



LUNDS
UNIVERSITET

What About Tomorrow?

Charting and Implementing Sustainability Solutions Today

IIIIEE SSC-Report 2021 | LUND UNIVERSITY



What About Tomorrow?

Charting and Implementing Sustainability Solutions Today

Joint Course Report: Sustainability Solutions in Context



LUNDS
UNIVERSITET

This Publication should be cited as:

International Institute for Industrial Environmental Economics [IIIEE]. (2021). *What About Tomorrow? Charting and Implementing Sustainability Solutions Today*. Lund: IIIEE.

ISBN (print): 978-91-87357-75-6

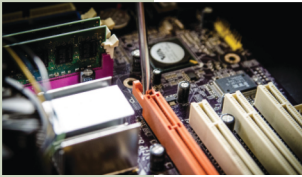
ISBN (digital): 978-91-87357-74-9

CONTENTS



INTRODUCTION

p. 4



RIGHT TO REPAIR

Axis Communications

p. 5



SUSTAINABILITY CERTIFICATION

CVRA

p. 17



CLEAN CONSTRUCTION

IKEA Retail (Ingka Group)

p. 31



LOW-CARBON HEAT TRANSITION

Nomad Energy

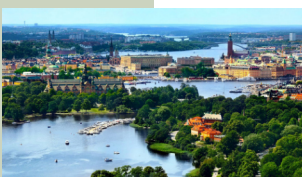
p. 45



SUSTAINABLE E-MOBILITY

Opibus

p. 59



ENVIRONMENTAL DIPLOMACY

Stockholm+50

p. 71



CIRCULAR ELECTRONICS

TCO Development

p. 85



INDUSTRIAL CLIMATE ACTION

UNIDO

p. 99



FINAL REMARKS

p. 113



INTRODUCTION

As parts of the world begin to return to normal two years after the onset of the COVID-19 pandemic, so does the work of the sustainability practitioner. After all, the long-term global threats of climate change, biodiversity loss and other dangers to the planetary environment are as urgent as ever. And sustainability practitioners come in all shapes and sizes: As the UNFCCC Conference of Parties in Glasgow (COP26) brought world leaders and climate negotiators together after a year's delay, master's students at Lund University's International Institute for Industrial Environmental Economics (IIIEE) wrapped up consulting projects for external clients that, in some cases, had allowed for in-person meetings and site visits meant to facilitate solutions-building and accelerate change.

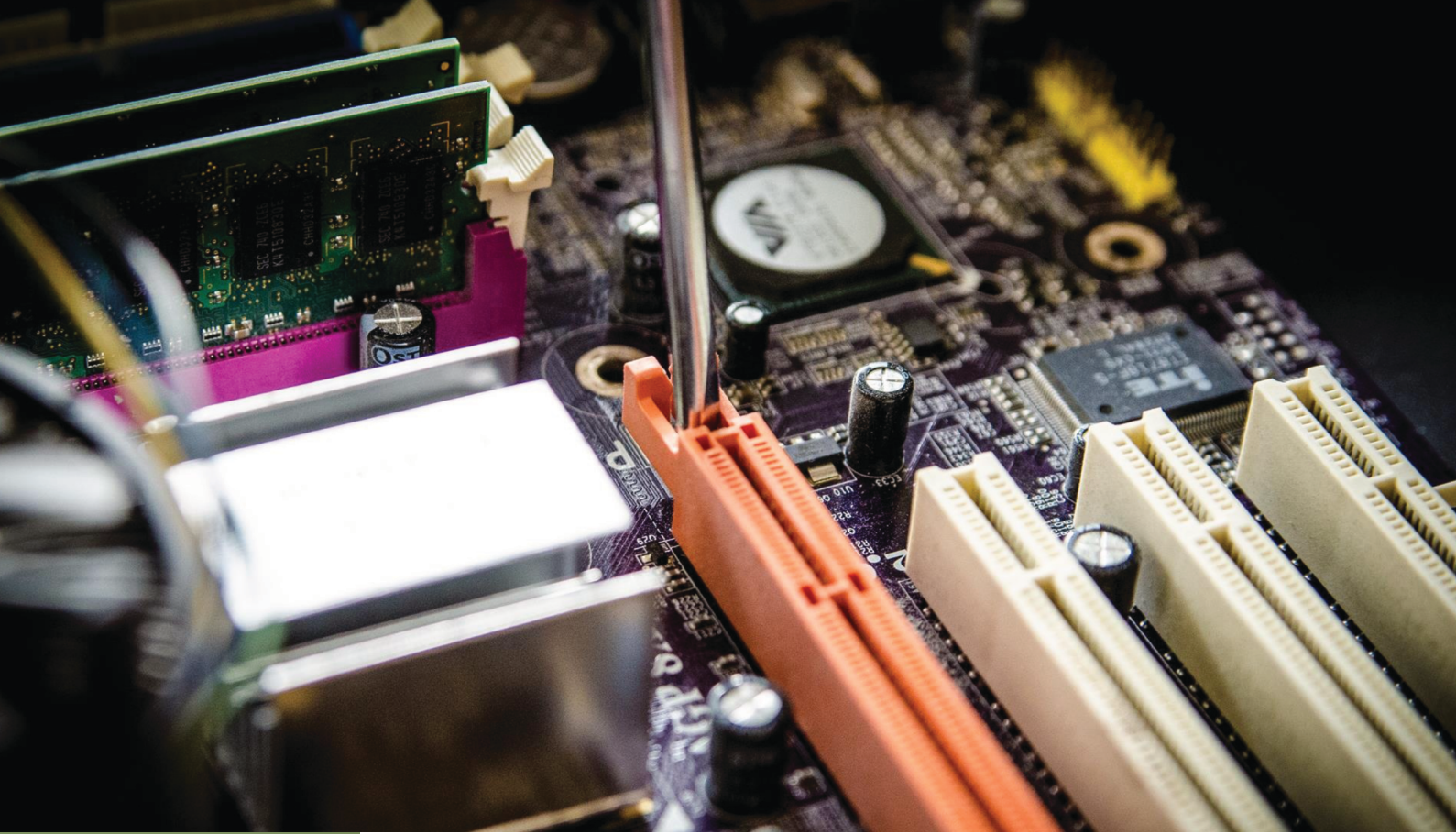
Eight such client projects were conducted as part of the capstone course *Sustainability Solutions in Context* within IIIEE's MSc programme in Environmental Management and Policy. As the title of this anthology indicates, the projects allowed students to dig their hands into the practical work of *charting* or *implementing* the sustainability solutions needed to achieve the tomorrow we want.

As diverse as sustainability practitioners are, so must sustainability transformations take place in all sorts of organisations: the clients with

which the Class of 2022 worked ran the gamut of private companies of various industrial sectors (food & beverage, construction, security, and electronics); national governments; and inter-governmental bodies. Together, the projects have demonstrated that, although there is no one-size-fits-all approach to organisational sustainability transformation, everyone has a part to play, and independent outside perspectives can prove to be incredibly valuable in helping organisational leadership find the right path forward.

What About Tomorrow?

As those who follow global environmental politics are aware, the pandemic has shown how the pressing need to address today's problems often comes at the expense of future concerns, a phenomenon referred to as the "tragedy of the horizon." It is therefore appropriate that organisations take the opportunity to involve students in the development of sustainability solutions. As the reports in this volume demonstrate, students not only benefit from the opportunity to develop professional skills and apply their knowledge in practice, but also provide clients with both concrete outputs and an infusion of idealism, hope, and ambition – the future incarnate.



RIGHT TO REPAIR

Axis Communications



From left to right: Nahla, Emily, Martina and Boyan in front of Axis Headquarters in Lund, Sweden.

Acknowledgements

We want to thank IIIIEE for providing us with the chance to research the contemporary issue of Right to Repair. A special thanks to our supervisor, Emma Johnson, who was very engaged with our project since day one, providing valuable feedback and constant support.

We also want to thank Per Björkdahl, our company contact, for giving us an opportunity to get involved in such a project, providing information, contacts and the possibility to work from the office in Lund.

We also wish to thank all Axis employees and external experts that give us their time for conducting interviews.

Last but not least, we want to thank our colleagues from Batch 27 who have provided invaluable suggestions and comments throughout the project.

The Team

Martina Forbicini is from Italy but has lived in Australia, Spain and Portugal. She holds a BA in Global Governance. She has worked with social and environmental NGOs, providing support with marketing and digital communication.

Nahla Maalla is from Sudan and has 6 years of professional experience in environmental assessments of industrial products and services in Sudan, the U.S., Egypt, and Sweden.

Emily Silva is from the U.S. and has 8 years of work experience in public accounting at KPMG. In this capacity, she worked in audit, tax, and technology services for a range of multinational companies across different industries.

Boyan Wei is from China, with a background in Agriculture and Ecology. He has 3 years of work experience at Beijing Normal University, mainly focusing on training programmes for promoting teachers' capacity in rural areas of China and coordinating international student life and studies at the Zhuhai campus.

The Right to Repair

Exploring the Impacts of Potential U.S. Right to Repair Legislation for Axis Communications

By Martina Forbicini, Nahla Maalla, Emily Silva and Boyan Wei

Introduction

The right to repair (R2R) movement has been gaining momentum around the world, notably in the E.U. and the U.S. R2R advocates that owning something should imply being able to repair it yourself or bring it to a technician you prefer [1]. R2R legislation would establish rules that promote reparability practices throughout industries [1]. The R2R movement in the U.S. context is mainly focused on stopping monopolies on repair services and opening the repair market to independent repairers.

Manufacturers have questions and concerns around opening repair, such as the following: How will intellectual property be protected from competitors? How will R2R impact product quality and liability? How will warranties be affected if an independent repairer is used?

Recent trends in the U.S. indicate that R2R legislation could be close to passing in several states, thus affecting nearly all manufacturers of

digital electronic products. Forty states have proposed R2R legislation since 2018 [3] and there has been increasing interest at the federal level, especially since summer 2021. Among the manufacturers affected is Axis Communications (Axis), a global leader in the network security industry.

The U.S. is a major market for Axis, comprising over half of their sales. Axis was therefore interested in understanding how this legislation may affect them if passed, and what they can do to prepare.

Axis – Company Overview

Founded in 1984 in Lund, Sweden, Axis Communications delivers network video solutions to improve operational efficiency and physical security of its clients [2]. During the last 30 years, it has been expanding, with over 3800 employees in more than 50 countries worldwide generating total sales of USD 1.2 billion (EUR 1

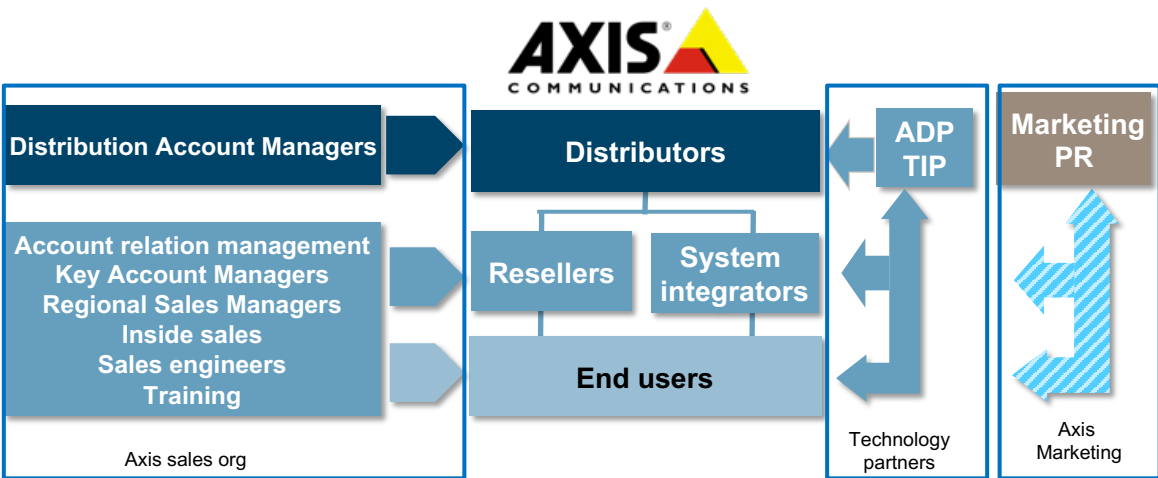


Figure 1: Axis Indirect Business Model. Source: Axis

AXIS COMMUNICATIONS

billion) in 2020 [2] and thus achieving an influential position in the security industry.

The wide array of Axis products is distributed and sold through an indirect business model (as shown in Figure 1). Sales of Axis products and solutions occurs via distributors which sell to resellers and system integrators who, in turn, sell to end customers [4]. Axis is characterised by a robust and extensive partner program which involves global network partners in 179 countries [4].

Axis Current Repair Offerings

When understanding how R2R might impact businesses like Axis, it is relevant to understand their current repair offerings. Upon arrival of a damaged unit to Axis, two alternatives apply: the broken item can be 1) repaired by a Return Material Authorisation (RMA) partner or 2) swapped with a replacement unit if the RMA does not have the capability to repair or if it is not economically viable to repair.

