00:11:15] **Interviewer:** so, yeah. And, and how do you like, ensure, like, like long life span of the products? Is there policies or strategies that you want to ensure, okay, we want to like sustain this product for these years?

[00:11:28] **Interviewee:** Yes, there's policies and there's also strategies. Uh, some of our equipment in fact, runs for many, many years. Mm-hmm. , network equipment, uh, uh, some network equipment. Not the critical things, but some network equipment can run for a lot of years. Uh, um, Uh, and sometimes when it is, uh, something that has a hard disk in, uh, it is not, uh, it is not feasible to, to [00:12:00] run, run it for many years, but, uh, three to five years.

[00:12:04] Mm-hmm. , but, um, so, so, so we have policies about the, that, uh, and, and, and we are, we mostly comply to these policies.

[00:12:17] **Interviewer:** And on that note, like, uh, when, when you use any equipment's or for network, uh, do you also prioritize like, uh, the products which are environmental, uh, I mean, which use like, which has like low energy consumption?

[00:12:34] Is it like,

[00:12:35] **Interviewee:** yes, we try to mm-hmm. , we try to, but there's always a balance between functions and, uh, and, and, uh, eco-friendly equipment. Yeah. So, and, uh, still

in, uh, in, in 2022, uh, you can be surprised how much heat. They are in a, an equipment that that is not, uh, necessary. You just want the functions. You [00:13:00] don't want the heat.

[00:13:01] Yeah. But they're still heat, they haven't found out of that yet to, to get rid of all that heat.

[00:13:07] **Interviewer:** Yeah. I mean it's that, that, that actually, like, it's quite interesting thing. And, and like, I, so I mean, uh, in terms of energy, like, are, are we also using like the green energy in, in our, in our, uh, university.

[00:13:21] **Interviewee:** That I cannot not ask, answer that, but I can ask facility management.

[00:13:27] Yeah.

[00:13:28] **Interviewer:** Okay. Yeah, that'll be helpful.

[00:13:43] Yeah, that was okay. My,

[00:13:47] **Interviewee:** yeah. I don't think we are. Mm-hmm. . Okay. But, uh, but, I will ask facility management.

[00:13:56] **Interviewer:** Yeah. And like you also, you already answered about the next question actually, like, [00:14:00] how do we handle the equipment after the end of life? Like you already mentioned, we, we give it to, we turn it to the vendors and so that it can be recycled properly.

[00:14:09] Is it right?

00:14:09] **Interviewee:** yeah. Vendor or, or some other third party company that takes care of, of doing it in a good way and also take care of, uh, getting rid of all the data. So we get certificates for all, uh, all artists that I raised, uh, and destroyed and. So I think that, that, that process is, uh, is, uh, yeah, we are, we are in control of that process.

[00:14:37] **Interviewer:** Yeah. And, and how do you say it like, uh, like publishing this kind of documentations in our like, annual sustainability report of our university, do you think it'll, it'll, uh, like create any positive impact for our stakeholders? Cause now it's like all about our research activities and things that our university practice.

[00:14:57] Uh, that's, that's published in the [00:15:00] report. Do you think the work that is done in the IT department that can be also published?

[00:15:07] **Interviewee:** I think so. Yeah. And I think it's, it would have a positive impact. Yeah. We, we have a, we have a project running right now where we are testing, uh, a new technique for cooling servers, uh, with, with the, with the cooling, uh, directly on the CPUs and so on.

[00:15:30] Mm-hmm. , uh, and it's not a new technique. But, uh, they have another angle on it, so it's, we are testing that right now, and I, I, I agree with you that, that, uh, um, It could have a good impact, uh, for the university to, to, uh, inform if we are doing something well in the IT department regarding uh, uh, environment and so on.

[00:15:57] Yeah. But, but, but we still, uh, we [00:16:00] still have to, to localize the very good solution there because we don't have it yet.

[00:16:06] **Interviewer:** So Do you have any, like, any further plans? You already mentioned one like you are doing already, but do you have any, any further plans to make it more eco-friendly?

[00:16:13] **Interviewee:** Yes, uh, uh, we are looking at, uh, closing down, uh, areas of functions, uh, during the night or during, uh, holidays or during weekends.

[00:16:28] Mm-hmm. , but it's not our decision. It's the management's decision. Yeah. Yes. But that's one of the proposals that has come up. Um, For example, if you, if you say this building or this, uh, three buildings, we, we close down in all holidays, uh, then you can, you can, uh, turn off, uh, some of the equipment there, but, but.

[00:16:55] But as I said before, you cannot turn off anything because, uh, fire [00:17:00] detectors and, uh, and a lot of other transducers are dependent on the network. So, but, uh, for example, access points you can turn on, turn off and, and spare some, uh, wet some energy.

[00:17:19] **Interviewer:** And like on that note, like, cause it's about sustainability.

[00:17:22] Cause right now I, I actually had a meeting with our purchase department and uh, it was like mentioned like, uh, now if we want to know any carbon footprint or emission footprint or of any product, we have to rely on the the manufacturers. Do you think it's also, it'll be helpful for decision making

[00:17:41] Uh, if, if we can measure, like, the footprint of our own internal infrastructure, do you think it'll be like beneficial for decision making in terms of

[00:17:50] **Interviewee:** Yeah. Yes, I think so. And more, more now than for two years ago. Yeah. So, so that, that has happened something in, in, [00:18:00] in the world that, uh, that, that affects this, uh, this thing right now, I would say.

[00:18:08] So there's more focus, not only from us, but from everyone. Everyone. Yeah.

[00:18:14] **Interviewer:** Okay. And, and, yeah. And I had like another question which was about what do you think about like if you, if you want to make it infrastructure more eco-friendly, which things should be like more prioritized? Like, uh, making for example, network route or like the protocols more efficient so that it takes less time to travel and consump less energy.

[00:18:37] Or like, or for example, like the virtual machines that we use now, like having three, four machines in one server so that we don't have to buy three machines, three servers, these kind of solutions or like, uh, like saving or like the other parts, like when you buy hardwares and things, considering footprints on that one, which one, you think is like more, better solutions?

[00:19:04] **Interviewee:** That's a good question. I don't think I have the competence to, to answer that. Uh, very qualified, but, but I would say that, uh, if, if, if equipment lasts, uh, uh, more than expected mm-hmm. , uh, so you don't have to buy new equipment every trip every second or third year, but can wait until it's five years old.

[00:19:28] Yeah. Then that, that's always a good, uh, uh, that always a good thing. Uh, uh. In regard of, uh, with, in relation with the sustainability. But, but the other things I cannot really judge between. I think it's very difficult. Yeah. I think it's, yeah. Yes, please.

[00:19:51] **Interviewer:** Uh, I was thinking it's, I mean, if it's like both can be done, then it's the best solution, I would say, but

[00:19:57] **Interviewee:** Yeah.

[00:19:57] That's a good answer. Yeah. Yeah, you're [00:20:00] right. And who did you say you, uh, you had a meeting?

[00:20:04] **Interviewer:** I had a meeting with, uh, from the purchase department. I just, uh, I think it was Jim. Jimmy. Jimmy, okay. Yeah. Jimmy from the purchase department. From the support department? Uh, no, from, from the procurement for the IT purchase.

[00:20:21] Ah,

[00:20:21] **Interviewee:** okay. Yes, Jimmy? Yes. Okay. Yeah.

[00:20:26] **Interviewer:** So, yeah, I mean, I was also like, cause my, my, my, my main problem statement of my thesis was like, basically our university is working with sustainability a lot and IT is also functioning behind, but there is no documentation or reporting about IT in the know, in all reports.

[00:20:44] It's not, I know university, it's like almost every place's it is not highlighted that much that we are doing sustainable as well. So I think these things should be like prioritized. That was like the main area actually. So do, do you think like if, if like, [00:21:00] uh, the emission rate of internal IT infrastructure that we have can be measured, do you think if, if it's, if, if it's like published in our reports, it'll, it'll be better for the university?

[00:21:10] Like to be more transparent,

[00:21:13] **Interviewee:** no. Not . Oh, there's a lot of noise here now. Uh, okay. The echo is off again. Uh, no, I don't think so. I don't think that, uh, that these concrete data, uh, will do something good. instead, they will do something bad, uh, for the university, uh, I believe, but, but of course we should, we should work with these things.

[00:21:43] Mm-hmm. and we are already, so, so, but it takes time. Mm-hmm. and, uh, and, and, uh, uh, and, and we will go, go on, uh, making good solutions, uh, with respect to this.

[00:21:58] **Interviewer:** Okay. And how do you see the user end? Cause [00:22:00] users also has to be responsible, right? Like it's, it's two way,if you, if you ensure something sustainable from the deployment department part and users also has to be responsible, right?

[00:22:11] In usage and everything. So how do you see, like training the users and things about this kind?

[00:22:17] **Interviewee:** Yes. That's a good, that's a good way. Uh, I think that's a good idea to, to train the users. And, uh, already we have a, a take, um, um, What is called facility management has already, uh, uh, sent out some emails with, with good, uh, good advices.

[00:22:36] Mm-hmm. , uh, when using power, remember to turn off the, the, the light in your office and so on. Yeah. Uh, and we have also, uh, made some measurements. Uh, does it make a difference if everybody is turning off their monitor when they leave? . Mm-hmm. , uh, and it's a very small amount of, of, uh, energy that is saved.

[00:23:02] So, so, so, uh, s uh, but, but if we, for example, turn off, uh, um, every second access point on the university, then uh, we can, we can, uh, spare, uh, uh, energy, uh, for 250,000. korner every year. So that's a lot of energy, but, but still, uh, um, we cannot do that without the management, uh, decision because it will, it will affect, uh, how good service they are.

[00:23:40] And, and we expect that students come in, uh, 24 hours, uh, a day and all days. Yeah. So that's, that's the, that's the rule now, but, but I, I, I know that this is, uh, this is considered as we speak.

[00:24:00] **Interviewer:** Yeah. Okay. That makes sense. And like I also, like, I actually, I also, I've already questions like all of my questions.

[00:24:08] I had, uh, and I actually also requested like some datas, uh, do you have any like, feedback for, for those datas?

[00:24:15] **Interviewee:** No. Uh, as I said, I'm still awaiting these data from, from, uh, uh, facility management. But, uh, I'll, I'll, uh, push them uh, again today so you can get your data.

[00:24:29] **Interviewer:** Okay. Cause it'll be helpful for me cuz I have like just one month left for writing.