In the second case, the defective item can either be sent into the RMA spare parts pool or be scrapped, becoming e-waste. This last point becomes particularly problematic when looking at the U.S. since it has low e-waste recycling rates and much of it is shipped abroad making it that much more important to extend the lifetime of products via repair [5]. Based on interviews with Axis employees, we learned that Axis has 16 repair centres worldwide with Atlanta being the only one serving the U.S. market. This might not be the most preferred option for customers who might seek a local, timelier repair option. Turn-around time is very important and by having just one facility, that can be a limiting factor.

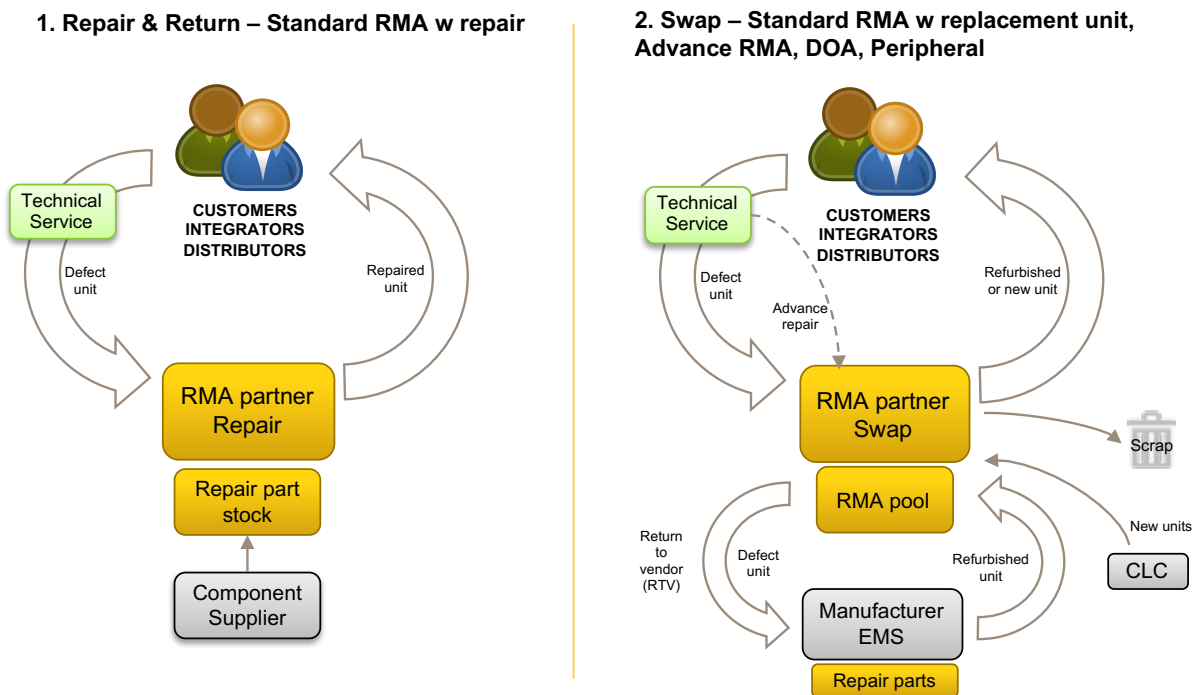


Figure 2: Axis Reverse Supply Chain. Source: Axis

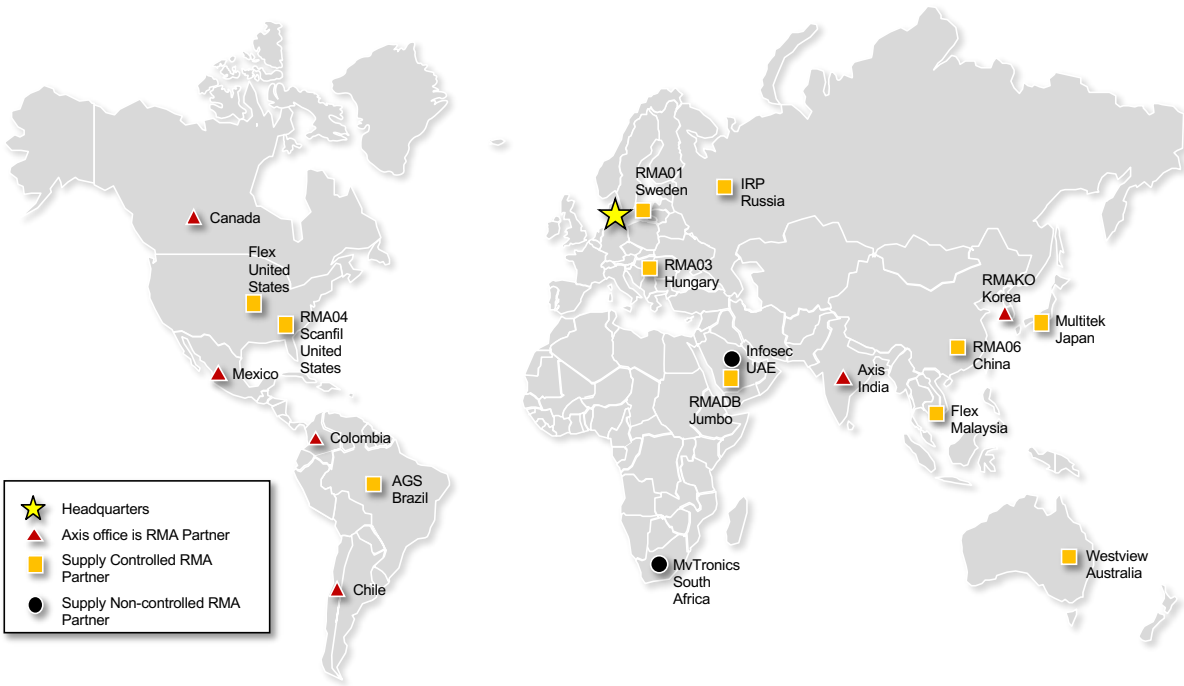


Figure 3: Axis RMA Global Footprint. Source: Axis

Our Approach

To help Axis understand how R2R may affect their business, we developed an approach that would provide a holistic view of Axis’s operations and the latest R2R developments. Our approach for this project included:

1. *Interviews with Axis employees* to understand their business model and current repair offerings. We interviewed 12 Axis employees in total. Employees interviewed include representatives from the following departments: reverse supply chain, customer service, legal, sales, environmental, and industry associations.
2. *Interviews with experts* to understand the latest R2R developments and trends. We sought to obtain a well-rounded picture of R2R, hearing from experts working with R2R generally as well as those specific to the security industry. We also spoke to those advocating for and against R2R. In total, we interviewed five external experts.
3. *Literature review*, including reading the proposed bills for New York [6] and Massachusetts [7], the Federal Trade Commission (FTC) report [8] and decision on

R2R, President Biden’s Executive Order related to R2R [9], as well as reviewing other academic and grey literature.

4. *Workshop with Axis and stakeholders* to present key aspects of the legislation, discuss concerns, suggested actions and priorities moving forward.



The team performing interviews

Motivations for Right to Repair

The R2R movement has received support from several stakeholders, such as trade associations, emerging community networks for repairers, such as iFixit and physical repair cafes as well as companies focusing on design for modularity

[10]. Advocates for R2R highlight three core motivations:

1. *Environmental benefits:* Access to repair would make it easier to extend the life of the products. Consequently, improved repairability would decrease the product’s carbon footprint, resource use and e-waste. [10]
2. *Increased competition:* In the EU, debates around R2R started with the rise of the Circular Economy and the adoption of design requirements for electronics [11]. In the US, the development of a consumer R2R has been focused more on the idea that by ending monopolies on repair and opening access to multiple stakeholders, competition and innovation can be fostered. [10]
3. *Improved resiliency:* Supply chain disruptions caused by geopolitical tensions and trade wars as well as supply chain interruptions recently witnessed with the COVID-19 pandemic, can be tackled by opening access to repair. Providing wider access to repair would, at the same time, improve consumer relationships by enhancing trust in Axis. [10]



Figure 4: The Case for R2R

Key Aspects of Right to Repair Legislation

To understand the key aspects of R2R legislation, we focused on two proposed state bills: New York and Massachusetts, as well as interviews with R2R experts. We focus on these states as experts believe R2R legislation is most likely

to pass at the state level, and because these states are expected to set the standards for future legislation in other states or at the federal level.

The language and requirements of these bills are quite similar. The bills apply to Original Equipment Manufacturers (OEMs) of digital electronic products who provide repair services (whether provided by the OEM or an OEM’s authorised repairer). Digital electronic products are defined as any part or machine with a micro-processor, which is quite broad and includes both business-to-business (B2B) and business-to-consumer (B2C) sales. The state bills would apply to digital electronic products sold or used in the respective state.

The goal of these bills is to end monopolies on repair services and provide open repair access to external parties. OEMs would be required to provide independent repair providers and product owners with the following (hereafter referred to as “repair materials”):

1. Diagnostic and repair information
2. Service parts
3. Diagnostic repair tools

The diagnostic and repair information must be provided free of charge, while the service parts and diagnostic repair tools can be sold at a fair and reasonable cost. The Massachusetts bill applies retroactively to products sold after 31 December 2012, while New York is only applicable for products sold or in use after the date the bill takes effect.

OEMs are only required to provide repair materials that they have available for their own repair. In other words, there is no requirement for OEMs to create repair manuals for all their products or to source spare parts and tools that they no longer carry for their own repair.

A notable difference from the R2R movement in the E.U., the proposed bills in the U.S. do not directly require design for repairability. However, they do seek to provide more transparency around repairability of products, which indirectly encourages design for repairability. By

requiring companies to provide repair materials externally, this provides visibility into how repairable a company’s products are. If repair materials are lacking, or do not cover many products, this will now be more visible to customers.

Timing & Likelihood

The consensus amongst several interviewees we spoke with indicates that some states will eventually pass R2R legislation. There are several recent developments that have increased the likelihood of R2R legislation passing:

1. *Increasing federal support:* through President Biden’s executive order, the FTC report, and the introduction of a federal R2R bill. Not only does this increase pressure at the federal level, it also helps raise the priority of R2R bills at the state level. Previously these bills might have fallen off the state-level agenda because they were deemed low priority, but federal backing for R2R may change this.
2. *Bipartisan support:* R2R legislation has bipartisan support (i.e., the support of both Democrats and Republicans). This can be rare in the U.S. context and thus decreases resistance to R2R legislation.
3. *State momentum:* 40 states have proposed R2R legislation since 2018. In 2021, New York was the first state to reach the milestone of passing R2R legislation in the state senate. It is expected that states will continue proposing R2R legislation.
4. *Major Opponents Backing Down:* Vocal R2R opponents such as Microsoft have recently changed their stance on R2R, bowing to shareholder pressure. In October 2021, Microsoft agreed to take steps to facilitate independent repair, including a commitment to make repair materials available beyond its authorised network by 2022. Apple and Deere & Co are facing similar shareholder actions, with shareholders arguing that opposing R2R negatively impacts the companies’ reputations, exposes them to regulatory risk, and is generally inconsistent with principles of corporate social responsibility [12]. R2R opponents

such as Microsoft backing down decreases overall resistance to R2R, thus increasing the likelihood of passage.

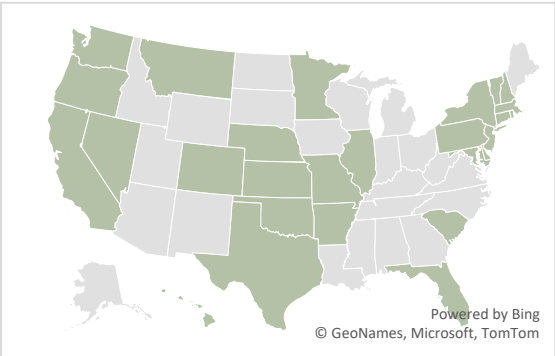


Figure 5: Map of States that Proposed R2R Legislation in 2021

Collectively, the factors above increase the likelihood of R2R passage. If one of the currently proposed state bills passes, it would be in early 2022. If these bills do not pass current legislative sessions, we expect that states will continue to propose R2R legislation, which will eventually pass.

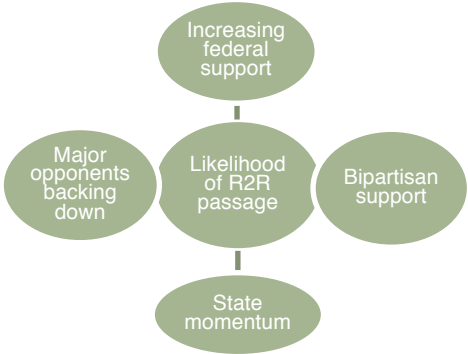


Figure 6: Factors increasing the likelihood of R2R passage

Intellectual Property

Many companies, especially those in high-innovation industries such as Axis, have highlighted concerns about R2R legislation around intellectual property (IP) protections. With the requirement that companies provide repair documentation such as schematics to external parties, companies are concerned this may increase the risk and rate of a competitor reverse-engineering their products. However, during an interview with Nathan Proctor, Campaign Director, Right

to Repair at U.S. PIRG, he explained that companies are generally defining IP restrictions too broadly. He noted that President Biden and the FTC were not receptive to companies' arguments that schematics are intellectual property.