[00:24:33] So I actually put like this month for data collection. I took and yeah, if I

[00:24:40] **Interviewee:** could have it very soon. Mm-hmm. . Yeah, I'll work on that as if,

[00:24:45] **Interviewer:** yeah, I mean it would be helpful cause I'm actually trying, what I'm trying to do, uh, by getting those datas, I will run one simulation of one life cycle assessment. Like just to portray what, what can be like possible emission rates and [00:25:00] things.

[00:25:00] So then we get the idea and like can link to each. Okay. That was the idea actually.

[00:25:07] **Interviewee:** Okay. Uh, so, so, so is it, is it your, uh, your, uh, final project? Yeah.

[00:25:14] **Interviewer:** No, it's, yeah, it's my master's. It's the final project.

[00:25:18] **Interviewee:** It is, but I I thought you were from 21, you started last year.

[00:25:23] **Interviewer:** Yeah. Yeah. But, uh, it's an Erasmus program. I actually finished one semester in Austria before coming.

[00:25:29] Oh,

[00:25:30] **Interviewee:** okay. Yeah. Okay,

[00:25:31] **Interviewer:** I'll, so you are, my submission is January 1st week.

[00:25:35] **Interviewee:** Oh, okay. Yeah, that's good for you. That's good for you. Okay. I will, uh, look into these, uh, numbers, uh, as if, and, uh, get back to you. I'm a little con, I'm a little worried that the facility management cannot deliver all the data. Uh, but, but, uh, I'll ask them again now.

[00:25:55] There could be some, uh, some, um, details that they don't [00:26:00] even have.

[00:26:01] **Interviewer:** Uh, so yeah, it'll be actually like as much as they can.

[00:26:06] **Interviewee:** Okay. Okay. But, uh, I'll, uh, I'll push them and get back to you.

[00:26:12] **Interviewer:** Yeah, it'll be helpful actually. I mean, if you also need to write me then I can. However you prefer

[00:26:20] **Interviewee:** Yeah, but it's, it's okay for, to.

[00:26:24] Middle man here, so because I have already asked them, so it would be nice for me to, to just follow up on that one. Yeah, it would be actually helpful.

[00:26:34] **Interviewer:** And if I can get

[00:26:36] **Interviewee:** this month and very soon. Yes. Yeah. Okay. Thank

[00:26:41] **Interviewer:** you. Thank you for your time. And I think we have already crossed the time limit.

[00:26:45] **Interviewee:** Yeah, that's all right.

[00:26:46] I'm going to another meeting, but still, uh, you must promise me that you will not share this, uh, record.

[00:26:53] **Interviewer:** No, no, no. I mean, it's, I mean, I will this record. It's, it's only based on your consent. Uh, [00:27:00] the plan was like that. The transcript was to be added in my documentation. But if you still want not to add, I can also skip.

[00:27:08] Okay. Yeah. I mean, whichever you prefer, basically. So do you want me to add this, the transcript of this interview in my final report or not?

[00:27:18] **Interviewee:** Uh, that's alright. Okay. Yeah. Yeah. But this, I don't think there's anything. Yeah. Yeah. Okay. Yeah.

[00:27:25] **Interviewer:** Okay. Okay. Thank you. And yeah,

[00:27:27] **Interviewee:** I'll get back to you soon.

[00:27:29] **Interviewer:** Yeah, soon.

[00:27:29] Thank you. Thank you for, that's no problem. Have a nice day. And you too.

[00:27:37] **Interviewee:** Bye.

Interview 2

[00:00:00] **Interviewer:** So shall we begin? I'm trying to basically, basically analyze how we are thinking about sustainability when we work with IT hardware and things. I've send you some questions, I hope you saw it already.

[00:00:33] Yeah. So do you follow any SDG when, when you have anything in mind when you buy IT equipment?

[00:00:44] **Interviewee:** Um, well, uh, basically, uh, as a public, uh, institute, uh, we are Demanded by law to have, uh, several, uh, vendors and

[00:01:00] bid on it and make, uh, agreements so we cannot just shove around. Okay, so, so that we make, uh, an agreement, either we follow the agreement that have made on behalf of all public, uh, um, institutes, uh, or, okay.

[00:01:26] Um, Uh, that's in one way limits us, but also we can make some, uh, demands, uh, and, and follow. Um,

[00:01:42] we, we think about it, um,

[00:01:48] uh, when, when we have used equipment Yeah. That we have to, that that cannot be used anymore. Uh, then we have an agreement [00:02:00] with, uh, uh, a company, uh, special agreement with them mm-hmm. because they take the hard drives and they destroy it. Yeah. Uh, and they are allowed to, to, uh, reuse whatever they can from the rest the units.

[00:02:19] So in that sense, um, that we are thinking about it and, and also sort, um, That, uh, the garbage as we're supposed to be doing. So in that sense, we are doing it, uh, I don't think at the moment.

[00:02:46] **Interviewer:** one second. Like, can I also record this meeting? Like I might need it later. Yeah. Okay.

[00:02:52] Thanks.

[00:02:54] **Interviewee:** Uh, by the way, have you seen that um, there have just been made in, [00:03:00] uh, agreement of. On a product called dot software for transcription? If you look at our software page, then you can find the info about it and it is free for students to use. Okay. Just, uh, for it might be helpful.

[00:03:21] Helpful for you. Yeah. Um, so, yeah. Um, We, we do not have special thoughts at the moment about, um, that it has to be, uh, reuse of, uh, uh, plastic and so on. Mm-hmm. , but of course it's something that it. It [00:04:00] gives extra credits when we are judging the, the different office we, we have.

[00:04:07] Um, so, so the thing about it, we're also thinking about, uh, some, what can we do about, uh, something like freight? Mm-hmm. instead of getting, uh, by 10 things, on 10 different orders and they have to deliver it 10 times. Yeah. Maybe we can collect some of that. That's also things that are being considered on how, to do.

[00:04:42] Um, so it's, uh, when we're not at a point yet where it, it's a very big thing. Mm-hmm. , but it's something we know we gonna have to, uh, consider and we want

[00:05:00] to consider it, uh, as, as humans, human beings. Also, uh, one of your question is, uh, do we buy refurbished products? Uh, no. And, and that's because of our agreement.

[00:05:18] Uh, we have to make. An agreement and, and has to be on specific products. So on, so, so on refurbs products, we cannot, because you'd never know what they, they are available. And also, uh, from an IT point of view, we have making image and, and a poll that for four or five years on each model.

[00:05:46] So we don't. Uh, want to have too many models that we have to maintain. Yeah.

[00:05:53] **Interviewer:** So in that case, like, I actually had another question there. For maintenance, do you have any, like with any SLA vendor or like [00:06:00] they provide the product and they maintain it? Is it like this or is the maintenance, maintenance is done by university?

[00:06:07] Uh, it's, it's, uh, done by, uh, the vendor or the manufacturer. Okay. Yeah, we have a, a minimum of three years Onsite warranty. Mm-hmm. on the products. Yeah. Uh, that, that's, uh, a demand in our agreement. Yeah. Yeah.

[00:06:28] **Interviewer:** And you think like it makes, like the maintenance easier also, like makes the product more time. I mean, it has like more lifespan when it's maintained by the manufacturer itself rather than ours.

[00:06:44] **Interviewee:** No, I, I don't think it has that much of a consequence because of course, our supporters are, they're not specialized in this thing because we have that agreement. But, uh, [00:07:00] they can change many things and have done it. So that wouldn't be that much of an issue, but, The problem is that if you want to maintain warranty, you have to make that that agreement that it's someone certified.

[00:07:20] **Interviewer:** So when you buy any products, what are the like main criteria that you see on, on those?

[00:07:27] **Interviewee:** Um, of course, as public, uh, institute, we, we have to look at price. We, we look at, uh, that's not, uh, the, the main thing. We have many other criteria. Quality is actually one of them. And, uh, uh, the, the also that they, uh, can use the same docking station.

[00:07:59] So you [00:08:00] have all peripherals that, uh, you don't have to have that many different things. And if you change, get a new model of pc, then you can hopefully still use the old docking station, keyboard, mouse, and so on. So, so you don't have to change everything mm-hmm. just because you change the pc.

[00:08:23] Yeah. Uh, quality is very important. Because we expect a Windows PC to last at least three years, and I think now it's more four years. Mm-hmm. that's expect the least. Yeah. So, so you need a certain quality. Yeah, that's, and that's why we also, uh, the lines, product lines we're looking for, for products that, that's, uh, the business lines.

[00:09:00] **Interviewer:** But do you also consider or planning to consider in the future the green leveling when you buy? Cause the companies are now leveling their product screen or not. And also like the emission. Uh, and like I the product with the high or low, do you also consider this or not?

[00:09:17] **Interviewee:** It's gonna be, uh, my belief is that it's gonna be something that's gonna have very high focus and I think I, I'm sure that the government is going to issue a domain for all public institutes.

[00:09:36] Yeah. Yeah. Um, We as a university, we would like to be in front, uh, uh, of things. Yeah. Because that's sort of being in the, uh, university you research and and so on. And so that's whole idea, uh, rebels down [00:10:00] in all the organization.

[00:10:01] **Interviewer:** Yeah. So at this point, If, even if you want to know now. So basically you have to rely on like the vendors, right?

[00:10:08] You have to ask them, okay, what are they thing? So from our end, we don't have any mechanism to check by ourselves. These are like internal things like how, how, how much electricity we are using and what's like an overall footprint. Do you think if, if it's possible to calculate our own internal footprints and emissions, it'll be better?

[00:10:35] **Interviewee:** I, I think we, we are just about, uh, signing a new agreement for, for many years to come. Mm-hmm. , and I think the next one will have even more focus on something like electricity. Mm-hmm. . But, but we know that, uh, Business, uh, units, the business lines they optimized, uh, for, [00:11:00] for, uh, long, uh, battery time.

[00:11:04] Mm-hmm. , uh, and, uh, low use of, uh, energy. Energy, yeah. Because that, that, that gives more battery time. So, and we have seen that every time Intel changes the. The chip set on, on the, the computer and, and the new, uh, CPUs. Mm-hmm. , low energy use, especially for, for the laptops. Yeah. I mean, if I like talk

[00:11:38] **Interviewer:** from our university point of view, what's the priority? Cost of eco-friendly? If it's expensive but it's eco-friendly, will you buy that?

[00:12:04] **Interviewee:** Uh, the, the cost is, uh, is the most important to be honest. Um, and, and we have, we are, um, we have to get several office and basically most, most look

at the price. Mm-hmm. , of course, it, it, it's not used taking the cheapest product if it's really bad.

[00:12:38] Yeah. You also have to make sure that, that it, it keeps on working. Yeah. Because, uh, even though you have a warranty, if, if a PC breaks down, then you have a day or two. or perhaps more if they need certain parts for it, where [00:13:00] the person You also have to make sure that, that it, it keeps on working. Yeah. Because, uh, even though you have a warranty, if, if a PC breaks down, then you have a day or two cannot work or needs to borrow a new PC and you know before you have the right, uh, software install and so on, then yeah, you have used a lot of time and.

[00:13:21] **Interviewer:** Yeah, so, so you feel like you do think like it's, the cost is the like barrier. One of the important barrier to make things more friendly?

[00:13:27] **Interviewee:** Yeah. I, I, I think, um, it has such, such a high focus from the vendors point of view that they, they're gonna, uh, use it.

[00:13:44] They're going, uh, I know several years ago, it's maybe 10 years ago. Mm-hmm. , I said meeting was working somewhere else. Um, and. Uh, there was a guy from Fuji [00:14:00] there, uh, talking about, uh, their products, their laptops, and said, when they are not in use anymore, then they're being recycled. And, and they, uh, cabinet the plastic, they are, uh, reused for, um, for car parts.

[00:14:21] Mm-hmm. , uh, for fenders and so on. so that, that, uh, already at that time they were using, they were talking a lot of it. Also we have some of the, uh, backpacks we have, we are suggesting for people. Mm-hmm. . We also have some of them that are what eco-friendly, uh, re used from, uh, Recycle plastic and so on. Yeah.

[00:14:53] So, so we, we are thinking about it, uh, and, and trying to balance it [00:15:00] on what we are allowed to do, what we, we have to, uh, and, and when we are using actually, um, The, the people's money, because we are funded by the government, uh, then we have an obligation to, to not, uh, to, yeah. So if, if the cost is not, uh, two, two, make a difference, then we try, uh, And, and, and look at all the other things.

[00:15:38] And, and they have, uh, they score high on, on the other things that, uh, eco-friendly, uh, uh, quality and so on. So it's not price alone. Yeah. But, but we have to look at the whole picture, picture

[00:15:58] **Interviewer:** on that. Not cause like, I mean [00:16:00] the current, like sustainability report. I know sustainability report offer univers.

[00:16:05] It contains like a whole lot of other things, which, which university focuses on like sustainable research etc. You think it's also a good way to like, uh, like publish activities within IT?. For example, if you are buying something and you consider like eco-friendly or not, or you are using eco-friendly hardware, You think it's also important to publish the activities within IT infrastructure in our annual report so that it can get more focus?

[00:16:37] Yeah. Totally agreeing on you that and, and it is something that we have talked about and, and, and we have to also, because each institute have their own money so that it's. It's like we are making the agreement on behalf of, uh, 40 different [00:17:00] companies, basically within aau. So we also have to tell them why we are doing this.

[00:17:09] Mm-hmm. , why are we focusing on, uh, just, uh, this, so instead of this range of products and. Some of it also we have talk about, um, making sure that they know that we, we are eco-friendly as a university, we want to do that you see in the new buildings, um, that are being made and renovations and so on. The thing about it, and, and of course we also have to consider it on the it, but then.

[00:17:53] It's a balance because one needs that the, uh, that they work, the [00:18:00] key one working, that we can maintain it and, and yeah, so we do whatever we can, but we, we still have, have a lot. Of ground that we can cover to get where it would really be. Yeah. Really be good. But, and that's also where the vendors have, or the manufacturers have to, uh, help with when they recycle.

[00:18:30] as much as possible. for the products. then, then we can, uh, We can pick it.

[00:18:40] **Interviewer:** it's like more now on like, uh, I think it's also like an important issue, like, for example, rather than like maintaining in the root level, if it's possible to like, like get the, from the vendors.

[00:18:51] Okay. Like, okay, this is the, I think it's also better for, for us and is to, is to manage, right? Yeah. Yeah. [00:19:00] So, yeah, that's, that's, and with that, like, I mean, do you have any, any particular plan now? Like how you want to proceed? Like is there anything in mind like, about making the part just more greener?

[00:19:17] No, not, not at the moment..Um, it's, we, we are still so much, uh, being looked at regarding. What's the best offer we can get? Mm-hmm. , price wise and, uh, quality and, and, um, maintenance wise, because the cost of the unit is just out of, you have to look at the whole life cycle. Uh, the better it worked, less, uh, downtime you have on the products, uh, then[00:20:00] the better it is.

[00:20:01] So, you know, if, if you have very cheap product and a product that's more expensive mm-hmm. basic, normally the, the more expensive product is a better product. Yeah. So, That, that's, that's what we will look at. Say, okay, we, we might, uh, uh, pay a bit more for better product because our total cost of ownership.

[00:20:36] Yeah. The TCO will be less. Yeah. And of course something, uh, as, uh, the eco friendliness is, is also considered. We have, and that has been, I've been here for eight years. Uh, and, and this about, um, When [00:21:00] the product, uh, is gonna be scrapped mm-hmm. , then it has always been high focus on how they do it. Um, yeah, of course, number one, is our data.

[00:21:16] Yeah. Yeah. That hard drives being threaded, so, so we don't, uh, lose any data and.

[00:21:28] And so on. But, um, but then they have this agreement that if they can reuse it, and, and we cannot, we cannot give it away. We we're not allowed to give, uh, our used products away. Yeah, that's true. I know we have, uh, looked at it, um, regarding the agreement, if there could be some buyback part so that, [00:22:00] uh, the vendors could, uh, they should purchase it after three or four years, uh, and, and then they could, uh, sell it on as a refurbished.

[00:22:14] Yeah, it has can been looked at, but it was not, uh, yeah. It would be too expensive. Yeah.

[00:22:22] **Interviewer:** On this one, like, I mean basically I want to understand like how the purchase procedure. Do you mention the specifications and publish for the vendors then the vendors send the price?

[00:22:39] **Interviewee:** Yeah. Uh, we, we, we tell them we, we want, um, these kinds of, uh, uh, products to, to choose from. Um, because that covers most of our demands. Mm-hmm. , uh, and, and then we [00:23:00] have, uh, Say it must weigh maximum this and the size and so on, and, and at least eight or 16 gig, uh, Ram. Yeah. And, and then they,

[00:23:21] if they say, have a look at this. Okay. What can we. Offer, what products do we have that meet the specifications? Yeah. And what can we do price wise? Yeah. And then of course we have other, um, demands regarding, uh, warranty, delivery time, and so on. And, and they, they all, you know, do we want to make an offer or do not, uh, Okay.

[00:23:57] Yeah. So, so that, [00:24:00] that's, uh, it's a big package that, that they have to look at and consider. And of course we have, we have had a look at it. Um, the, the,

the big, um, manufacturers, of course we have a look at what they have of products, so we don't exclude the major. Uh, uh, no reason to say we want this product and no one can deliver, so we don't get any of, of that, that, that would be

[00:24:37] Then we have to go whole through the whole process again. Yeah,

[00:24:41] **Interviewer:** yeah. That's true. Yeah. I mean, it makes senses, Do you have any minimum-like thing? Okay. I have to get responses from three companies or two companies.[00:25:00]

[00:25:01] **Interviewee:** Um, no. We, we have, uh, it's not how many that re replies. It's how many that can, can make a bit Okay. That that's what counts. Mm-hmm. . So, so basically when you do a, a small. One, you have to ask at least three different mm-hmm. , uh, on this big, uh, agreement, it's basically open for, for, for, yeah. Any big vendor.

[00:25:36] Okay. Because, because of the, the, the large agreement is then as a small, uh, company where there's only one or two employees that that. Handle it. Yeah. So it has to be, one of, it has to be one of the major players on the market. And, and so, so we both [00:26:00] have, uh, the vendors, uh, the dealers, and then you have the manufacturers.

[00:26:06] So both have to make an offer. Yeah. Yeah.

[00:26:10] **Interviewer:** So I mean, I actually, what are the like products like mostly using for computer, server, router, switches this kinda things?

[00:26:23] **Interviewee:** Yeah, it, it's, it's, uh, actually, it's, it's for, for everything that we use, uh, in, in theory, we are not allowed to purchase anything without having, uh, asked.

[00:26:43] Mm-hmm. make either public bid, uh, yeah. And, and then there are, depending on the amount, then you can make a small, uh, bit, because the last [00:27:00] one, it, it takes perhaps a six month Yeah. To, to, uh, to get in place and then it runs for several years. So it's, it's, uh, really hard work. Yeah. . And you also, I have to, you have to look in the ball and, and think, oh, how, how work going.

[00:27:24] Looking for years.

[00:27:26] **Interviewer:** I was also working like for an NGO in Bangladesh, in, in the headquarter. And I also had to like, build up like procurement of IT products. And yeah, it was, it was quite exciting. Yeah. And during Covid it was like, so, you know, like nothing was available, like vendors, like they couldn't provide products and we needed more products cause it was like shifting online and we had to buy more and more.

[00:27:51] But yeah. Yeah, it was actually exciting. That's why actually I am kind of interested in like, sustainability of this, um, like it, it procurement or IT product [00:28:00]

[00:28:01] **Interviewee:** We, we think about it also regarding can, can you reuse the dock station? Can you reuse that when you get a new pc?

[00:28:20] Because there's no reason to. You have to change it. Everything. Yeah. Yeah. So that

[00:28:27] **Interviewer:** at least we're concerned.

[00:28:27] **Interviewee:** and that is not, of course, it's at a certain point it's, it's money that, that, that drives that. But it's also saying, why not reuse it if you can. Mm-hmm. , why do you have to get a new this and that free time?

[00:28:51] Yeah. Yeah. That makes sense. Yeah. Thank you Jimmy. I think we are out part time and Yeah, yeah, it was,

[00:28:59] **Interviewee:** [00:29:00] yeah, I, yeah,

[00:29:00] **Interviewer:** you too. For the question, I'm just wondering, like if I want to know something, is it, is it okay if I like write you email and you write reply there? Yeah,

[00:29:10] **Interviewee:** sure. No problem. Yeah.

[00:29:12] **Interviewer:** Yeah. So, yeah. Okay.

[00:29:14] And I'll, I'll keep you updated. What, how, how it goes.

[00:29:17] **Interviewee:** Yeah. Thank you for that would be fine. And good luck with the project. Yeah,

[00:29:22] **Interviewer:** yeah. Thank you so much. Okay. Yeah. Okay. Have a nice day. Yeah, you

[00:29:27] **Interviewee:** too. Bye.

Interview 3

[00:00:00] **Interviewer:**

[00:00:04] Yeah. So shall we begin? Yeah. Yeah. So like, basically like what are the, like SDGs you have in your mind when you like work on the report of, is there anything?