Other IP protections may be available, however. The draft state bills include protections for trade secrets and the FTC report indicates the possibility of protecting patented parts.

Warranty Implications

With the possibility of product owners repairing themselves or using an independent repairer, companies may question how this will impact their warranties. Could OEMs void warranties if a repair is performed by an unauthorised provider during the warranty period?

Generally, the answer is no. For consumer products, the Magnuson-Moss Warranty Act (1975) prohibits this based on the anti-tying provision. While this Act has been in effect for decades, it is still a common practice for OEMs to tie warranties to the use of specific repair providers. In summer 2021, the FTC urged the public to submit complaints of these violations, so we may see less of these tying practices in the future.

While this act covers consumer products, it does not cover B2B relationships. However, there are anti-trust laws that prohibit tying arrangements, so similar logic would apply.

Liability Implications

OEMs, especially those in the life and property protection space, may question how their liability is affected if a product is improperly repaired by an independent repairer, resulting in the product failing or the repairer injuring themselves. Experts we spoke to pointed to the automotive industry as an example of how this may be handled. The digital R2R legislation is quite similar to automotive R2R. Further, automobiles also have the potential for loss of life and property damage if not repaired correctly.

From what we have seen with automotive R2R legislation, liability often does not fall on the OEM. If the repair was performed improperly,

generally the person or entity that performed the repair would be liable.

OEMs should also consider that even without R2R legislation, independent repairers may already be repairing their products. Thus, this liability likely already exists to some extent. OEMs can reduce their liability by providing comprehensive repair materials. The stronger the repair materials, the higher the likelihood that repairs will be performed correctly.

Exemptions

The Massachusetts and New York bills provide exemptions for motor vehicles and medical devices. There are no indications that security products would be exempt. According to Mr. Proctor, no state has proposed an exemption for security products and the security industry has failed to convince those outside of their industry of the need for such an exemption. The Massachusetts bill even specifies that OEMs may not exclude repair materials for security-related products.

Barriers to Repair

Besides some of the concerns discussed in the previous section related to R2R, companies face practical challenges related to repair generally. Some key barriers include:

1. *Time:* In both design for repairability and the repair itself. Companies with fast innovation cycles like Axis are quite sensitive to time. Any additional time in the design stage, such as substantial design changes for repairability, could delay Axis from getting their products to market before competitors. For repair itself, customers expect quick turnaround times, so if a product cannot be repaired quickly, it may be replaced instead.
2. *Cost:* Design changes for repairability may increase manufacturing costs. For instance, making products with screws instead of glue adds an incremental cost per unit. Similarly, when performing repairs, companies may use thresholds to determine when a repair makes sense

financially, such as a threshold based on cost of goods sold. If a repair costs more than the set threshold, the company may choose to replace the product instead of repairing it.

3. *Organisational inertia:* To improve and integrate sustainability strategies, including repair, throughout a company, organisational inertia should be overcome. It can take time to make substantial changes to business models, but top-down management approaches can help with this, especially when the size of the company is quite large. Moreover, it is relevant to make sure that employees share a common understanding of the challenges to be solved through improving the internal visibility of repair.



Figure 7: Barriers to Repair

What Can Companies Do to Prepare for R2R?

Our understanding of the barriers to repairing digital electronic products, the legal requirements of R2R, and Axis’s operations has fed into our analysis of the most effective approach for Axis to undertake to prepare for upcoming legislation. Although these recommendations were tailored based on Axis’s business model, we think they also apply to most other OEMs.

In general, we suggest that the preparation for the proposed R2R legislation should start as early as possible, because late responses could create difficulties for OEMs’ supply chains, operations, employees and business partners. For successful preparation we suggest that OEMs start now with the following action items:

1. *Communicate internally and get management buy-in:* one of the project findings was that the legal requirements and implications of R2R legislation are rarely understood fully by business functions in many OEMs. In that sense, we suggest that the first step for preparing for legislation is getting everyone on board. This should be done by establishing active communication between different departments. We suggest that this communication should aim to exchange knowledge in two principal areas: first, understanding of R2R and its likelihood, and secondly, have a solid understanding of the possible implications of R2R on each department operation. We also propose that OEMs should aim to get senior management support at this early point. This support will ensure effective preparation.
2. *Plan for close monitoring of the R2R developments in the U.S:* R2R has gone through many major milestones in the last year. For OEMs to stay updated, we suggest that their legal departments should aim for monitoring the legislation closely and in the case where an OEM has no legal departments in the U.S., we propose consulting a US law firm.
3. *Assess the current repair offerings:* one of R2R’s objectives is to increase repair activities and decrease e-waste, and OEMs should therefore aim to improve and scale up their repair offerings while keeping them competitive. We propose that the first step to do so is to assess current repair models, including repair capacity, pricing, and convenience to customers and partners. By doing so, OEMs will be well-prepared to offer attractive and competitive services in an open repair market.
4. *Assess ability to provide repair materials:* the main legal requirement of R2R is that OEMs must provide repair materials to independent repairers and product owners, thus OEMs should ensure they have the availability and the channels in place to sell or provide diagnostic and

repair information, service parts, diagnostic tools and spare parts.

5. *Engage suppliers and partners in tailoring action plan for responding to the R2R:* supplier and business partners are central in any OEM’s business model; therefore, their involvement is key to ensure a comprehensive assessment of the OEM’s current repair capabilities.
6. *Assess product repairability and design for repairability:* one of the main indirect implications of R2R is that it will highlight which products are repairable and which are not. We therefore predict that repairability will be a key competitive advantage from which companies with more repairable products will benefit. Hence, we suggest that OEMs should review their product repairability and design products accordingly.



Figure 8: What can companies do to prepare for R2R?

Reflections

The R2R legislation in the U.S. is progressing with a fast pace, fuelled by strong support from the federal government. It is therefore likely that the potential legislation will influence the current OEM’s operations and repair offerings.

As a result of the proposed legislation and action items identified, we predict that the major business implications of R2R will be on:

1. *Operational costs:* we predict that there will be additional operation costs associated with the response to R2R, which include the costs associated with ensuring the availability of repair materials and the cost of establishing channels to sell them.
2. *Customer relationships:* as mentioned before, R2R will highlight products’ repairability and make it a strong economic incentive for customers. We predict that relationships with customers will be positively impacted if OEMs prove to provide more repairable products.
3. *Brand Image:* a positive response from OEMs towards R2R will reflect positively on brand image and vice versa. The legislation is linked to social welfare and resources conservation and any company opposing the legislation will expose themselves to reputational risks. Moreover, if OEMs are not able to provide repair materials, this will reflect negatively on brand image as it will highlight their technical limitations.
4. *Business resilience:* capitalising on an OEM’s current resources and scaling up repair offerings will ensure business resilience for future changes in policy and legislation, creating a competitive advantage compared to less-prepared competitors.

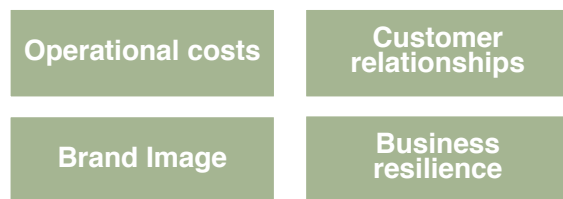


Figure 9: business implications of R2R

While it is critical that companies start to prepare for R2R, it is also important that they revisit their long-term sustainability strategies. We suggest that OEMs rethink their linear business models and aim for more circularity to reduce electronic waste and preserve natural resources. This long-term thinking will also ensure a successful and cost-effective response to any future legislations that promote circularity.

References

- [1] T. Klosowski. (2021). “What you should know about Right to Repair.” nytimes.com. <https://www.nytimes.com/wirecutter/blog/what-is-right-to-repair/> (accessed Nov.3,2021)
- [2] Axis Communications (n.d.). “About Axis.” axis.com. <https://www.axis.com/sv-se/about-axis> (accessed Nov.3,2021)
- [3] USPIRG (n.d.). “right to repair” uspirg.org. <https://uspirg.org/feature/usp/right-repair> (accessed Nov.3,2021)
- [4] Axis Communications (2020). “2020 Annual Review & Sustainability Report.” axis.com. <https://www.axis.com/files/brochure/axis-annual-review-and-sustainability-report-2020.pdf.pdf> (accessed Nov.3,2021)
- [5] earth911 (2021). “20 Staggering E-Waste Facts in 2021” earth911.com. <https://earth911.com/eco-tech/20-e-waste-facts/> (accessed Nov.3,2021)
- [6] The New York State Senate. 2021-2022 Regular Sessions. (2021, Feb. 2). *Senate Bill S4104, Enacts the digital fair repair act.* Available: <https://www.nysenate.gov/legislation/bills/2021/S4104>
- [7] Massachusetts Legislature. The 192nd general court of the commonwealth of Massachusetts. (2021, Mar. 29). *Bill S.166, An Act relative to Digital Right to Repair Act.* Available: <https://malegislature.gov/Bills/192/S166>.
- [8] U.S. Federal Trade Commission. “Nixing the Fix: An FTC Report to Congress on Repair Restrictions” 2021. [online]. Available: https://www.ftc.gov/system/files/documents/reports/nixing-fix-ftc-report-congress-repair-restrictions/nixing_the_fix_report_final_5521_630pm-508_002.pdf
- [9] U.S. White House. “FACT SHEET: Executive Order on Promoting Competition in the American Economy” Jul.09, 2021. [online]. Available: <https://www.whitehouse.gov/briefing-room/statements-releases/2021/07/09/fact-sheet-executive-order-on-promoting-competition-in-the-american-economy/>
- [10] BSR Sustainable Futures Lab (n.d.). “The Right to Repair.” bsr.org. <https://www.bsr.org/en/emerging-issues/right-to-repair> (accessed Nov.3,2021)
- [11] S. Svensson, J. L. Richter, E. Maitre-Ekern, T. Pihlajarinne, A. Maigret, and C. Dalhammar. (2018). “The Emerging ‘Right to Repair’ legislation in the EU and the U.S.”. Paper presented at Going Green CARE INNOVATION 2018, Vienna, Austria, Nov. 26-28, 2018.
- [12] Grist (2021). “Bowing to investors, Microsoft will make its devices easier to fix.” grist.org. <https://grist.org/accountability/bowing-to-investors-microsoft-will-make-its-devices-easier-to-fix/> (accessed Nov.4,2021)

AXIS COMMUNICATIONS

List of interviewees:

Jessika Richter, Postdoctoral Fellow, International Institute for Industrial Environmental Economics (IIIEE), 4 October 2021

Per Björkdahl, Sustainable Sales Engagements Director, Axis Communications, 5 October 2021

Drake Jamali, Manager of Government Relations, Security Industry Association, 8 October 2021

Kirsten Wikkelso, Senior Legal Counsel, Axis Communications, 11 October 2021

Per Castensson, Reverse Supply Chain Director, Axis Communications, 11 October 2021

Ausra Reinap, Senior Environmental Engineer, Axis Communications, 11 October 2021

Ebba Lundgren, Thesis Student, Axis Communications, 11 October 2021

Ellen Pellosniemi, Thesis Student, Axis Communications, 11 October 2021

Per-Johan Persson, Service Manager Customer Services, Axis Communications, 11 October 2021

Alex Barbosa Segerson, Service Manager Customer Services, Axis Communications, 11 October 2021

David Olsson, Thesis Student, Axis Communications, 11 October 2021

Patrik Qvarfordh, Repair Management Operations Manager, Axis Communications, 13 October 2021

James Marcella, Director Industry Associations Business Development America, Axis Communications, 14 October 2021

Nick Pintaro, Program Manager-Key Accounts US, Axis Communications, 14 October 2021

Nathan Proctor, Campaign Director – Right to Repair, U.S. PIRG, 15 October 2021

Paul Roberts, Founder, SecuRepair, 18 October 2021

Klas Hansson-Gladh, Business Development, GIAB Nordic AB, 26 October 2021



SUSTAINABILITY CERTIFICATION

CVRA



From left to right: Sebastian, Sawinee and Nicolò

Acknowledgements

We would like to thank the IIIIEE for the possibility of carrying out this project, a concrete, and hands-on way to test our knowledge in real-life settings. Thanks, João, for the challenging and interesting task, through which we could explore certifications and eco-labelling, a topic widely discussed during our Master Programme. Thank you also for your help in identifying the important stakeholders and providing support in contacting them. Special thanks to our supervisor Åke Thidell, who we felt was part of the team from the first day. Thank you for your help, insights, and advice on the project and for the support you gave us during the interviews.

The Team

Sawinee Galaputh, from Thailand, holds a Bachelor of Art in Economics from Yonsei University, Seoul. After graduating from Yonsei, she

worked for five years in the international strategy and management team for a multinational insurance company based in Seoul, Korea. She has an interest in corporate sustainability and how businesses can contribute to sustainability.

Sebastian Wehrkamp, from Germany, has a background in the field of Environmental Science with a Bachelor of Science from Leuphana University Lüneburg. He has worked as Environmental Protection Coordinator at a heavy train maintenance factory. He is enthusiastic about circular economy solutions and a great traveller who loves exploring the world by bike.

Nicolò Zagato from Italy, with a Bachelor of Science in Business Administration and Management at Bocconi University, Milan. Before joining the EMP Master Programme he worked in the marketing department of an outdoor e-commerce company. He is passionate about nature, agriculture and also wine, coming from a wine-producing region.

WASP is Ready to Sting the Market

Market Advantages of Sustainability Certifications

By Sawinee Galaputh, Sebastian Wehrkamp and Nicolò Zagato

Introduction

With a global export market value of EUR 29.6 billion [1], the wine sector plays an important role in the economy of many countries, regions and communities. For Portugal, the EU's fifth and the world's eighth-largest wine producer, the wine export market value is around EUR 846 million in 2020, with a 3.3% increase from 2019 despite the COVID-19 pandemic [1]. Among the fourteen main wine regions in the state, Alentejo (1.130 million hl) is in the top three for hectolitres produced in 2020/2021 [2].

In this region, since 1989, the *Comissão Vitivinícola Regional Alentejana* (CVRA – “Alentejo Regional Winegrowing Commission”) has been active to protect, control and certify the Alentejo Protected Designation of Origin (PDO) and protected geographical indication (PGI) wines [3]. The CVRA is also responsible for the domestic and international promotion of the wines from Alentejo.

In 2015, the CVRA established the Wines of Alentejo Sustainability Programme (WASP), built on a holistic framework to refine the sustainability of viticulture in the region. Today the programme has 460 members and 10 509 hectares of vines in the region are covered by the WASP. In the middle of 2020, the WASP certification was launched as an addition to the sustainability programme. Producers who fulfil the requirements and undergo an independent certification audit can use a label on the bottles. It certifies and communicates that the wine was produced according to the standard.

Task Description

The project was carried out for João Barroso, Sustainability Manager at CVRA, and the main

goal was to research and understand the business value of the WASP certification to foster participation in the scheme.

The objectives for this project were threefold:

1. To identify possible commercial advantages for wine producers generated by the WASP certification.
2. To provide insights on how to strengthen the competitiveness of the WASP certification and to support the marketing strategy of CVRA.
3. To map and understand the differences between the WASP certification and other commonly used green symbols and labels in the wine sector.

This project feeds into a long collaboration between IIIIEE and João Barroso, an IIIIEE alumnus. While previous working groups have focused on different aspects of sustainability, from resources saving projects to sustainability communication strategies, this year the focus was on the research of the market advantages gained by the certification.

Sustainable Wine and Certification

The wine industry is influenced by evolving consumer preferences and shifts in consumption patterns. Following a global and pervasive trend, consumers and societies are more and more aware of the impacts of the products they buy. In addition, some customers are starting to use that information to make more environmentally and socially friendly purchases to reduce their impact on the natural world [4].

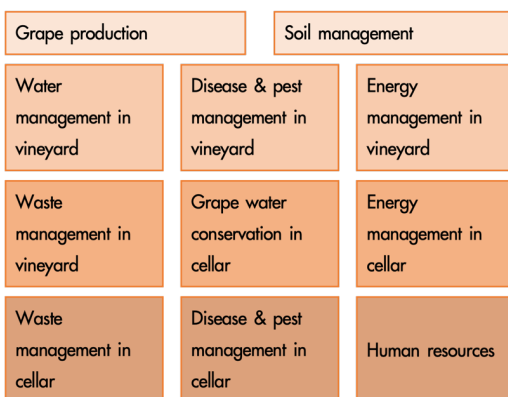
While traditionally country of origin and region of production, alongside grape variety, price and brand were the key choice drivers for wine,

sustainable production has recently joined the list [4]. This transformation was caused in part by pressure from governments and civil society at large and subsequent public debate on topics such as water use, resource efficiency, pollution and pesticides among others [5].

Sustainable wine is commonly understood as wine that has been produced in accordance with sustainability principles. While there is still no clear and unanimous definition of what sustainable wine means, sustainability in the wine sector refers to a broad set of practices in the vineyard and in the cellar that tries to minimize the impact on the environment, while increasing social wellbeing and economic values for the wineries and communities.

Issues Addressed

PRIMARY INTERVENTION CHAPTERS



SECONDARY INTERVENTION CHAPTERS



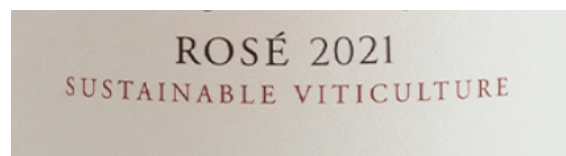
Figure 1: The 18 chapters of the WASP. Source: authors based on CVRA website

Commonly addressed issues by wineries that are pursuing sustainability are pest management, biodiversity protection, emissions to air and water, soil health, energy and water efficiency and reduction, social wellbeing, and fair working

conditions. The WASP is built on 18 chapters divided into two categories, as outlined in Figure 1 above.

Certification – a Step Further

It is quite common to read “sustainable viticulture” or “eco-friendly wine” on wine labels. But it is often not clear what these statements refer to. What guarantees do consumers have that these claims are true? How can they verify if producers are committed to sustainable practices? And additionally, who determines what sustainable practices are?



Example of a claim on a wine bottle label

Furthermore, producers that indeed practise a more sustainable type of agriculture want to show that theirs are not empty claims. Hence, to combat greenwashing and unsubstantiated claims, a wide range of certification schemes have arisen around the world.

Ideally, their role is quite simple: to establish rules and standard practices for wine production, to have compliance with the rules checked and to award certification if compliance is verified. Some certifications also include labels to be put on the bottle to communicate with customers the presence of certain attributes. Furthermore, certifications are usually awarded after an audit by an independent organisation, giving credibility and trust to the claims. In this report, we consider certifications as being third party certified.

Following the same reasoning, the CVRA has decided to introduce a certification for the WASP. Fulfilling the necessary requisites allows a wine producer to obtain the certification, and the possibility to use a label on the bottles that communicate the award.



WASP certification label

As of October 2021, three wine producers have been awarded the certifications and labels are used in some of their wines.

Differences from Other Schemes

Sustainable wine labels are only part of a large plethora of different labels available. There are also certification schemes that, instead of taking a holistic approach, focus on specific environmental or social aspects. This is the case for organic or Fair Trade, but also vegan, biodynamic or carbon neutral. Table 1 below exemplifies some of the main differences between sustainable wine certifications, organic and Fair Trade. Given the lack of a clear definition and a common framework, even within the category of sustainable wine certifications, there are dissimilarities in the scope, stringency and issues addressed. It is then quite difficult for consumers, but also retailers, to fully grasp the differences between all the labels and certifications.







		Sustainable	Organic	FairTrade
Defintion		The wine was produced in accordance with sustainability principles. The goal is to have the least impact on land. A holistic approach covering environmental, social and economical sustainability.	Organic relies on natural substances, physical, mechanical, or biologically based methods. It must be grown on soil with no prohibited substances trace for three years prior to the harvest.	The wine was produced in a fair and ethical conditions, meeting the internationally recognised standards. The scheme ensure that conditions for production and trade are economically, socially and environmentally responsible.
ENVIRONMENT	Air	GHG reduction and other air emissions.	-	GHG emission reduction and limit spraying pesticide use.
	Soil	Pesticides, fertilizers and ecosystems management.	Pesticides and Herbicides are prohibited. Preventing soil erosion.	Soil quality management
	Biodiversity	Topics of conservation and enhancement of biodiversity.	Soil biodiversity and coservation of biodiversity	Pest management, biodiversity protection, prohibition of genetically modified organisms and harmful chemicals.
	Resource Efficiency	Water efficiency management.	-	Water usage and efficiency.
SOCIAL		Equitability in the social aspects and the employees' welfare.	-	Prohibits child labours, forced overtime and harassment. Contribution to community. Safe working conditions and fair compensation to the grapegrowers and employees.
PACKAGING		✓	-	-
CERTIFICATION		✓	✓	✓
3RD PARTY		✓	✓	✓
LABELS		  	 	

Table 1: Main differences between Sustainable, Organic and FairTrade wine certification. Source: authors

Certification and Labels – Communication Tools

Consumers are increasingly showing preferences for more sustainable products and interest in the journeys and stories behind the products they buy [6]. Therefore, it is important for businesses to communicate their actions and practices towards sustainability. Among others, certifications and labels are important communication tools. A certification is a document that attests the company respects certain standards and rules. It is an important tool to demonstrate the truthfulness of claims that otherwise could be seen as greenwashing. Labels are seals that are usually placed on the primary packaging of the products.

Wine is an experience good with many attributes, such as quality and taste, that can be verified only by consuming it. Additionally, the social and environmental aspects are credence attributes and cannot be validated by consumers. Therefore, sustainability labels play an important role in delivering information to consumers about how the wine has been produced.

In our context, the WASP certification is awarded to wine producers that fulfil the label's requirements and undergo a successful independent audit. The document can be then used as proof that the standards are indeed met and that the wine is produced in accordance with them. Certified producers are allowed to place the WASP label on their products, to communicate the sustainability attributes of the wines to the customers.

As bottles are sold and shipped to different markets around the world, sustainability labels function as a communication tool to inform the customers on how the wine has been produced. The label of a sustainability certification programme should have a high recognition value so that the informed customer can choose a product according to its values. Brand recognition may be important for companies, but they are just as important for the certification program, as the main objective should be for consumers to trust the certification.

This enables consumers to easily differentiate the products on the shelves and empowers them

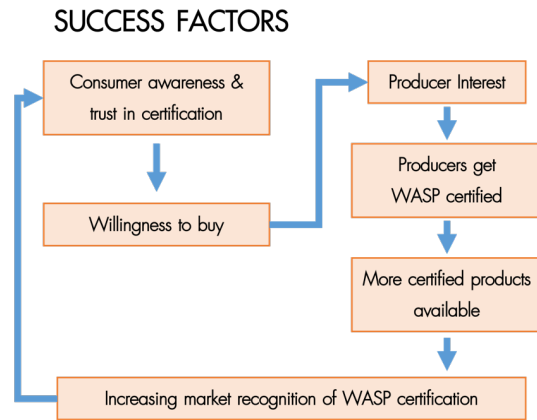


Figure 2: Success factors of labels. Source: authors based on course material

to select a sustainable wine over other options. However, trust in and awareness of the label are necessary conditions to influence the purchasing decision of a consumer. It is important for both the certified producers and the certification scheme to communicate the standards, the practices and the results of the certification, to create an awareness in the markets regarding the meaning and values of the certification.

Certifications and labels are communication tools not only for end consumers but also for retailers, supermarkets and wine importers. These tools can be used to reduce information asymmetries between producers and interested parties.

Methodology and Approach

The methodology adopted for this project encompassed a literature review as well as semi-structured interviews, which were later reviewed to extrapolate information. First, a stakeholder mapping exercise was carried out to identify which stakeholders could be interviewed to contribute to the project.

Stakeholder Mapping

As shown in the figure below, four main categories of stakeholders were identified through the mapping exercise. The aim was to get a diverse but representative group of stakeholders with high salience for the CVRA members. At the same time, the team tried to cover different geographical markets. Figure 3 presents the stakeholders consulted and interviewed.



Figure 3: Stakeholder mapping for the project. Source: authors

The market was represented by Nordic Alcohol Monopolies (NAM), other alcohol monopolies, wine importers and retailers. Alcohol monopolies are particularly important as they are very large single buyers, and for the NAM, they are operating in a market in which sustainability issues are usually high on the agenda and awareness among consumers is generally high.

Furthermore, consumers in the Nordic countries are familiar with eco-labels due to a long tradition dating back to the 1980s, when the Nordic Swan label was introduced. In addition, the NAM have a strong sustainability strategy that is being translated in the procurement process and the products purchased. Therefore, the NAM can exert strong pressure on the market, given their large volumes.

The media is represented by journalists specialized in the wine sector, PR and creative agencies, magazines and blogs dedicated to wine and wine practices, and sector specialists. These opinion-makers have a great influence on purchasing decisions, because of their position in the communication chain between producers and consumers, which could be located thousands of kilometres apart.

To carry out our task, the team decided that it would be beneficial to consult other wine certification schemes, so they could share their experience on market advantages and on ways to increase participation in the schemes.