[00:00:20] **Interviewee:** Yeah. For the, for the report for the university, we work with all 17 SDGs. Um, and one of the reasons for that is, The requirement in times higher education impact ranking.

[00:00:34] Yeah. Which specifically asks for, for progress report on all SDGs. Mm-hmm. . So that's one of the inspirations. But also because we as a university contribute to all SDGs, so we actually include all of them also with an equal uh, weight. So we go through all of them, uh, focusing on research, education, operations, and our external engagement.[00:01:00]

[00:01:00] **Interviewer:** uh, in that sense, what are the like things that you prioritize or what are the things are essential to put, put onto the report? Is there anything like that?

[00:01:14] **Interviewee:** I think that is, um, in the end, it's not my responsibility to, to prioritize the content.

[00:01:22] Um, I work very closely with, uh, representatives of the faculties from campus service. Mm-hmm. , uh, hr, all of the different parts of the organization and. Sort of tell me what they would like to present, uh, within the different SDGs. Yeah, so it's, it's important for them, especially for the faculty to showcase research education, uh, within specific SDGs and for our, uh, what do you call it?

[00:01:55] Facility services, campus service, et cetera. They want to showcase the good [00:02:00] stories, the good examples of, of sustainability efforts. So it's very much what the remaining organization wants to showcase. Yeah. And then. For me, my priorities, uh, is to ensure that we have a, a broad representation within each SDG because we could easily fill up s TG three on good health with just our health faculty, but I wanna make sure that we can include other faculties and operations as well.

[00:02:31] So I'm trying to go for a broad representation of the university.

[00:02:36] **Interviewer:** Yeah. In that sense, like, uh, I mean if I, if I go like in the environmental part of it's, I think it's only the part of facility management, uh, also the IT

department. Like, uh, if, if, uh, in our report, uh, if it's like it, if we add the environmental efficient IT infrastructure, cause there a lot of things are going on, they, they try to like ensure the things are [00:03:00] recyclable.

[00:03:00] They're working on cooling things down. Like so they. Do you think if, if these things are added on the like report, it'll be better for the report to add there?

[00:03:12] **Interviewee:** I think, uh, one of the things that we, that would be great to add, uh, is some more quantitative data on how much are we actually improving our energy efficiency or how.

[00:03:25] Much IT equipment are, we are recyclable or reused because right now the reports are based on a lot of stories and it's a very good platform for storytelling. But it would be very nice if it was actually supported with some more facts on how much is actually then recycled or reused or cooled down in this way.

[00:03:49] **Interviewer:** Yeah. So in that sense, like if, if, if we can for. Uh, right now the, the products that we buy, IT equipments the emission factors or things. It's more [00:04:00] we ly like rely on vendors data, but do think if, if we can measure our own, own internal IT infrastructure footprint, our emission, and then we can get the data and you think it's better to publish on the reports.

[00:04:15] **Interviewee:** I think it would definitely improve, uh, because that would also make it possible not only for the report, for the organization to set targets for improving our performance. And I think that's, that's the next step. Uh, because we have been spending all of this time sort of mapping our current practices and what's going on, where are we, and in order to actually set some new targets on what we would like to improve.

[00:04:40] We need to, to know some sort of baseline. So I think it would definitely be a strength if we knew some of these

[00:04:47] **Interviewer:** things. But would it also be like, uh, make it like transparent from our university end, like to show like we are how responsible and what the things that we are doing. And what we are, how, [00:05:00]

[00:05:00] **Interviewee:** yeah, exactly.

[00:05:01] So we need to both tell the stories, but also measure, uh, some of these things to, to also showcase that we focus our efforts. Mm-hmm. in the areas where we have a big impact because we can do a lot of small micro actions, but we need to showcase that it's actually making a difference and we are sort of the role model.

[00:05:25] **Interviewer:** That sounds like how our university prioritize actually like the documentation of all kinds of these sustainable activities. Is there any like strategies or something?.

[00:05:36] **Interviewee:** Um, not that I'm aware of yet. Um, it's, it's still work in progress. Mm-hmm. , uh, we have published two sustainability reports, which is still also undergoing a lot of changes and trying to figure out what is the right.

[00:05:51] reporting cycle, what is the right format? Um, and there's also a lot of work been done on, on [00:06:00] developing the first climate, uh, yeah. climate account, uh, for all our university, which is also an area where we will try to measure and document more. Uh, but it's, it's not a, there's not a clear strategy.

[00:06:14] from Management on how exactly we should do this yet

[00:06:17] **Interviewer:** and how does it work for the rankings? Cause I feel like all recently also QS they also publish on ranking and they had like also different criteria there. And how does it work?

[00:06:30] **Interviewee:** Um, well we have a specific ranking office at the, the library department, um, in Aalborg

[00:06:37] And they prioritize which rankings we submit data to. Yeah. And one of. more recent one. Of course, the QS is the newest one. It, it has only been published one year. And um, for that one, I don't think we actually submitted data, but we were ranked based on what was publicly available. And that's not a great [00:07:00] ranking for us.

[00:07:01] I will, but at times, high education impact ranking, we submit a lot of data and that has been prioritized, but the ranking office assesses, which rankings should we participate in and which should we not? And I think it's, it's also a matter of spending the resources within the organization in a wise way.

[00:07:25] So there will definitely be someone from the ranking office that can share a lot more. Uh, that's for sure, I

[00:07:31] **Interviewer:** surprised when I saw, like for the QS it was like bit lower in the rank and in that sense, like also, uh, okay. So you mean if they rank based on like the public data available that we have. So it's important actually.

[00:07:49] Is it important for us to also to publish more sustainable activities like online so that it can easily accessible?

[00:07:56] **Interviewee:** I, I would say so, because these [00:08:00] rankings both times higher education, there's a green metric ranking, and the Qs, they, they assess us. How we as an organization act and the responsibility we take.

[00:08:12] So the research metrics are easily measured because they can, they can extract a lot of data on our publications, but our own practice, we need to communicate that and be transparent. So it's a matter of actually developing more, more policies, for example, at the university level on. We need a more sustainable procurement policy.

[00:08:36] We need perhaps some climate policies, climate strategies, IT policies, and we need to showcase those because that's what we're being assessed on, that what we are actually doing. And it should be publicly available I think.

[00:08:52] **Interviewer:** Yeah. I actually had also like some interviews with IT department and I had like questions with them about circular economy.

[00:08:59] [00:09:00] And like, do you think it's a hot topic at this moment? Yeah. Do you think like focusing on circularity kind of thing would be good in the report?

[00:09:10] **Interviewee:** I think it would be very interesting. Uh, but I might also be biased because that is my research topic. . Okay. So, so, so in the time I. I'm employed as a researcher, but then also doing the sustainability reporting.

[00:09:24] So I might be a little bit biased to say that circular economy would be a great addition because that's my field. I was

[00:09:30] **Interviewer:** like, even the questions that I asked, like, uh, it's not that our, it's, it's not that IT department or the responsible people, they don't like a manager or something. It's more about from that.

[00:09:42] Uh, they have to comply with other things as well. Like they try to ensure proper recycling, that's fine. But for example, using refurbished products, it's not possible from the end because of the policy and other things, but they also have to ensure the best product. They don't want [00:10:00] take the risk. So that's kind of like an area which can be like considered the number with.

[00:10:07] But Yeah, and cause like it's like everywhere. Everywhere. It's like circle economy and coming from different ages, like from packaging to other things. But it might. Yeah.

[00:10:18] **Interviewee:** Yeah. I think it is, I think it's key for, for sustainable development. So, so we need to take more responsibility at Aalborg University for all of the products and services that we are buying and using.

[00:10:30] Uh, but it also requires quite a significant change in, in our practice. Yeah. Surrounding, yeah. IT equipment. In this case, you

[00:10:38] **Interviewer:** mean like, if you, if you, as you already mentioned, practice, like, so how do you see it? Cause it's, I think it's also both side and. Uh, the policies and things and implementations and also the users.

[00:10:50] Users also have to be responsible from their end. And, uh, yes. But is there initiatives in the university about user engagement or [00:11:00] something?

[00:11:02] **Interviewee:** I haven't come across any yet. Um, I, I know from a personal or as a researcher at University, I would very much like that. There was a bigger focus on reusing and refurbishing with new employees.

[00:11:18] And we have something going on at the Department of Planning where if we have an employee for six months, a research assistant, if they get a new phone, that phone will be handed in and reused for the next one. But I think we could do so much more because it's, it's not something that's in a policy, so it's.

[00:11:37] Whether or not the employees actually practice that opportunity. But we also have a lot of computers just lying around that nobody is using. And I think a lot of departments have a lot of different unused resources. Um, and I think we need, I think it would be great if we had some more support, management support saying [00:12:00] that this is a priority.

[00:12:03] Resources are prioritized to ensure that our IT department can actually support this, this change

[00:12:09] **Interviewer:**. Yeah. Yeah. And another question was about like reporting about like, cause they're already, uh, like, uh, recycled properly. There like, the disposal is in a structured way. But you have already mentioned like proper, like quantification would help to put this into the right.

[00:12:28] Yeah. Yeah. And. And do you have any other the plans? Like in my, like for next ones or any changes that are going to happen ?

[00:12:42] **Interviewee:** well, we are, we are still testing different ways, uh, and, and different, um, formats. But one of the things that I would very much like would be to, to

actually Set up, maybe it's an appendix there in the report, but with measurable key performance indicators [00:13:00] for the university within both environmental and social sustainability.

[00:13:04] Um, I'm, I'm looking at a lot of different, at other universities and how they are reporting their sustainability efforts and. , I think we are very good at telling the stories and, and showcasing the good examples, but I, I hope that our organizations will become better at setting targets and measuring our progress towards those targets.

[00:13:26] And that requires a lot of resources and a lot of data management. And I'm, I don't think we are there yet, but for me, that would definitely be a focus area in the future. Um, yeah, cause like, and then I will say for, for, for the sustainability report itself, that would be great. But I think for our sustainability website, I think we, would also be great if we had more data tracking on energy consumption.

[00:13:52] Yeah. Water consumption, different kind of uses we have. So we could also more transparently report on our [00:14:00] consumption waste generation and management. So we showcase, uh, more on that side as

[00:14:06] **Interviewer:** well. But, but when you like report about these kind of things, uh, is it, like, for example, if, if you have the footprint data of, and it's not quite well, will you also add it, I mean, at this point, what, what should be the strategy?

[00:14:19] Like, will you still add those data or like try to like skip it or?