Finally, the team wanted to receive inputs from wine producers both locally in Alentejo and

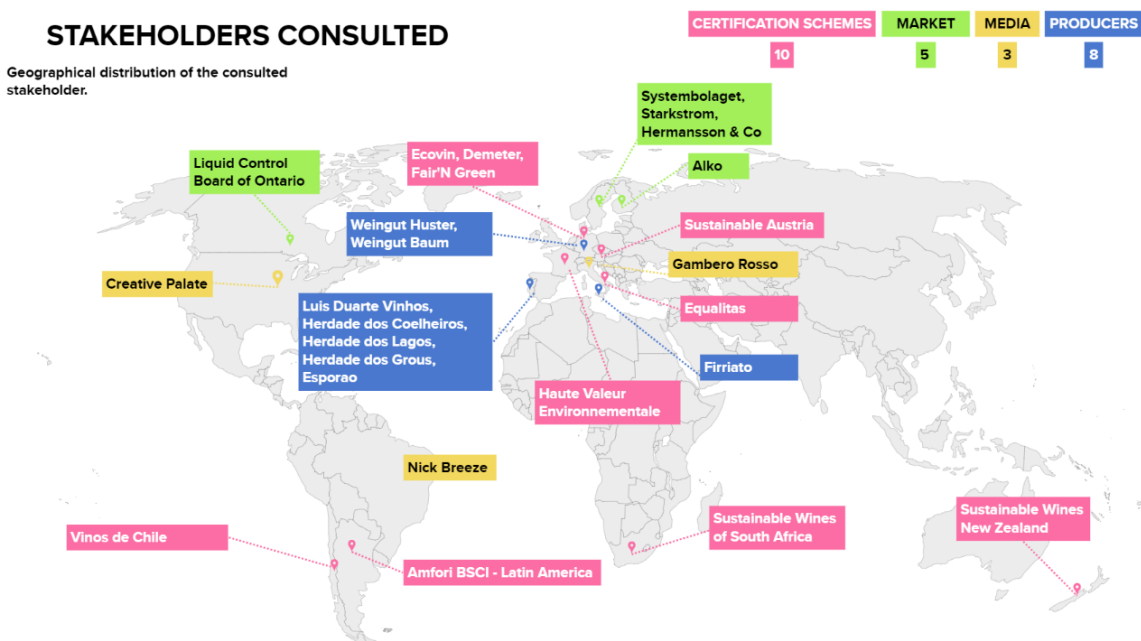


Figure 4: Stakeholders consulted in the project

outside the region. Additionally, to broaden the understanding, producers in Italy and Germany were interviewed.

As the project was carried out remotely due to the global COVID-19 pandemic, the team relied extensively on virtual interviews. These were carried out in a semi-structured way, with questions moulded to mirror the specificity of the interviewees. During the 4 weeks of the project, 26 interviews were conducted and lasted one hour each on average. The complete list of interviewees can be found at the end of the report.

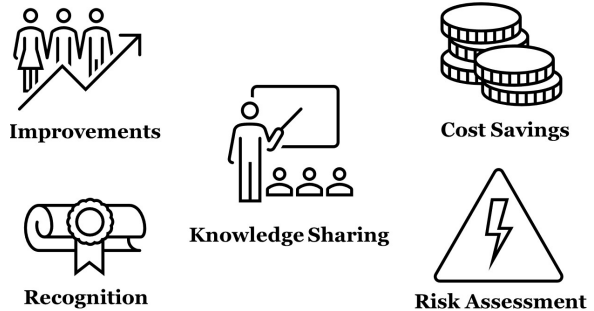
Literature Review

Academic literature has been reviewed to gather inputs from scholars on market advantages stemming from sustainability certifications. Despite extensive literature in the wine sector and the number of papers consulted, the team was unable to derive clear indications or results from quantitative analyses regarding the presence of these competitive advantages. However, there are some valuable insights to be gained from the academic literature [7,8,9,10,11], including the presence of an additional willingness to pay for wines with certain environmental and social characteristics, the importance of third-party verification, the internal benefits of sustainable certifications and the consumer confusion surrounding the plethora of labels. In addition, the difficulty of isolating the impact and effects of such a label is confirmed. Price, origin and variety, along with quality, are still predominant attributes in the hedonic analyses reviewed. In addition, many of the results and conclusions of the consulted studies suffer from limited external validity when exporting the findings in other contexts.

Our Findings

The following section presents the findings from our interviews, starting with the internal and external benefits of a certification from a producer's perspective, followed by drivers and risks for wine producers to acquire a certification.

Internal Benefits



Some interviewees mentioned that certifications are seen as an opportunity for improvements within the organisational structure, processes, and operations. According to one producer, starting a certification process makes you look at the organisation from a different angle and forces you to take new perspectives. At the same time, it helps establish several performance indicators which help to increase the measurability of production processes.

Members of different wine certification schemes have pointed out that educational events, like training as well as platforms for knowledge sharing, are greatly appreciated aspects of participating in such schemes. These allow for best practice sharing and benchmarking among the participants of the certification. One national certification programme interviewed goes a step further and sends seasonal benchmarking statistics and reports to its members. In these reports, producers can see how they performed in areas such as water and resource use compared to other producers in the country and region. This incentivises producers to improve their performance and enables them to track their changes in comparison to the rest of the market more easily.



Vineyard in Alentejo

In addition, by adopting sustainability principles in the vineyard and the cellar, it is possible to unlock additional benefits for an organisation's facility management. For example, several interviewed producers have encountered a range of cost savings that can be traced back to operational changes. They mentioned reduced costs for water or energy consumption of up to 50% that were direct results of measures implemented to obtain a certification. Since most sustainability certification schemes restrict or limit the use of herbicides and pesticides in the vineyards, farmers have to turn to mechanical practices for weed control. This can have a strong impact on the quality of the soil, which in turn has a high impact on the quality of the wine, as one wine grower pointed out, by saying "better soil, better grapes."

Furthermore, wine producers need to conduct a thorough self-assessment as part of most sustainability certification programmes, which helps the company to assess the risks and reveals weak points within the organisation. Tackling these risks can lead to health improvements for employees, but also it reduces the liability risk for the producer. As pointed out by one interviewee, being aware of all risks the organisation faces enables the management to respond to threats much faster, making the company less vulnerable and possibly leading to greater longevity within the industry.

Besides, it was also mentioned that certification is a great way to promote recognition of the company's efforts in tackling sustainability challenges. Internally, it recognises the efforts of all employees to reduce the company's environmental impacts and thus shows that their work is valued by the management. It further commits all employees to actions on sustainability and encourages them to do more.

External Benefits



Sustainability certification can also be used for external recognition. It can work as a communication tool for markets, retailers, and end-consumers to display the producer's efforts in the field of sustainability. It is a way for the producers to show their actions with only a few words.

In the interviews, both producers and retailers have emphasised that sustainability certifications open up access to new markets, as it enables them to reach out to environmentally-minded customer groups or sell to retailers in a niche market. Representatives of retailers have pointed out the fact that sustainably certified products have a significant advantage in the purchasing processes. Especially for the NAM, sustainability certifications are specifically targeted by including aspects of environmental management in the tenders. Thus, certified producers gain a significant market advantage over non-certified ones, as they can easily prove that they fulfil the requirements asked for in the tenders.

Another benefit of obtaining a certification is an increase in data availability for retailers. More and more supermarket chains and retailers of beverages have committed to decrease their impact on the environment and have therefore started to report on greenhouse gas emissions. To capture these emissions further down the supply chain, retailers approach the producers and ask for their emission data and information on their environmental performances. Certified producers are advantaged, as they have the requested data available, having collected them for the certification process already. Besides, it is easier for retailers to evaluate their suppliers' environmental performance and access their

data if they supply from certified producers. Thus, certifications can increase the transparency and accountability in the supply chain and reduce the risks for suppliers

Different interviewed stakeholders have described a growing market pressure within the wine sectors to move towards sustainability. They have also stated that they expect this trend to continue in the future. Through changing their codes of conduct, having tough price negotiations or demanding suppliers improve their processes, retailers naturally have a very powerful leverage position over their suppliers and producers. In this situation, a certification can be a good way to withstand the pressure from retailers and enable producers to have a stable market position and in most cases also an advantage over their competitors.

Furthermore, sustainability certifications give wine producers the chance to verify their claims through an independent third party, thus increasing their trustworthiness among retailers and end-consumer. Producers have told us that through obtaining a certification they can avoid greenwashing by being able to support the claims made by their marketing departments.

Both retailers and representatives from certification schemes interviewed have pointed out that sustainability certifications for wine can attract new customers. While there could be customer segments that are very environmentally minded or have certain health or dietary restraints, certifications are a way for the consumer to easily pick a product of their choice. A certification label on a wine bottle can convey to a customer under what requirements and circumstances the wine has been grown and produced, and therefore it increases the consumer's trust in a product while fostering its recognition value at the same time.

Drivers

As described in the previous section, sustainability certifications enable a wide range of internal and external benefits for producers and other stakeholders along the wine supply chain. The findings of our interviews point out that

there are, and there will be even more, clear market benefits for certified producers. Increasing competition, as well as the growing sustainability trend, are strong drivers for wine producers to obtain a sustainability certification. However, there are other reasons for producers.

The latest research, as well as our interviews with retailers, point out a general trend towards purchasing green products and services in most sectors. The consulted retailers agreed that this trend is present in the wine sector as well, and that demand for sustainably produced wine is growing among consumers. As shown by Figure 5, sales in Finland for alcoholic beverages categorised as “green choice” are growing, and Alko, the Finnish alcohol monopoly, year after year increases the supply of those products.

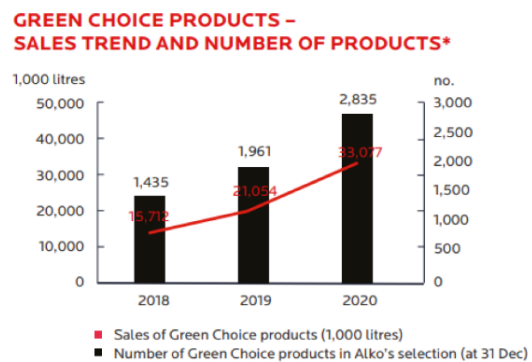


Figure 5: Sales trend of green choice products in Finland. Source: Alko

These insights confirm what producers and other certification schemes told us, that producers face strong pressure from retailers and end-consumers to get certified, to increase the transparency in the supply chain and to respond to a shift in the wine demand. Furthermore, by supplying certified wine producers, retailers can simplify their purchasing processes, save time and resources, and reduce supply risks. Additionally, the retailers we have talked to have emphasised they plan to increase the number of green- or sustainability-certified products on their shelves within the next years, thus making it difficult for companies not to make any efforts in the field of sustainability.

Especially during the interviews with representatives of the certification schemes of Chile, New Zealand and South Africa, the issue of exceptionally strong market pressure from the Nordic and North American markets towards sustainability was presented. Perceiving this pressure has motivated many producers in these countries to join the respective sustainability certification programmes, as they understand the risk of not being competitive under new market trends. For producers in these countries, in which wine production does not have strong historic roots, sustainability was perceived as a major opportunity for differentiation [10]. Additionally, as two interviewees have pointed out, in these countries sustainability in the wine sector is coupled with a national tourism marketing strategy to promote the country's image as green and sustainable.

Moreover, sustainability certifications could have positive effects on wine expert scores and are likely to play an increasing role in wine journalism [11]. This can be seen as another driver for producers to take steps on sustainability and get certified.

There are further drivers and arguments for producers to seek certification. In Austria, the certification scheme is publicly available, and producers can enter all the data and information about their production processes in a convenient online tool. Furthermore, New Zealand's certification scheme provides benchmarking among producers in the region or on a national scale. This feature is highly appreciated by producers.

Barriers

However, despite the many factors in favour of certification, there still are many concerns and hindering factors preventing producers from getting certified. Some producers have voiced their concerns that sustainability labels are much more difficult to communicate than other eco-labels such as labels for vegan or organic products. Producers find it difficult to point out what aspects a sustainability certification covers. Communicating the meaning of all these aspects often needs an elaborate

certification schemes usually include many requirements that are often rather complex and thus time-consuming to fulfil. Some smaller producers might not have the human or financial resources to implement the requirements to obtain a sustainability certification. Some are also not able or willing to bear the costs of the certification and the required audits, as they do not expect enough benefits in return. While many producers get certified to gain access to new markets or customers, there is no guarantee for these benefits.

Over the last years, the number of certifications for sustainability-oriented wines on the market have grown significantly. Some producers have therefore confided with us that they find the certification landscape quite confusing for their customers and themselves. Some also fear a high risk of a decrease in the value of certification due to the overabundance of available certification and labels. Besides, both producers and certification schemes fear that competition with other national or independent certification programmes can be damaging to the public perception of sustainability certification schemes as a whole.



Figure 6: Some of the sustainability labels in the market. Source: authors

Further, some producers have voiced their concerns that greenwashing could ruin their credibility and for that reason, they prefer to stay away from any non-third-party validated certification scheme or any unsubstantiated claims.

Lastly, several interviewed stakeholders emphasised that there is still a widespread stigma that

organic or sustainably produced wines are of lower quality. Given the experience nature of wine and the importance of taste and quality, many consumers may not be willing to make this trade-off for wine. An Italian wine producer interviewed, although it possesses multiple sustainable certifications, does not place any label on the bottles, as it fears consumers will not choose its wines due to this perceived trade-off. However, it was also pointed out by the producer that the adverse selection that may arise from the labels is ascribed only in specific markets, in which consumers do not value sustainability attributes positively. The Italian producer also stated that sustainability labels will be placed on the bottles for specific markets, such as the Nordic ones. However, this differentiation may increase costs as different labels have to be produced for different markets.

Reflections

From interviewing and discussing the topics with multiple stakeholders in the wine sector, we have found that the topic of business values and market advantages of sustainable certification remains subjective to each stakeholder. For example, a large-scale certified wine producer may experience direct benefit as many retailers are looking for sustainable wine and products, whilst a smaller certified producer may not have the same experience due to the difference in production capacity and targeted markets.

Another key factor found was the importance of communication strategies. Both wine producers and certification schemes must be careful when communicating the message of sustainability, as excessive information could be perceived as greenwashing, especially if the consumers do not understand the process of certification and how it is based on different auditing processes and standards.

We have also found that the size of the certification schemes can sometimes affect the implementation and the uptake of the schemes by the producers. In the case of central national schemes, there are more endorsements from the producers in the country. For example, in New

Zealand, 96% of the vineyard area are certified under the Sustainable Winegrowing New Zealand (SWNZ) programme. The centralised scheme, which encompasses the whole country, may have more advantages in comparison to a regional scheme like WASP, which is only applicable to wine produced in the Alentejo region. Some CVRA members, who are also growing grapes in other regions, may feel reluctant to apply for a regional certification that only covers a part of their production sites.

The collaboration between the wine sector and the tourism industry can bring benefits for sustainability. For example, according to Vinos de Chile, their members can now get certifications for their vineyards, the winemaking process, the social and wine tourism. These choices can be seen as a new opportunity, hence encouraging the producers who are also in the tourism sector to become more sustainable in their operations and drive them to get certified.

Synergies between touristic marketing and sustainable wine could help strengthen the brand of the Alentejo region. By gaining critical mass and by having a regional sustainability certification, the Alentejo region could promote itself as being a sustainable wine production region in Portugal. The CVRA members could benefit from these synergies and attract tourists interested in wine and sustainability alike, but also gain a different image in the global markets in which wines from Alentejo are sold.

Finally, there is a need for a global framework on sustainable certifications around the world, that could help increase the stringency of standards of different schemes and awards the top performers. It could also create a level playing field for holistic schemes, that are sometimes facing competition with less complex, easier to communicate labels. However, sustainability is a multi-faced topic, and the creation of a global framework needs the involvement of all the stakeholders.

During this project, we were able to gain valuable insights from different stakeholders from different countries. The limitation was however

centred around the low response rate which leads to a lack of representation from other retailers apart from the NAM and the monopoly in Canada. Hence, the findings of market preferences in this report should not be taken as a representation of the global wine market. Nonetheless, interest and willingness to work with sustainability are increasing rapidly for both consumers and producers all over the world.

References

- [1] OIV, 'STATE OF THE WORLD VITIVINICULTURAL SECTOR IN 2020'. OIV, Apr. 2021. [Online]. Available: <https://www.oiv.int/public/meldias/7909/oiv-state-of-the-world-vitivinicultural-sector-in-2020.pdf>
- [2] Carmen Valverde, 'Portuguese Wine Exports Rise in 2020 Despite COVID-19 Challenges', United States Department of Agriculture - Foreign Agricultural Service, Voluntary Report PO2021-0002, Jan. 2021. [Online]. Available: <https://www.fas.usda.gov/data/portugal-portuguese-wine-exports-rise-2020-despite-covid-19-challenges>
- [3] CVRA, 'About Us'. <https://www.vinhosdoalentejo.pt/en/cvr-alentejana/about-us/> (accessed Oct. 27, 2021).
- [4] I. Schäufele and U. Hamm, 'Consumers' perceptions, preferences and willingness-to-pay for wine with sustainability characteristics: A review', *Journal of Cleaner Production*, vol. 147, pp. 379–394, Mar. 2017, doi: 10.1016/j.jclepro.2017.01.118.
- [5] C. Corbo, L. Lamastra, and E. Capri, 'From Environmental to Sustainability Programs: A Review of Sustainability Initiatives in the Italian Wine Sector', *Sustainability*, vol. 6, no. 4, pp. 2133–2159, Apr. 2014, doi: 10.3390/su6042133.
- [6] amfori, "Endless Possibilities - A guide to effective sustainability communications". amfori, 2019. [Online]. Available: https://www.amfori.org/sites/default/files/amfori_effective_sustainability_communication_guide_2019_0_1.pdf
- [7] N. Berghoef and R. Dodds, 'Determinants of interest in eco-labelling in the Ontario wine industry', *Journal of Cleaner Production*, vol. 52, pp. 263–271, Aug. 2013, doi: 10.1016/j.jclepro.2013.02.020.
- [8] O. Bonroy and C. Constantatos, 'On the Economics of Labels: How Their Introduction Affects the Functioning of Markets and the Welfare of All Participants', *American Journal of Agricultural Economics*, vol. 97, no. 1, pp. 239–259, Jan. 2015, doi: 10.1093/ajae/aa0088.
- [9] E. Pomarici and R. Vecchio, 'Millennial generation attitudes to sustainable wine: an exploratory study on Italian consumers', *Journal of Cleaner Production*, vol. 66, pp. 537–545, Mar. 2014, doi: 10.1016/j.jclepro.2013.10.058.
- [10] P. Sinha and M. E. M. Akoorie, 'Sustainable Environmental Practices in the New Zealand Wine Industry: An Analysis of Perceived Institutional Pressures and the Role of Exports', *Journal of Asia-Pacific Business*, vol. 11, no. 1, pp. 50–74, Feb. 2010, doi: 10.1080/10599230903520186.
- [11] M. A. Delmas and O. Gergaud, 'Sustainable practices and product quality: Is there value in eco-label certification? The case of wine', *Ecological Economics*, vol. 183, p. 106953, May 2021, doi: 10.1016/j.ecolecon.2021.106953.

List of interviewees:

- Anne Holl. Communications Manager, Ecovin. Online 15/10/2021.
- Dora Simoes. Managing Director and Co-Owner, Luis Duarte Vinhos. Online 21/10/2021.
- Federico Lombardo di Monte Iato. Owner, Firriato Distribuzione. Online 15/10/2021.
- Florian Reinert. Senior Project Manager, Fair and Green. Online 26/10/2021.
- Franz Rosner. Research Coordinator Sustainability and PR, Federal Agency for vini- andpomiculture Austria. Online 28/10/2021.
- Giuseppe Carrus. Wine journalist, Gambero Rosso. Online 18/10/2021.
- Helena Manuel. Farm Manager, Herdade dos Lagos. Online 20/10/2021.
- Jimena Sanchez. Network Representative Argentina, Amfori. Online 22/10/2021.
- João Barroso. Sustainability Programme Coordinator, CVRA.
- Kjell Bogvard. Manager, Starkstrom Wine. Online 11/10/2021.
- Laura Bello. Technical Support, Equalitas. Online 14/10/2021.
- Luis Patrao. Team leader viticulture and oenology, Herdade de Coelheiros. Online 6/10/2021.

CVRA

Maiju Sirviö & Hanna Kangasaho. Sustainability Development Specialist & Sustainable Sourcing, Alko Oy. Online 21/10/2021.

Marcus Ihre. Sustainability Manager, Systembolaget. Online 27/10/2021.

Maryna Calow. Communications Manager, Wines of South Africa. Online 15/10/2021.

Meagan Littlejohn. Programme Manager, Sustainable Winegrowing New Zealand. Online 13/10/2021.

Meg McClean. Sustainability Specialist, Liquid Control Board of Ontario. Online 21/10/2021 & 25/10/2021.

Miriam Mascarenhas. Quality, Environment and Sustainability Manager, Herdade do Grous. Online 14/10/2021.

Myriam Ennifar. Environmental Certification Officer at Ministry of Agriculture and Food. Online 28/10/2021.

Nick Breeze. Wine journalist, Secret Sommeliers. Online 11/10/2021.

Nina Weis. Advisor wines & gastronomy, Demeter Germany. Online 21/10/2021.

Nuno Cabral & Sandra Alves. Brands and Markets Director & Winemaker, Esporão. Online 28/10/2021.

Patricio Parra. Managing director, Vinos de Chile. Online 18/10/2021.

Tobias Huster. Managing Director and Owner, Weingut Huster. Online 22/10/2021.

Sebastian Baum & Lena Göth. Winemaker and Owner, Weingut Baum. Online 26/10/2021.



CLEAN CONSTRUCTION

IKEA Retail (Ingka Group)



From left to right: Ismat, Christopher, Johannes, Mathias and Tom (Engineering Leader at Ingka Group)

Acknowledgements

The team would like to thank Kristian Gerdtsson, Engineering Manager, Lars Landén, Construction Manager, Linda Cordoba, Expansion Manager Assistant and Siva Ram Kuricheti, Technical Design and Engineering Manager from IKEA Group for hosting this project and to allow access and insights to the exciting and complex world of the built environment within Ingka Group. Additionally, the consultants extend that gratitude towards the partners of C40 Cities, namely Cécile Faraud, and Paulina Lis.

Furthermore, the group is deeply grateful to the IIIEE staff & teachers, and supervisor Håkan Rodhe. The SSC course is an important opportunity to learn, apply environmental management in practice and add value for our client. Likewise, we humbly thank our skilful student colleagues for invaluable discussions and constant support throughout the project.

The team would like to send another big sign of gratitude to each interviewee that the team had pleasure to discuss with. The interviewees gave incredibly valuable input to the project and allowed for a multi-perspective analysis of the task at hand.

The Team

Ismat Fathi is an architect and holds a Bachelor of Architecture from JNAFAU, India. She has great interest in the interaction between urban and natural systems, policy development and stakeholder engagement.

Johannes Schön studied in Cologne and holds a B.Sc. in International Business. He has great interest in a circular economy within the planetary boundaries and has experience in sustainable business modelling and advanced building automation.

Christopher Marton is from Sweden and holds a B.Sc. in Economics and Political Science from Lund University. He has experience in multi-stakeholder projects for sustainable urban transitions as well as public affairs.

Mathias Peitersen hold a B.Sc. in Business Administration and Philosophy from Copenhagen Business School. His professional experience lies in the media and NGO environment of Copenhagen. He interned with Ingka construction and sustainability analytics during spring 2021.

Building a Case for Clean Construction

Recommendations for Pushing the Standards in Urban Construction

By Ismat Fathi, Johannes Schön, Christopher Marton and Mathias Peitersen

Introduction

This project, in collaboration with IKEA Retail (Ingka Group), takes place in the global construction sector and tries to assess new opportunities for climate-neutral building practices.

After a brief introduction of the client party and a showcase of the issue, the team describes its approach and gives an overview of the construction sector and its stakeholders.

Further, the report elaborates on the emerging concept of “Clean Construction,” its relevance and tools and principles that guide decision-makers and policymakers. Eventually, the team presents its findings and concludes with managerial recommendations and feasibility issues.

Project Description

Client

With currently 392 stores across 32 countries, Ingka Group is the largest IKEA retailer and represents about 90% of all IKEA retail sales worldwide. Ingka Group is also a strategic partner to develop and innovate the IKEA business and help define common IKEA strategies.

To meet the changing consumer demands Ingka Group has initiated a change in strategy, complementing its traditional ‘blue boxes’ by opening new customer meeting points in city-centre locations. The change in strategy leads to new opportunities such as reduced travel emissions by the customers but also new challenges as construction projects are now taking place in urban settings with space scarcity, busy infrastructure, and pollution affecting the surrounding neighbourhoods.

With a stated objective of *becoming people and planet positive* Ingka Group has long pursued sustainable building performance through building certification schemes and on-site renewable energy production. However, these efforts do not address the full scope of adverse effects from the building and construction in an urban setting as many aspects are left out of scope.

Seeking to address these blind spots, Ingka Group and C40 Cities in November 2020 announced a partnership to support resource-efficient and zero-emission construction. The aim of the partnership is to mitigate social and environmental impacts connected to urban construction and retail operations.

For this project, C40 Cities is a key knowledge partner, however, Ingka Group remains the project client. In the project, Ingka Group is represented by Group Real Estate.

Task and Objectives

The project aims to identify the implementation potential of clean construction practices in the construction process of the Ingka Group. Construction projects at Ingka Group are complex and involve multiple stakeholders within and beyond the organisation, including the franchisor Inter IKEA Systems B.V., internal departments, and multiple contractors during the design and construction of the building. However, implementing clean construction practices at Ingka Group is not simply a matter of aligning stakeholders. It is highly dependent on the local context of the project, including market maturity for sustainable alternatives, legislative barriers, and construction industry norms and culture.

The client also wanted the team to look into an ongoing Ingka Centres Meeting Place which is currently in its construction phase, located in Gurugram, India. Gurugram is a major developing area next to Delhi and is part of the Central National Capital Region.

In consultation with the project client, the team identified a central aim of the project: Explore the potential for developing global guidelines for adopting clean construction practices in urban construction projects.

Specifically, this task is fulfilled by delivering value to the client on three objectives:

- Identify drivers, barriers, and best practices for clean construction.
- Conduct a case study of the construction process of the Gurugram meeting place, India, exploring the local context of potential clean construction initiatives.
- Propose process improvements yielding better sustainability performance and impact mitigation of future real estate development projects of Ingka Group.