[00:14:26] **Interviewee:** I think for, for our, uh, climate account, we will definitely. Some of it in, in the report. Uh, the next one will be published in 2023. So we have a year, uh, until publication and I, I know they're working very hard on making this climate account more reliable. And, uh, Yeah, trustworthy. And I think we will have some great data and there will also be work on a climate strategy, an action plan.

[00:14:57] And I think those are, are very important for the [00:15:00] sustainability report to also follow up on the climate targets that we adopted last year. Yeah.

[00:15:07] **Interviewer:** Yeah. And, and actually with that, like, I mean, uh, I mean basically my other question, You already mentioned it about the websites and putting the data. What are the, like things also like to make the practice of like using green IT infrastructure more visible to the outdoor world or like to the reports?

[00:15:28] Is there any, any particular things that can be done?

[00:15:34] **Interviewee:** I think first of all, we, we need more awareness internally, uh, because I, I think we might be doing something great. There are different examples, but if we are not communicating internally on these efforts and practices, I think it become a little bit shallow if we try to communicate externally that we are doing all of these great things and we as [00:16:00] employees or students are not even aware of that.

[00:16:03] So I think we need to work in on sort of two step communication. Um, and then maybe even, I think we also need to improve our practice. Yeah. Maybe before we start communicating external. Uh, to actually know if we are, are we making a difference by what we are already doing or, or is it just Yeah. IT equipment is being recycled because we have a, a good system in place in Denmark.

[00:16:32] Yeah. It's, it's not something that we as a university body needs to take care of. Okay.

[00:16:37] **Interviewer:** Yeah, that's true. Yeah. And in that sense, the most visible ones are like using recycled cups and things cause which I see, but like, cause I feel like the students, uh, it's not, they're not getting involved with [00:17:00] that much practices that's happening.

[00:17:02] And, and do you have any like, Idea how to like, make things better, to engage more students? Yeah,

[00:17:09] **Interviewee:** I think that's, that's a really great question. Uh, we, I have been talking a lot with the council service in Aalborg actually about this because they would like to be a living lab, uh, the campus site and a lot of different activities with students, but the students are not engaging.

[00:17:27] They choose not to. So even when there are invitations for there. A big day on, on the student, the study environment with different angles. The students choose to not participate, so I think it's really difficult to engage students because they have so many things on their plate with full-time studies, part-time work, families, friends, hobbies, and then really getting them engaged in sustainability.

[00:17:55] And I think most of them feel. Well, it's not gonna make a difference. Mm-hmm. [00:18:00] what I say because I'm one in 19,000 students at University. Um, but I think that we have. Some areas where we actually have some engaged student, uh, in the Sustainable Campus Forum, which is a body representative of both staff and students.

[00:18:17] They have a lot to say, the student representatives and they can bring up forward a lot of ideas on sustainability and sustainable management of the university. But I think they might be three student representatives out of, and we have a big student body,

so I think we could do a lot more. But I actually don't know how, uh, and I, I'm hoping students would actually tell us how we should involve them and engage them because yeah, we that have been tried at lot of different things.

[00:18:48] You know, free pizza if you come and talk about waste management or waste sorting. And I think it's difficult.

[00:18:55] **Interviewer:** Did you feel like it's, uh, I mean, uh, for the students it's [00:19:00] more the, the thing that's more needed is the passion, like for sustainability or like the climate in general. If, if they're more concerned about these kind of things or like, I had another perspective, I mean, how people can get passions.

[00:19:14] For me it was basically I was a suffere, so that's why, uh, cause I'm originally from Bangladesh and we have that a lot of damage issues of things. That's why I got concerned since I was a kid. Uh, so I was thinking like whether, like the background, like relating with the, like the fearful things that might happen with like individual people's.

[00:19:35] Will it be like a way to engage more?

[00:19:40] **Interviewee:** I think it could be. Uh, and I think it, it's also a really a balance on, on both understanding the, the severeness of our situation. That we are actually on a burning platform, the climate change is real, all of these aspects, while also having faith. And [00:20:00] hope that we can make a difference and still change.

[00:20:03] So it's, it's finding the right balance, but maybe actually bringing students together with different backgrounds and different that are impacted differently, uh, from climate change would be a great way to showcase that. Okay, this actually means something different, whether you're from Bangladesh or the Netherlands.

[00:20:23] Yeah. Pakistan, wherever you're from, it will have a different impact on your life, which means that we all have a shared responsibility. Yeah. But it's also, it's also difficult because it's not an individual responsibility. Yeah. So we need to, to, I think our job at the university for engaging students is actually allowing them to

[00:20:47] influence the policies and, and overall strategies of the universities because that's a level where we can make a difference. Mm-hmm. as a body and

[00:20:58] **Interviewer:** and with that [00:21:00] from, from university and point when they want to ensure sustainability, particular things. In theory IT infrastructure. You think like, uh, the contradiction between, it's not a contradiction, but still like the contradiction between environmental, social, and economical parts of sustainability is a barrier?

[00:21:15] Because sometimes it's difficult to balance history.

[00:21:20] **Interviewee:** Yeah, and I think, I think the main barrier actually is that we have a core task of educating the future and doing our research. So no matter what sustainability effort we would like to put forward. It should not compromise our core activities. Um, and I think that's, that's the main, main paradox or the main challenge that we are dealing with because there are so many great intentions in the university of improving our sustainability efforts, but we cannot make it or reduce the, the quality of our [00:22:00] study environment or the facilities for research because, That is our, yeah.

[00:22:07] And that's also where we make our biggest impact. It's actually by educating the future and by doing our research, that's our biggest positive sustainability impact. Yeah. And I think we need to, to showcase that along with our sort of, of course we need to walk the talk at at University. There's no doubt about that.

[00:22:30] But we also. Understand that our biggest impact is not within the university, it's actually outside. Yeah. And I think that's the biggest challenge because I think for, at least for IT equipment, I, I don't see a lot of challenges concerning the different sustainability pillars. Mm-hmm. , um, maybe some environmental and economic issues.

[00:22:52] Yeah. I think, but the socials most . Yeah. . Yeah. Um, but I think we also need to. [00:23:00] Be very transparent if we only prioritize economic sustainability or if we would like to support the social sustainability of job creation of people refurbishing IT, for example. Yeah, and I think that's, since we are public sector organization, it's really difficult to prioritize the social sustainability.

[00:23:26] Because we have a big economic responsibility since it's taxpayer money, to some extent. Yeah,

[00:23:33] **Interviewer:** that's true. Yeah. I mean it's, it's always like something that, but, but that's, that's actually good analysis and, and I was also like, when I was working for my thesis, it came to my mind at what point, point, cause like, I mean, every institution has particular focus on it and they are focusing their sustainability based on that.

[00:23:54] So thinking about other things and, but then still it's valid for the university as [00:24:00] well, like the activities like core is like research and innovation or other things. But my analysis was basically like also for it it's cause our university is also connected with like research and education network, which runs globally and it also works like, it's not like universities sitting here and doing activities, but there's like IT activities running behind like worldwide.

[00:24:24] And as part of the network, uh, how, how university should react on what are the things that can be done. So that was my kinda, but, but yeah, let's see how it goes. And thank you for your time.

[00:24:38] **Interviewee:** and. Yeah, definitely. And I, if I can, uh, just add one thing. I think it's, it's really important that whenever we want to improve our own practice, our own operations, uh, governance at the university, that we actually bring in the researchers that we have, the students that we have that are working with these topics.

[00:24:58] Yeah. Uh, [00:25:00] If we want to make a sustainable procurement policy on how to buy and procure things, we need, we should bring in the researchers, the students that are working with the topics instead of just looking only at in the administration and what we can do there, because we have so many great resources there.

[00:25:16] Yeah, and I think for if we, if we are looking at an. Environmental or sustainable IT policy at some point. It shouldn't just be our IT department and administration. Yeah. We, we have a lot of great researchers, uh, working with green IT or whatever they prefer to call it now. Mm-hmm. and I think that would be a very important part of moving forward.

[00:25:40] **Interviewer:** Yeah. Cause like I, I was also thinking about like another part of greening IT, cause it can be like done in different ways actually. Like, for example, Uh, rather than putting more focus on like, uh, purchases or something like, uh, if its people, can would make it greened by [00:26:00] using, uh, for example, virtual machines came and, uh, it made an impact.

[00:26:04] Like rather than when before it was like one server. Now you can use multiple in one it. Mm-hmm. it made an impact. So, I mean, I think it's, uh, uh, I, uh, it's, it's like both should be combined if both can be combined. Like putting the solution and also the current, the usual practice that should be done. Uh, it can be things more efficient, but uh, then comes to like also issues of maintaining.

[00:26:28] For example, uh, when I had, I had interview with purchase department was like, uh, because of also like making things more feasible and um, less problematic. For example, they mostly rely on vendor data. Uh, like I, I would say it's, uh, if it's like micromanagement, then it gets difficult for them or as well, so they, they actually like prefer to manage from the surface.

[00:26:55] So, yeah, better from the end.

[00:26:59] **Interviewee:** And I think [00:27:00] that there are a lot of challenges when it comes to, to this at, at university, but I think it's, it's really important that we actually

engage the people that know something about this. Yeah. I know there's been a lot of research done, uh, recently on how to eco label software.

[00:27:16] Uh, it, it matters a lot. The energy consumption depends on the code language that you're actually writing your software in. And for me that was new information, I think half a year ago. And I think some of that needs to be sort of brought into our own practices. Yeah, it's

[00:27:33] **Interviewer:** actually, I like the routing route and things also, like if you, in consumption, like based on like the pick hours or not pick.

[00:27:40] So it's a lot of things are going on that I've actually like. Last question we do like, cause it's, it's like the circular economy research, uh, area. And how in general, in Broadway, how can contribute in this.

[00:27:58] **Interviewee:** Uh, to me, [00:28:00] I think it's, it's one of the key tools or concepts that we have to actually improve our consumption.

[00:28:09] Um, but I think we, we often overlook the fact that we also need to reduce our consumption. Mm-hmm. , uh, because we, we often see circular economy as the different strategies for Yeah. Repair, reuse, refurbishment. Um, but I think the, the reduction Principle needs to be more explicit because I think we need to start there because we can do a lot to circle things.

[00:28:33] Um,

[00:28:37] **Interviewer:** the production reduces, is it like

[00:28:40] **Interviewee:** Yeah, but I think it's more the consumption, uh, because we, we cannot recycle our, a way out of the problems that we have created. And it's not. the most efficient solution and takes a lot of energy, but, and if we build a society where we just recycle whatever we use, we do not slow the pace of [00:29:00] consumption.