Delivering on these objectives will result in a series of recommendations for organizational policies enabling performance improvements from the local Indian context to the global. This ties into an intervention map for the company and applying realistic but forward-leaning assessment criteria in service and material procurement related to construction projects. Further, the outputs produced by the team will aid in capacity building and awareness around this topic within the organisation.

Project Approach

The team approached the complex task at hand through the method presented in Figure 1. This served as guidance throughout the project process. Based on initial findings from preliminary research and discussions with the project client, the issue was conceptualised using illustrative techniques such as a fish bone diagram, a system map and a materiality matrix. Findings from the desktop research, material from the client and

interviews were compiled in a synthesis matrix, forming the main source for our analysis.

For the desktop research, the team conducted extensive research on global best practices for clean construction. After drawing a stakeholder map, relevant internal Ingka Group team members and external professionals and organisations were contacted, providing us with valuable inputs on organisational workings of the Ingka Group and multi-perspective thinking of the topic. Conclusions on barriers and drivers, led to main findings of practical recommendations for the Ingka Group and feasibility of implementing them. This was then converted to tangible outcomes in the form of factsheets and presentations to be used both by the Ingka Group and potentially C40 Cities.

To gather information for the case study of Gurugram, India (hereafter referred to as “local context”), relevant Indian stakeholders, both external and internal, were interviewed, the status quo of the project was determined, and the national industry landscape was understood. This generated a set of drivers and barriers for the Ingka Group in India to implement clean construction practices. Since the project design was completed, we focused more on the construction phase Zero Emission Transportation (ZET), Zero Emission Equipment (ZEE), Sustainable Procurement (SP) and Zero Waste Streams (ZEW). Thereafter, a feasibility study was carried out based on factors such as market maturity, availability of resources, capabilities and environmental priorities for Gurugram.

The main challenge and limitation of the project was to scope it down to deliver a valuable outcome given the short project period (one month). To balance two-fold client requirements and navigate from local to global contexts and to further scope down different aspects of clean construction we adopted a cyclical method. This non-linear approach involved discovering new knowledge through research and interviews, defining the problem, and delivering the task. Furthermore, we did not delve deeply into the social sustainability aspect of clean construction.

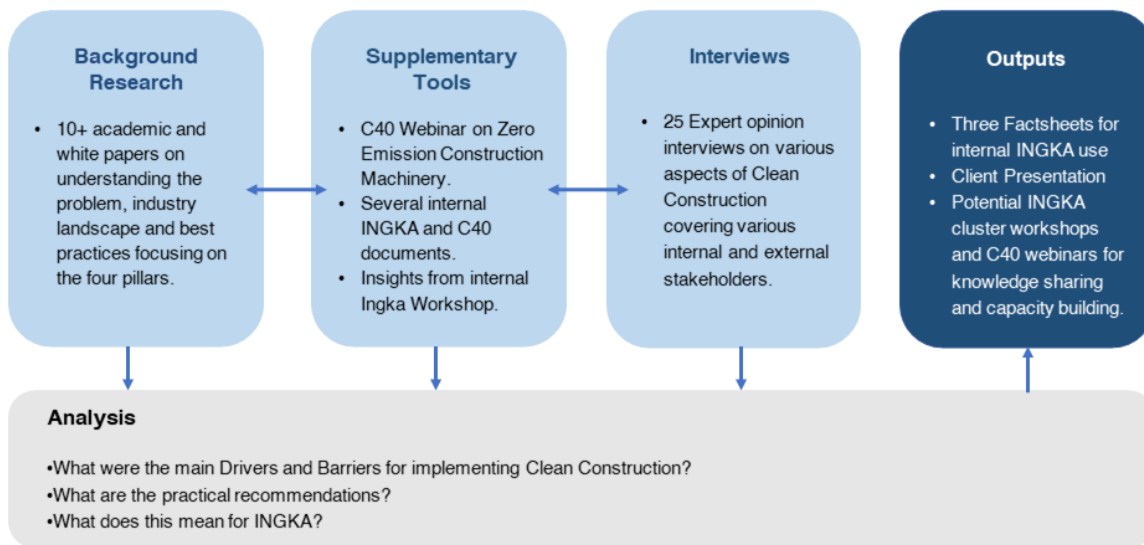


Figure 1: Method Map

Industry Landscape

The construction sector is complex and multi-faceted. It involves a long supply and value chain, since buildings are complex structures that require multiple products, for the interior and exterior materials in use. This complexity also shows in the number of stakeholders involved in the entire building lifecycle. From raw materials extraction, over the construction phase to the demolition and potential reuse of building parts, there are numerous incidents of environmental pollution and the emission of greenhouse gases (GHG).



Figure 2: Overview of Environmental Problems [1]

Figure 2 provides a concise summary of the array of environmental problems facing the sector.

Looking at the construction phase of a building, the team identifies several environmental issues. Machinery and equipment contribute to air and noise pollution, while transportation of building materials cause further greenhouse gas emissions. Additionally, the environmental degradation from raw materials extraction is a crucial environmental factor that often is overlooked.

Considering that most construction takes place in urban spaces, cities are dealing with severe air pollution that can cause premature death, harm public health and reduce societal welfare. Moreover, the industry is known for societal issues, e.g., precarious employment and hazardous work, including standards of operational health and safety.

With a strong global trend of urbanization, there will be a rise from 54% in 2015 to 66% in 2050, of the global population living in cities, according to UNEP [2]. This goes along with a strong expected growth within the construction sector. This growth is expected to be especially strong in fast-developing countries, e.g., China, India and Nigeria.

Further, the construction sector has seen little innovation and sustainable development in recent decades. While the resources needed for

building materials are sparse, high-emission reinforced concrete continues to be used on a large scale. The prevailing paradigms are characterized by conservatism and cost leadership, which makes change difficult, but means that the potential for improvement is enormous.

Recent schools of thought, such as the circular economy, lean and clean construction, create innovative incentives to both reduce negative social and environmental effects, and at the same time promise feasibility and profitability.

Construction Sector in India

India, a rapidly growing economy, is one the largest global construction markets, accounting for 9% of the country’s Gross Domestic Product (GDP). Furthermore, there are about 51 million people employed in this sector [3].

Nearly 70% of the building stock that will be there in 2030 in yet to be built in India [4].

Gurugram is one of the fastest-growing financial hubs of the country. In fact, the Central National Capital Region is projected soon to become the world’s largest urban agglomeration, housing a population of 37 million. With an increasing number of construction sites, and the conventional way of designing by using materials; steel and concrete, the construction sector in India has a substantial ecological footprint. The sector is responsible for 40% of carbon emissions in India, 30% of solid waste generation and 20% of water effluents, along with noise, air and odour pollution. Hence, clean construction practices could have major beneficial effects on the sector and on the well-being of the Indian people [4].

Clean Construction Framework

Clean construction is about creating net-zero, climate resilient and socially just built environment systems. The aim is to transform attitudes towards construction projects and to tackle the negative impacts of the sector globally.

The underlying idea of clean construction is to study the full lifecycle of a building, from planning to deconstruction. Emissions can be split into operational emissions and embodied emissions, with the latter being the main focus of clean construction. This covers all emissions outside those related to the actual use of the building, including emissions from raw materials extraction, manufacturing, transportation, and construction equipment. It also covers the deconstruction and end-of-life phases of a building lifecycle, see figure 3.

The embodied emissions, sometimes referred to as the hidden emissions of the construction sector, are estimated to represent 20 to 50% of an average building’s total lifecycle emissions [6].

Throughout our interviews with external stakeholders, it became clear that a common understanding for clean construction is largely lacking in the industry. Several interviewees mentioned that clean construction was a new concept for them and asked us what we meant with the phrase. This is not too surprising. Clean construction is still in its infancy and the lines between similar concepts (e.g., sustainable construction, green buildings) are blurred.

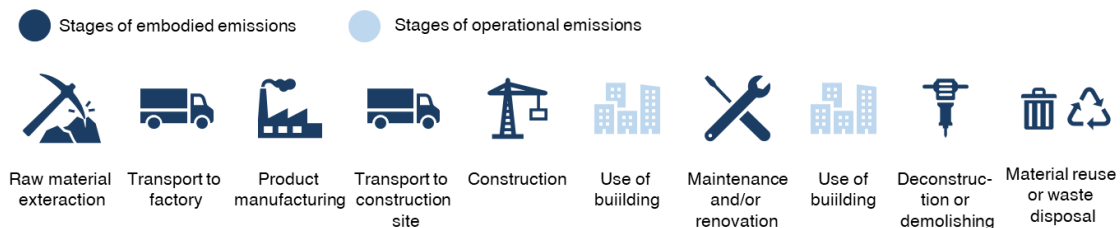


Figure 3: A Building’s Lifecycle. Adapted from One Click LCA [5]

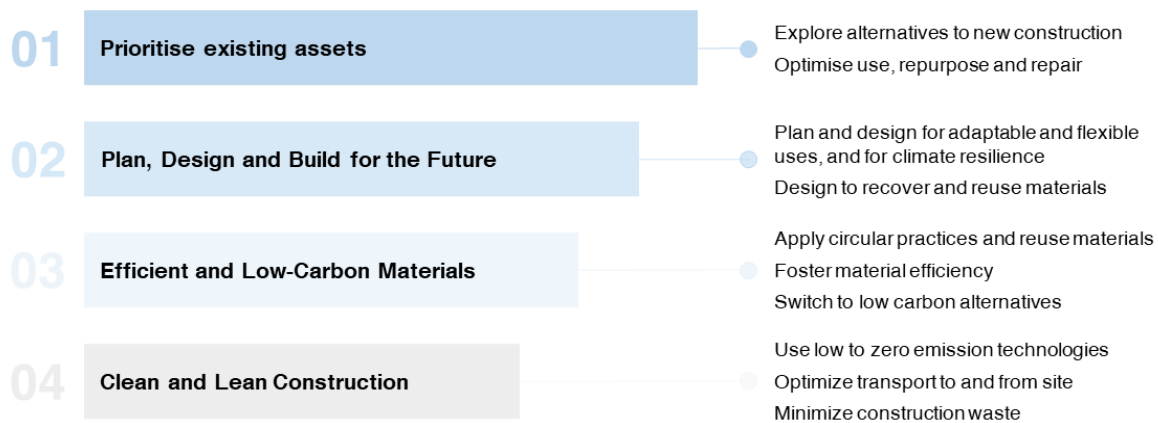


Figure 4: The Clean Construction Hierarchy. Adapted from C40 Cities [6]

The Clean Construction Hierarchy

To bridge the lack of a common consensus for how clean construction should be understood, approached and acted upon, C40 Cities developed the *Construction Hierarchy* [7]: see Figure 4.

The cleanest building is the one that never has to be built. Optimising existing building assets is therefore a top priority. In cases where new construction is necessary, steps 2-4 of the hierarchy should be considered and implemented, namely: 2) including circular approaches in plan and design, 3) increasing material efficiency and the use of low-carbon alternatives and 4) introducing low- or zero-emissions transport and construction machinery.

The implementation of cleaner construction practices is crucial for standing a chance to achieve the 1.5 °C target of the Paris Agreement. But clean construction practices not only reduce carbon emissions. It can also bring substantial economic and social benefits, as well as other environmental and ecosystem benefits. Figure 5 provides an overview of such benefits.

Value Chain and Stakeholder Mapping

The value chain within the construction sector is closely intertwined. Decision-making at various steps, planning and design to getting the building permit and finally the demolition of the building, accounts for various important

external and internal stakeholders for the Ingka Group, as shown in Figure 6. Additionally, engagement with the private and public is crucial to shift the market towards clean construction practices. The size and international nature of the company make the organisational structure elaborate and tangled. Stakeholder collaboration and engagement are the key to approaching different levels of the hierarchy.