[00:29:01] And I think we need to do that in order to actually make a real impact From circularity. So I think we, we need to look at what we are actually consuming. Could we use less, in general, a lot more sharing. And I know that's also a challenge, especially in the public sector, but I think we need to, to look at that.

[00:29:23] But I, to me, it's the most important solution, uh, that we have right now for our ways of living. That we need circular solutions. Uh, And I think we, we as a university, we could become front runner in some of the areas because we have great researchers and students that are engaged in these things.

[00:29:47] And if we just practice a bit more, I think we could be great

[00:29:52] **Interviewer:** at showcasing. Yeah. Yeah. I think we are out of our time and yeah,

[00:29:58] **Interviewee:** that's,

[00:29:59] **Interviewer:** uh, [00:30:00] is it okay if I, uh, put your name on the report or do I want to be.

[00:30:05] **Interviewee:** Um, I think if it's fine that you put my name on, uh, if you wanna quote me directly, it would be nice to see the quotes, uh, before you submit your report so I can check if you Yeah, sure.

[00:30:17] If I said something completely off or if, uh, yeah, if everything is understood correctly. Yeah, sure. I mean, then

[00:30:23] **Interviewer:** I, I will send you and then the report before submitting.

[00:30:31] **Interviewee:** Yeah, good luck with your studies.

[00:30:33] **Interviewer:** Yeah, thank you so much. Yeah, bye. Bye.

Interview 4

[00:00:00] **Interviewee 3:** Recording. Yeah.

[00:00:04] **Interviewee 1:** Do, do you know who, who is on board this, uh, discussion?

[00:00:09] **Interviewer:** Uh, uh, for my exam?

[00:00:12] **Interviewee 1:** No. I, I'm, should we introduce ourselves?

[00:00:15] **Interviewer:** Oh, no. I, I checked. I checked. Yeah, I know who's in board and,

[00:00:19] **Interviewee 1:** okay, great. So you're done your homework. Thank you, .

[00:00:24] **Interviewer:** So, I mean, I already sent you the questions before, and, uh, it was basically I saw like in Sustainability report that the goal of the university is they want to like contribute in 70% national emission reduction by 2030. And like in general, how, how the University contributes in that or what are the things that is going on?

[00:00:55] **Interviewee 1:** Well, should I start and then maybe Tim and Pierre could, uh, continue? Well, the, your first question, we do not yet have any specific, uh, KPI for mm-hmm. , um, for it, uh, area. and, uh, it's spilled into our 23 planning. Mm-hmm. to set up, some KPIs. Uh, we do have some specific efforts, um, but we can come back to that in a later question.

[00:01:28] **Interviewee 1:** Mm-hmm. .

[00:01:30] **Interviewer:** Yeah, sure. And, and so like, I mean, it was, it start from the like it perspective, like from in general perspective, like in the whole university when they want to, Like, ensure sustainability, want to make some things greener, which are the things like are prioritized most. Like, okay, we want to do these things.

[00:01:48] **Interviewer:** Like now I see, uh, our universities doing some activities in terms of, for example, recycling materials, use like cups and things. Uh, [00:02:00] also using, for example, like starting off lights, like properly, so, such kind of activities. But what are the, like most prioritized.

[00:02:11] **Interviewee 2:** We are, we are doing things like that. You mentioned there because we have a, a recycling program for our, our used computers.

[00:02:19] **Interviewee 2:** Uh, and we have also, uh, Uh, some, um, initiatives to, um, uh, to reduce, uh, cost of, uh, of power to, uh, for example, that we are going to make half of our access points without power from, uh, in the evening to, to the next morning, uh, to save some, uh, power. And there, there are some initiatives. Going on right now, but we, we, as Fleming mentioned that we, we do not have specific goals, um, for it yet, but it, it, it has to come, uh, in [00:03:00] the near future.

[00:03:01] **Interviewee 2:** Yeah.

[00:03:02] **Interviewee 1:** But as if, just for my clarification, your, your, your questions from the top. Are they aimed towards the entire university or, okay. Question. Okay. Then let me try to elaborate, elaborate a little bit. Um, just from top of mind, um, from, from a building standpoint. Mm. Uh, we are planning, uh, to do as, as payer also mentioned, that

to have much more, uh, smart buildings, um, so that we, uh, reduce the con consumption of, of power and, uh, and also have, uh, uh, controlling our climate indoor and so on.

[00:03:50] **Interviewee 1:** Uh, we are doing some initiative in one of our new buildings. Using sensors, uh, uh, iot, [00:04:00] um, and trying to, to find a way to organize that building. Um, if, if you look, uh, on waste, yeah. Yes. We, we have changed how we, uh, , we eliminate our daily waste between plastic, between paper and uh, um, a few years back, we, we had a, we had a bin in every office where we just dumped anything.

[00:04:25] **Interviewee 1:** Mm-hmm. from, uh, the last part of our apple and paper and stuff like that. But now, now it's, um, It's, uh, centralized a little bit, and, and then we, we, uh, divide it into each item, and that's going to, to reduce, uh, reuse, um, We are u re uh, reducing the number of, of plastic bottles using for water, for instance.

[00:04:50] **Interviewee 1:** And the kitchen, uh, the, the canteens are focusing on and waste on, on, uh, on food. Mm-hmm. , um, [00:05:00] and the outdoor, um, a couple of years ago, we went from, um, uh, doing the lawn, uh, and, and then we only do that twice a year. Uh, so it's, it's what we ca call wild, uh, nature between the buildings and, and not like an a park, um, that is, uh, Both to reduce carbon in, uh, uh, carbon use, on, on, on moving the lawn, and also to bring more wildlife in into nature.

[00:05:33] **Interviewee 1:** Mm-hmm. . Um, we are, We've just, uh, hired a, uh, environmental officer in our facility management department. Okay. Who is, who is to convert, uh, many of, of, uh, the initiatives in, into a, a strict, uh, master plan. And, and also to follow up and to, to set up this, uh, [00:06:00] this. Documentation you might call it. Um, but I'm, I'm, I'm sorry, I'm, I'm not on top of everything going on, on, uh, on the university-wide side.

[00:06:13] **Interviewee 1:** Yeah. I, I think we are a little bit more focused in this team on, on the IT side if, if it's okay with you. Yeah. I mean, yeah,

[00:06:19] **Interviewer:** that's, so in that way, like, I mean, my next question was about, you mentioned it already, where is there any metrics to, to people with within it as. , like how eco-friendly it is, or is there anything in your plan in the future?

[00:06:38] **Interviewee 1:** I'm not sure. We, we, maybe that's back to you, Tim, and I guess the two of you have been connected, but, but we are part of initiative in our server. Mm-hmm. , uh, facilities. Um, Tim, did you expand on that or, um, would you do that please?

[00:06:55] **Interviewee 3:** Yes. Uh, we talked, we talked about it, uh, last time. [00:07:00] This, uh, test we are doing in the basement, uh, about, uh, cooling servers.

[00:07:05] **Interviewee 3:** Yeah. In a, in a new way. Mm-hmm. . Um, so, but that's, that's, um, that's an experiment. Mm-hmm. . So, so it's, it's experiment, uh, it's experimental before it's operational. Yeah. Uh, , but still, uh, we are looking forward to see the,

[00:07:24] **Interviewee 2:** it's a part of a science project as well. Yeah, it is. And yes,

[00:07:30] **Interviewer:** exactly. Makes sense. And, and in terms of energy, like, uh, I also, we had also talked about it actually in our last fitting with Tim, uh, the energy source, is it like mostly from like green energy or, uh, what are the basic source of energy?

[00:07:46] **Interviewee 3:** In fact, it's, uh, better than I thought, as if I, I didn't, uh, know it, but, uh, as I promised you, I was in contact with, uh, our facility management. Yeah. Uh, and they, they sent [00:08:00] me, uh, a certificate. Uh, that I will forward to you. Yeah. Uh, which describes that, uh, Alpo University has, uh, has, uh, made agreement with, uh, uh, energy.

[00:08:14] **Interviewee 3:** So, uh, we should use a hundred percent. Uh, sustainable energy, uh, divided on 50%, uh, uh, wind power, uh, that is under five years old is the infrastructure, of course. Mm-hmm. and also 50%, uh, wind power that is only from Denmark, so you don't have to, to, uh, transport it, uh, over long distances. . So, so that's a very, very nice thing.

[00:08:46] **Interviewee 3:** I, I was, uh, uh, it made me happy to see that certificate because that's, that's, uh, in fact the most important thing right now, uh, because on, on, on the [00:09:00] hardware as we talked about, uh, last time, we are waiting good solutions from the manufacturers. Yeah. Um, so, so this certificate, I think describes it very.

[00:09:12] **Interviewer:** Yeah, that's right. I mean, if, if the energy is green from our end, then it contributes a lot, I think. Exactly. In terms of, yeah, in our journey.

[00:09:21] **Interviewee 1:** One bit, uh, just coming into my mind, the, the very building we are sitting in, in it, um, solar cells on, on the roof. But, but, uh, from, from a, um, percentage wise, I don't know how much that, uh, contribute, but, uh, yeah, a little bit I guess.

[00:09:40] **Interviewer:** I mean, that comes by another question actually. Cause I also had a meeting with, uh, with the editor of our sustainability. and basically they are con, like when I asked about what do you think about like adding our, what do they think about adding it infrastructure's activity in the report. [00:10:00] Then they basically mention we can, it can be added, but the things need to be quantified.

[00:10:06] **Interviewer:** So I mean basically how much impact it impacts or for example, how much we can save energy, how much, uh, we are improving in terms of. So is there any plan of like quantification or, or how do you see it, like the quantification of impact of it from the sustainability point

[00:10:23] **Interviewee 1:** of view? also there, I think we are a little bit in a beginner's mode.

[00:10:28] **Interviewee 1:** Um, I don't know our baseline. Um, I know from, from overall investigations that maybe 10% of all energy in in the world is utilized by, uh, data centers. Mm-hmm. , whether that's the case for us, I don't know. But, but somehow you need to have a baseline before you can set up metrics or KPIs for mm-hmm. , uh, for re.

[00:10:52] **Interviewee 1:** Uh, I, I wouldn't be surprised if, if we are, we, we utilize a, a large percentage of, [00:11:00] of electricity for it in a university as well because we, we do have a lot of service. Mm-hmm. , a couple of thou, uh, a couple of thousands I think. And, uh, we do have a lot of, uh, client, uh, equipment, laptops, printers, stuff like that.

[00:11:14] **Interviewee 1:** Um, yeah. . So I guess, I guess our consumption is maybe more than 10%. But, but I don't know. I don't think we have the baseline.

[00:11:22] **Interviewee 2:** No, we don't have it. And we also have a lot of, uh, old

[00:11:25] **Interviewee 1:** servers that, uh, with

[00:11:28] the

[00:11:28] **Interviewee 2:** energy as focus could be a good idea to change them to, to newer servers who used the less power.

[00:11:38] **Interviewer:** Yeah. And okay. And in terms of circularity, I was also talking with one of the, like, expert in circular, like from in the circular economy, and she basically mentioned me like, the best thing to get from circular economy is to con less so like, like reduce the consumption or making it like rotating so that it can be like, [00:12:00] uh, less consump.

[00:12:02] **Interviewer:** So is there any plan in our it, like our, how's it going in?

[00:12:08] **Interviewee 1:** Well, um, I'm not sure that the best one is to reduce the consumption. Maybe it's more refurbishment. Um, yeah, I mean, because, uh,

digitalization is up for helping people. Mm-hmm. , so, so reducing meaning we don't use, uh, digital, uh, items, whatever. I'm not sure that's the, the right way to do, but, but we

[00:12:31] **Interviewer:** need way, like, for example, like one of our co.

[00:12:34] **Interviewer:** one of our, like one of the person from university left. Then using that thing for another purpose or in that way

[00:12:44] **Interviewee 1:** on there. There we do. And again, maybe Tim can help me here, but, but, but, but we do re uh, reviews, uh, equipment either on our own or we bring it to a third party. Mm-hmm. , um, can, can you [00:13:00] please maybe expand on that, Tim?

[00:13:03] **Interviewee 3:** Yes. Uh, Pierre can be, we talked about this this morning and, uh, yes, it's, it's completely correct. We reuse all, uh, uh, all equipment that can be reused, uh, as I, uh, I think I mentioned that last time, as if mm-hmm. and, uh, also equipment here. Uh, if it can run for five years or six years instead of three. , uh, we do that unless it's, uh, very power consumptions.

[00:13:33] **Interviewee 3:** Yeah. Uh, but as we also talked about the first time we met, it is not easy to calculate what is best to, to, uh, to, to put it in a new equipment or, uh, make the last equipment last for, for two or three more years. Mm-hmm. that, that's a complex

[00:13:55] **Interviewer:** equation. I mean, it's difficult and also like lot of [00:14:00] like evidence and things are lacking there, like the empirical data so that you can get that decision.

[00:14:06] **Interviewer:** So do you feel like, uh, in terms of it, sustainability there, like the lack of data, lack of empirical evidence when you work with it, .

[00:14:17] **Interviewee 3:** Yeah. Yes. It would be easier to decide if we should, uh, uh, uh, buy a, a new unit or we should, uh, uh, let the old unit run for two or three more years. Mm-hmm. , uh, it would be easier to decide if we knew that it was best to, to let it live or to, to, to buy a new one and reuse components from the old one.

[00:14:43] **Interviewee 1:** I think, I think if I may supplement there. Yeah. What, what we hopefully will see in the coming years is that the manufacturers and suppliers, they might set up a kind of, of, uh, metric on their, uh, equipment. Um, [00:15:00] I think it's, uh, regulated by law and Denmark on refrigerators and, and, and. Equipment you have in your private home there, we have a kind of a rating.

[00:15:11] **Interviewee 1:** So whenever I buy a new dishwasher, I, I, I can buy the one which is best from an, uh, energy standpoint, but I don't know about equipment, uh, in, in it. Um, and I, I do hope it, it would be kind of a competition, uh, between the manufacturers of. Is it Lenovo or is it, uh, apple or whoever is doing the best? And, and there I'm also looking forward to see what components will they bring to that.

[00:15:41] **Interviewee 1:** Yeah. Is it, is it reuse of, of uh, um, plastic for the cabinet? Is it, um, is it, um, reducing the. the, uh, material that is, uh, used for packaging. Uh, and what about bringing, uh, [00:16:00] uh, tools from, or equipment from China to, to Western Europe and us mm-hmm. rather than, uh, you, you know, the transportation, uh, and carbon, uh, impact on, on the world.

[00:16:12] **Interviewee 1:** And, uh, and I think, I think we, we, we are, we are not being. By the manufacturers so far being decision makers in, in it, uh, we are kind of on our own and, uh, we can of course reverse it and put pressure in, uh, in, uh, in making, uh, the, the equipments, uh, or the, the agreements with the, the manufacturers on an equipment and saying, we only want to buy from, from somebody who is sustainable, and please document to us that you are sustain.

[00:16:40] **Interviewee 1:** Mm-hmm. . Um, I've been some to some talks with some suppliers and they're saying they're, they're going in that direction. Uh, but I think we have to be a little bit careful that it's not just some green washing. You know, they pretend and they, they find a kind of label that is green or, and, and they [00:17:00] put it on their equipment and, and we think they're home safe, but they are not.

[00:17:03] **Interviewee 1:** Uh, but there, I think this industry is lacking. Behind the automotive, behind, uh, many other industries. Yeah.

[00:17:12] **Interviewee 2:** But we have a, a little bit, uh, today because when we do tender and things like that, we have, uh, sustainability as a a point they have to describe. And, and in that case, we can decide which vendor with the best.

[00:17:25] **Interviewee 2:** Description of the sustainability we can choose, uh, choose by. And also as, uh, Tim mentioned before that we have the recycling process for old equipment when, uh, we have agreement with, uh, the windows that they try to, to sell it. Uh, and if they cannot sell it, they try to, to reuse some of the parts of the equipment.

[00:17:47] **Interviewee 2:** Mm-hmm. . So, um, that's the, the agreement we already have today. Mm.

[00:17:53] **Interviewer:** Oh, okay. That's that's good. And I actually had, my next question was about like, I think you already answered it [00:18:00] already, but what are

the, like ideas in IT infrastructure that should be emphasized more to make it greener? So do you think it's like the emphasis on vendors to make things in the manufacturing green is, it isn't like the most emphasized one from your.

[00:18:17] **Interviewee 2:** Yes. I think it it'll be that in that way we, we will start. Okay. But also, also as framing started to say that, that we are not home free yet. We are just in the beginning of the process. Mm-hmm. , uh, to set goals and KPIs and things for, uh, for this in the future. So, um, yeah,

[00:18:38] **Interviewee 1:** as well, I, I think the, the, the impact.

[00:18:43] **Interviewee 1:** Some, some guidance on impact. Maybe some scientists could, uh, and maybe all the radio they have, I don't know, but, but, uh, what will be the best impact is reducing the consumption of electricity. Or is it refurbish, uh, [00:19:00] the equipment or is it reducing the transportation or, or the packaging or whatever? We, we, um, I think at least maybe because we don't know, but, but we are fighting in darkness.

[00:19:12] **Interviewee 1:** Where, where do we put our effort best? Uh, for, for what, uh, impact? Yeah. Um, maybe it's out there. You, you've been starting it. Uh, maybe there is a, a green handbook. I don't know. ,

[00:19:25] **Interviewer:** no, I'm actually going on that direction as. So basically I'm also running on lifecycle assessment of the equipment and offer, offer whole that infrastructure and as like the energy sources green and I, I mean, I'll input everything and at the end I'll see okay, which has like the most emission.

[00:19:43] **Interviewer:** So then I'll say, okay, the if the raw materials that was used in the manufacturing, if that has a emission level high, then I can say, okay, it's the emphasis should be given more on manufacture end. We are okay, I mean on our. . So, I mean, the conclusion of my research was [00:20:00] going to be like, kinda like this, in which area it's, it can be more great, but let's see how it goes.

[00:20:07] **Interviewer:** Mm-hmm. like, but it comes to like the user management actually. Like, how do you say, like the managing users, like is there any activities or something for user engagement? Uh, in, in, in it use, in the use of it. So that can be more sustainable. I also had a talk with team about it.

[00:20:26] **Interviewee 1:** From a user standpoint, please. I, I'm not sure I understand your question. I mean,

[00:20:30] **Interviewer:** uh, how do you see, like, is there any activities for more user engagement, like to make the use of it more greener or better?

[00:20:49] **Interviewee 2:** I'm not, I'm not sure. I'm not sure that we have seen the focus on that yet. Uh, no.

[00:20:56] **Interviewee 3:** And, and also we, we, One example [00:21:00] is that you teach, uh, your, your users with awareness that they should remember to turn off the monitors when they leave the office. Mm-hmm. . But as I told you last time, uh, the consumption from two, two monitors and one docking station is only 1.2.

[00:21:18] **Interviewee 3:** Wet. Mm-hmm. . So it's a very small amount. Uh, yeah. Still, still, you could, you could, uh, multiply it with the number of users, but mm-hmm. . But, uh, then you should add the con, the, the economy for, for making switches. You can turn everything off. Uh, and, uh, it would be be a, a very small amount. Uh, but of course there could be other places where the, the users can, can do more.

[00:21:50] **Interviewer:** Yeah, that's true. I mean, it's, it's, it's both ways actually. And, and how do you say like, uh, like, [00:22:00] cause we, we, I mean you already mentioned about it like, like you need some, like evidence for the decision making. . And how do you say, like, if, if, if, uh, you know, the emission rate or like footprint of your own infrastructure, will it be like helpful for your decision making on like Okay.

[00:22:20] **Interviewer:** For example, also from the vendors. Okay. If I know, okay. This is the, like footprint of this product, this, the footprint of this product, will it be helpful for you for the decision making? , absolutely.

[00:22:33] **Interviewee 1:** Mm-hmm. . Um, it, it just, just coming into my mind last week I was, I was meeting with the top man of, of, uh, energy in Denmark.

[00:22:41] **Interviewee 1:** And, uh, and overall, um, we will see a shift. Mm-hmm. , uh, a rather dramatic shift. Uh, because today the way the entire energy structure is set up, that is we produce energy whenever it's. by the [00:23:00] consumer. Mm-hmm. . Uh, and, and that's where we have our carbon, uh, power plants and so on. Mm-hmm. . So, so, um, and the shift going forward when we go to wind and solar and, and maybe water as well, uh, then we have to.

[00:23:16] **Interviewee 1:** Teach the consumers to use energy when it's produced because it's, it's very difficult to, uh, to, to take all, all that energy and, and, and, uh, keep it until you use it. And that's why, for instance, in, in these days where the price of gas and so on, due to the, the war in, in Ukraine, uh, is going up. Then the message from the government side is, please, Make your laundry, um, start your washing machine in the night because that's, uh, that's where it's cheap.

[00:23:49] **Interviewee 1:** And, uh, and please do, uh, this and that. Um, and with your electrical car, uh, please program it to, to be, uh, filled with new, [00:24:00] uh, electricity when the windmill is going. So, so overall you will see a change in the society where it's not the consumer who is deciding when to use energy, but it is the producer of energy.

[00:24:14] **Interviewee 1:** Yeah. And how, how they'll manage that, I don't know. But, but that's, uh, somehow needed because, uh, when the wind is blowing, that's when you can use the energy, not when it's not blowing and the sun is, is shining and so forth. It's, it's, um, it's, it's going to be a major. Uh, transformation. Um, of course you have power to x where, where you can say, okay, now I convert, uh, wind power in, into ol and, and, uh, and, and then, uh, you can kind of contain it until when you, you need it.

[00:24:47] **Interviewee 1:** But, uh, 10 years ahead from now, it, it'll be very different according to him. Mm-hmm. .

[00:24:54] **Interviewer:** Yeah. And, and, and that's actually like another thing cause uh, [00:25:00] cause we, right now we don't have any reports in our sustainability report about it and things. And, and it's like also, like they said, it's the quantification is needed.

[00:25:11] **Interviewer:** So if you basically know, like if the, if they publish the emission rate or footprint of our internal IT infrastructure, how it'll impact, like, will it have a like positive or negative?

[00:25:26] **Interviewee 1:** It, it will. But still having said we are , we are in the business of making sure that, uh, it is being utilized. Yeah. We are not in it in the business of telling the users don't use it. Mm-hmm. . So I think, I think we have to be clever in, um, in buying the right equipment and also making sure that the electricity that we are used to dice is, is based on green power.

[00:25:55] **Interviewee 1:** Mm-hmm. , it's, it's not the way to go back and use paper and pen. [00:26:00] Yeah. That will never happen. Especially not in a university where, where, where the aim is to produce a knowledge and, and knowledge is of course based on, on a lot of, uh, um, algorithm and, and data that needs to be crunched in an IT system. . So I don't think we are going down and usually utilize it.

[00:26:25] **Interviewee 1:** It's more to

[00:26:25] **Interviewer:** do it. Clever. Yeah. But like for example, uh, if you, uh, if you have already, you know, your emission rate and footprint of it, the IT infrastructure that you are using at this moment, and uh, will you publish it publicly?

[00:26:40] **Interviewee 1:** Oh, public said? Yeah, I guess so, because we are, uh, we are part of the Danish state, so, so it, it's part of the law that we, we need to be open.

[00:26:50] **Interviewee 1:** Mm-hmm. , we can't hide it. If, if we were private university, we, we might do it, but, uh, it's, it's, uh, it's part of the way we run the university. [00:27:00]

[00:27:00] **Interviewer:** Okay. I mean, and, and in the, if you publish it, do you think it'll be like beneficial in a way that you are being transparent, you are transparent about your it because like, it's not like a usual practice, like nobody publish at this moment.

[00:27:14] **Interviewer:** And so if you, if you publish it, do you think it'll help you and it'll be beneficial to other stakeholders and things?

[00:27:23] **Interviewee 1:** I, well, maybe not directly, but, but for instance, uh, the younger generation mm-hmm. , um, your peers, you might say in your generation. I think, uh, at least amongst the Danish students, it's, it's part of, of, uh, of their focus.

[00:27:41] **Interviewee 1:** Um, and, and it might also impact which university they want to study at. Um, if, if it's somebody. who is doing something about the climate, um, uh, crisis in the world. Mm-hmm. , um, then they might pick our university, uh, [00:28:00] instead of another one who is either hiding or, or not having a focus.

[00:28:06] **Interviewer:** Okay. I think we're, uh, out of her time.

[00:28:10] **Interviewer:** Is it okay if I ask you one or two more questions or It's

[00:28:15] **Interviewee 3:** okay? Yes.

[00:28:17] **Interviewee 2:** No problem.

[00:28:19] **Interviewer:** I actually like almost covered like all of my questions, but I have one more question, which is basically, and I mean how do you see like, I mean the activity, cause it's mostly, it's hidden always, like people don't know about it.

[00:28:35] **Interviewer:** Infrastructure, sustainability or activity where people don't like, it's not highlighted that much. How do you see, like how to make it more visible to. The things that we are doing for sustainability, uh, in the IT department.

[00:28:54] **Interviewee 1:** Com communication, communication we need.

[00:28:56] **Interviewee 2:** Yeah. And, and I, and I also think that we have some, uh, what, [00:29:00] what is it? We call it, uh, its updates or something, but it's a, it's more local information we send. Out to everybody in the university. And there something sometimes have something about the sustainability and the project.

[00:29:17] **Interviewee 2:** We mentioned that about the, the water cooling system is, is one of the, the projects that we have mentioned in, in this, uh, um, documentation or in this update we sent, sent out to all the, the employees. So, um, in that way we, we do a little bit. Yeah.

[00:29:40] **Interviewer:** Yeah. I mean that's true. And, and the last question is like, in, in our data center that we have basically, and, and like how they're, like how they're planning or is there any plan to make it like, uh, cause in the data centers there are a lot of things to improve, like including cooling [00:30:00] and other.

[00:30:01] **Interviewer:** So is there any, any other plan except cooling or any other things in the plan? Uh,

[00:30:10] **Interviewee 3:** there, there are plans about,

[00:30:13] **Interviewee 2:** uh, uh, we have a lot of old servers we are looking into to close down and a lot of the old servers are using a lot of power. Uh, so in that way we are looking into it. . But that's not only a question about sustainability, but of course we could say it is, but it's also a question of security because a lot of the old servers, they are not very secure.

[00:30:37] **Interviewee 2:** Um, so, so this is, uh, I think this is the main recent that we are looking into it, uh, at the start.

[00:30:47] **Interviewer:** Okay. And my last question for today is actually, . I also asked Tim about this question. Uh, cause uh, when, when we make want to make it sustainable, it can be done in different ways. Like, for [00:31:00] example, like changing the routing path or like, like routing algorithms or, uh, uh, because it's needed energy.

[00:31:08] **Interviewer:** And also putting emphasize on manufacturers. Uh, also like, also like when we had like virtual machines came, it also helped Cause we don't have to like keep separate. Servers for each one we have virtual missions. So how do you say, say like, uh, among this to putting emphasis on manufacturer or putting emphasis on routing path, uh, using virtual missions, which one is more convenient in terms of management perspective?

[00:31:40] **Interviewer:** Uh, uh, are

[00:31:41] **Interviewee 2:** you asking for a cloud? Uh, I'm not sure I understand the question.

[00:31:46] **Interviewer:** Oh, I mean, , uh, which one do you emphasize? Uh, from management perspective to manage and things, which one you think is easier? Uh, putting more emphasize on manufacturer end. Like Okay. From in the [00:32:00] vendor end. Oh, to have green devices or like ensuring from your end that you are, uh, uh, uh, basically, uh, making things sustainable in terms of routing way, like for example, your data.

[00:32:14] **Interviewer:** Using efficient routing algorithm and things.

[00:32:21] **Interviewee 1:** I would, I would rather pick both. Uh, and I think we, we should do our homework as much as possible, but also being part of the state of Denmark, which is I think at least recognized worldwide as, as, uh, even we are small country, but, but as a country who is trying to focus on, on, uh, on the climate, uh, questions that being part of, of that.

[00:32:46] **Interviewee 1:** because we are state university. Mm-hmm. , we, we do have some buying power and we do have some political power, uh, towards, uh, the, the vendors towards the manufacturers and saying, if, if you want to continue [00:33:00] mm-hmm. , uh, to deliver to, to the state of Denmark, uh, you have to comply with this and that and, and, and I think kind of.

[00:33:09] **Interviewee 1:** of Denmark and, and more countries as well, uh, do have an obligation to put pressure on, on the manufacturers. Mm-hmm. . And that of course on, on many ankles. You, you can go into the, in, in, into the batteries and, and there are some specific, uh, uh, parts metal. I don't know which one, which is being dicked out of the ground in, in.

[00:33:32] **Interviewee 1:** Southern Africa or China and, uh, somebody are saying they're using child um, workers to do that. And uh, and that's also where we have to put a, a pressure and saying, if, if, if you don't, uh, change your way of drill riddling the, the ground or whatever, then we might not, uh, buy equipment. I, I think, I think this, this part of the world which might have a little bit more, um, [00:34:00] resources, um, and, and power than other unfortunate parts of the world, we do have an obligation to put, uh, pressure on, on the manufacturing.

[00:34:09] **Interviewee 1:** Okay.

[00:34:10] So,

[00:34:10] **Interviewer:** yeah, I get it. I think that's all I had.

[00:34:15] **Interviewee 3:** I, I, I have a little, uh, supplemental thing about, uh, what to emphasize to, to make, uh, it infrastructure greener. Uh, there's a huge, uh, task for, for scientists in this, uh, because here in 2022, we are still buying, uh, all our equipment. Of course make, uh, uh, do the, the function that, that we, we need, but it also generates heat and it's, it's stupid that we, that we, we, we use, um, We have to use equipment that also produces heat.

[00:34:57] **Interviewee 3:** And as we already spoke about, [00:35:00] uh, we have a, a large cooling infrastructure to, to take, uh, take care of, uh, kilos that are not doing anything good. Uh, so of course there's a physical loss, but the scientist has challenged physical loss before, so I, I think, uh, there's still a good. There's a good, uh, potential in doing, uh, electronical, uh, confidence even better.

[00:35:29] **Interviewer:** Mm-hmm. . So it's, it's like the manufacturer's responsibility actually.

[00:35:34] **Interviewee 3:** Yes. In fact, it is. They have to make pressure to, to

[00:35:38] **Interviewer:** about that. Yeah. Yeah. I mean, that makes sense. And I think that's all I had actually, and I also close your time, like 10 minutes more than the look. It's okay,

[00:35:52] **Interviewee 1:** but all, all the best with your thesis and, uh, yes, we hope, hope you, you'll find some good conclusions.

[00:35:58] **Interviewee 1:** And, uh, if, if you find some [00:36:00] guidance for us as well, please share it. Yes.

[00:36:02] **Interviewer:** Yeah, sure. I mean, I, I'll keep you updated about the findings and, and solutions and yeah, that's it. Great. Yeah. Thank you. Thank you for your time. Yeah, you're welcome.

[00:36:14] **Interviewee 3:** Nice talking to you.

[00:36:15] **Interviewee 2:** Okay, absolutely.

[00:36:17] **Interviewee 3:** See you. Nice day. See you cheer.

[00:36:19] **Interviewee 3:** Bye.