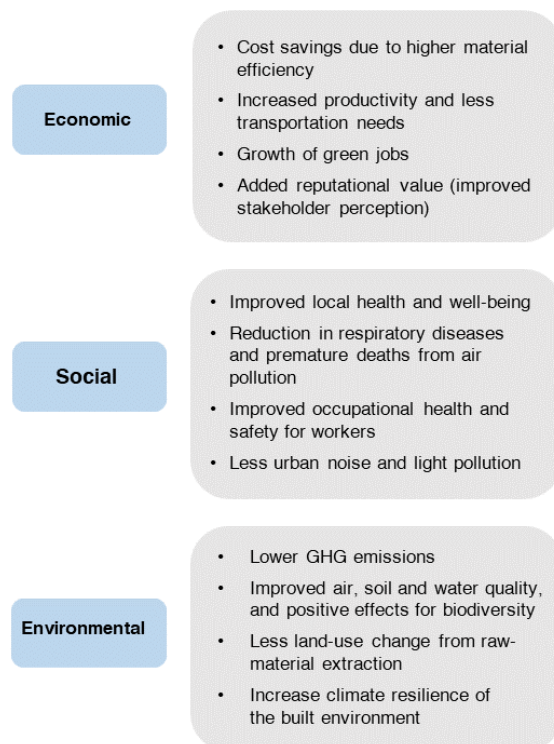


Figure 5: Benefits of Clean Construction

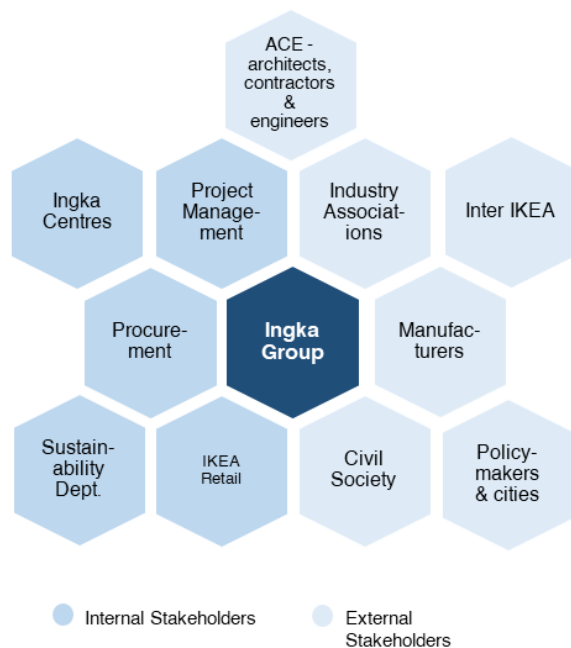


Figure 6: Stakeholder Map

Clean Construction at Ingka Group

Current common practice within the Ingka Group is to follow the three approaches mentioned below. Although, these approaches in their current form take on many aspects from the hierarchy, no central approach yet exists to the emerging concept of clean construction.

1. Building Certificate schemes, specifically LEED (Leadership in Energy and Environmental Design) and BREEAM (Building Research Establishment Environmental Assessment Method).
2. Local and national regulation for the construction sector: permit clearances, building codes, emissions standards, legislation on waste management.
3. Internal standards and guidelines: *IWAY Standard 6* (IKEA’s current supplier code of conduct) and Inter-IKEA design guidelines.

Best Practices

The C40 hierarchy allows for numerous measures and practices for advancing clean construction. Throughout the project, in interviews and through literature reviews, best practices were found for each of the hierarchy’s steps.

A selection of best practices, found both within and outside of Ingka Group’s current processes, are presented below. The aim of these success stories is to serve as inspiration and facilitate wider adoption of similar programs.

Step 1: Prioritise existing assets

IKEA Store – Paris La Madeleine. In 2019, Ingka Group expanded into the heart of the French capital by taking over an already existing shopping floor space. By expanding into an existing building asset and renovating it to fit its new purpose, Ingka Group was able to considerably lower the embodied carbon of the store.

Step 2: Plan and build for the future

IKEA Store – Vienna Westbahnhof. Opened in 2021, the building facade is covered by 160 trees. Applying greenery to buildings and urban infrastructure effectively cools the surrounding areas and reduces the so-called heat island effect. The Westbahnhof store is estimated to lower neighbourhood temperature by up to 1.5 °C on a warm day.

Step 3: Efficient and low carbon material

Use of recycled materials in India. In India, the low availability and poor quality of natural sand has led to a growing demand for manufactured sand (M-sand). Cities like Delhi and Ahmedabad process the Construction & Demolition waste to produce building materials like paver blocks and aggregates. These innovative materials and building blocks are providing a sustainable alternative to virgin natural materials whilst ensuring circularity.

Step 4: Efficient and low-carbon material

Clean and lean construction. The city of Oslo. By introducing tough and ambitious procurement requirements, Oslo has reduced construction sector emissions significantly. In a 2019 pilot project, Oslo carried out the first ever zero-emission urban construction site, using electric machinery and biofuels for material transport.

Unearthing the Results

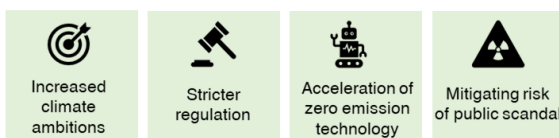
Clean construction is about creating net-zero, climate resilient and socially just built environment systems. The section breaks down our results and analysis into tangible and practical information to be used by the Ingka Group and potentially C40. Insights and feedback from the internal workshop conducted by the team were incorporated into the final results. Unearthing the results is divided into three parts:

- Barriers and Drivers (Global & Local)
- Recommendations (Ingka Group)
- Feasibility Matrix (Ingka Group)

Barriers and Drivers

There are several factors that influence the adoption of clean construction measures, on the one hand aspects with potential to drive change and on the other hand aspects that defer development of cleaner construction. Some factors are global in the sense that they affect the construction sector across the world, while others are more relevant to the specific local context of the Indian case study.

Drivers



Global drivers of clean construction practices include, but are not limited to, 1) an increased ambition on climate change mitigation, both among states and the business community, 2) stricter regulatory environment on polluting

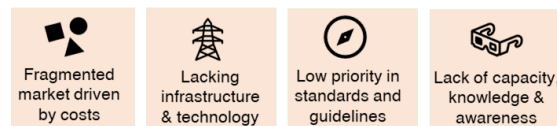
activities (i.e., air emissions, soil and water contamination and waste management) and 3) a rapid acceleration of low- and zero-emissions technologies. As for most companies cost savings, environmental leadership, improve brand image and internal learning and capacity building are possible additional benefits when adopting clean construction practices.



Local drivers that influence clean construction include 1) investments in renewable electricity generation and biofuels, creating possibilities for low- to zero-emissions construction vehicles and machines 2) a growing challenge of disposing waste due to limited landfill possibilities in urban areas and 3) a pressing need for reducing harmful pollutants from construction projects, a concern which is growing among authorities and citizens. Emissions to air is a major health issue in India. In Delhi, four out of ten children suffer from respiratory diseases [8].

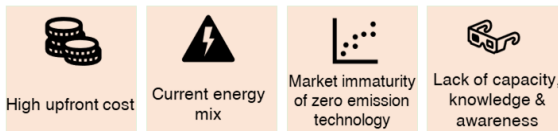
Further, local regulations can play an important role in advancing clean construction practices in Gurugram. For example, the Bureau of Indian Standards has recently allowed the use of concrete made from recycled material and processed construction and demolition waste and stricter vehicle emission standards have recently been adopted as part of the Bharat Stage Emission Standard (BSES) system.

Barriers



Global barriers include numerous internal and external barriers. They have been identified and consolidated into general themes. On a global level, the fact that the construction sector is both heavily fragmented and cost driven is a central barrier for cleaner construction, together with a lack of infrastructure (e.g., renewable energy

generation, charging infrastructure and alternative fuel supplies, waste management facilities, systems for material reuse, etc.) and low technology readiness levels in several regions. Further, prioritization appears to be low. Global standards such as LEED and BREEAM give little attention to reducing a building’s embodied emissions footprint, and as the project client point out, the internal guidelines do not yet fully address these issues. Finally, capacity and knowledge shortages, as well as low awareness of more sustainable construction practices are major barriers within and outside the Ingka Group both locally and globally.



Local barriers are similar to several of the global barriers, applying to the local context of Gurugram. However, four aspects were identified as specific to the Gurugram/Indian context. Firstly, while actors in certain regions have begun to accept higher costs from implementing cleaner construction practices, the market in India is still cost driven. Further, there are currently no subsidies or other regulatory mechanisms incentivising such measures, and enforcement on local waste and air pollution legislation is seen to be weak. Combined with market immaturity for zero-emissions technology, opportunities to advance clean construction in India appear quite limited.

Secondly, current electricity generation depends largely on coal and oil and utilizing it for powering electric vehicles and construction machinery is evidently counterproductive.

Recommendations: Practical Solutions for Ingka Group

As a result of the project a set of recommendations for implementing clean construction in construction development projects was developed. These aim to express a complex transition in a tangible way, allowing for integration in to established structures and work processes. A central learning from the literature review is to

improve clean construction performance by considering the lifecycle of the entire project period, from the initial conceptual stages to the finalisation [9]. Thus, C40’s Construction Hierarchy is used as a framework to make the guidelines more comprehensive. Out of the 10 recommendations listed below, some of could be implemented individually, however, most are interconnected and overlap, calling for a holistic approach to implementing it.

1. Brownfield expansion and refurbishment of existing buildings should be prioritized over greenfield expansion if overall project characteristics allow for it. If greenfield expansion is carried out, the opportunity for positively contribute to the local surroundings should be seized.
2. Pursue modular designs and off-site prefabricated solutions manufactured locally. This is supported by the development of simple designs ensuring reuse of old structures, resulting in minimal on-site construction and deconstruction waste.
3. Design to incorporate nature-based solutions into the buildings to increase performance of the building and improve overall well-being of the environment and humans. Examples include incorporating passive lighting and ventilation, using native plants and trees, green roofs, rain gardens, and permeable surfaces to reduce rainwater run-off.
4. Throughout the design and construction phase benchmark environmental and social impact of potential materials and designs, using LCA (Life Cycle Assessment) and BIM (Building Information Modelling) integration, along with the already established selection criteria of cost and convenience. This facilitates environmentally informed decision making, optimising energy, water and material efficiency for all the relevant lifecycle stages and synergies with sustainability analytics and reporting.
5. In procurement of architectural and construction services, social and environmental selection criteria should supplement established criteria on cost and delivery. These criteria should be market specific.

6. Specify environmental criteria for construction performance in the code of conduct. Stating disqualifying for maximum emission values for construction materials and activities. This document should also include requirements for data collection including on-site fuel, energy, and water consumption and waste generation.
7. Guidelines for attaining pilot credits and local credits from BREEAM and LEED certification schemes should be pursued, encouraging market development and higher building ratings.
8. Prior to the project tender offer, develop market profiles for individual markets identifying key external stakeholders to collaborate with, the best available construction machinery and materials, and potential for reusing local materials in initiating construction projects.
9. Guidelines for lean construction practices on the construction site should be developed and made available for on-site construction contractors. For example, on-site waste segregation increases productivity, saves time and ensures health and safety of the workers.
10. Finally, the best available technology and materials should be used depending on market availability, when the initial market assessment

deems it appropriate the use of fossil run construction and machinery should be disallowed.

Figure 7 provides an overview of these 10 recommendations. Most of the recommendations fall under the second phase of the hierarchy; plan, design and build for the future. This implies that solutions must be incorporated early on in the project process, already from the design phase. These initiatives will in turn affect the following stages of the hierarchy, multiplying its effect. Additionally, when implementing these recommendations, it is key to consider who the change agent is and at what point of the construction process it applies. Figure 8 presents a simplified model of the construction process placing each recommendation according to key decision and implementation points.

General Recommendations: Conditions for Facilitating Change

Additionally, we recognised some general conditions that need to be in place for the successful implementation of the recommendations mentioned above. These general recommendations span across all stages of the hierarchy.

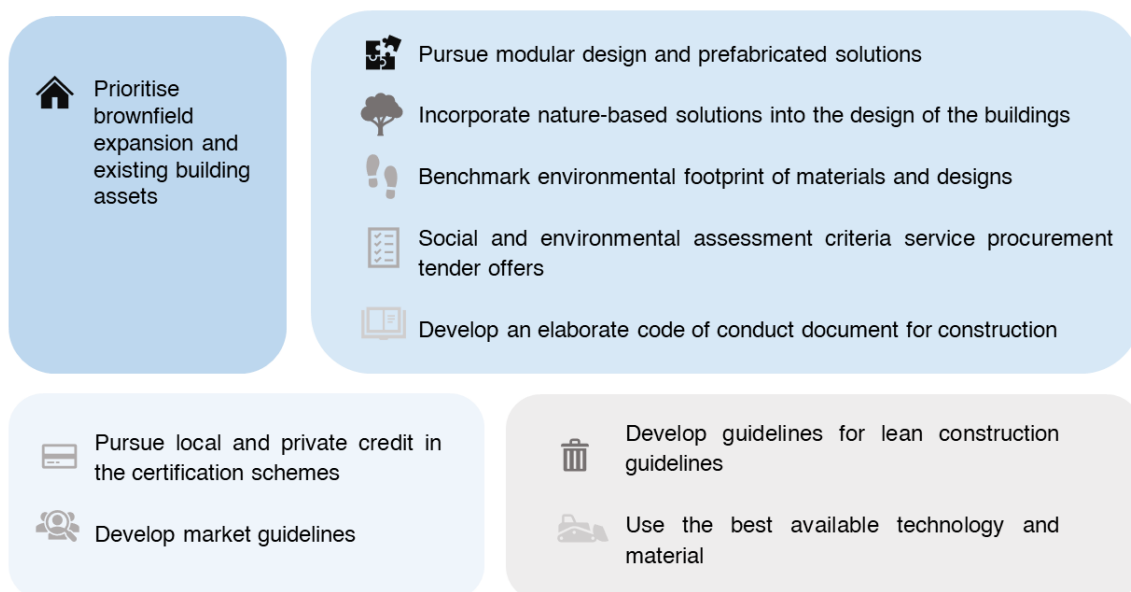


Figure 7: Summary of Recommendations for Clean Construction Practices

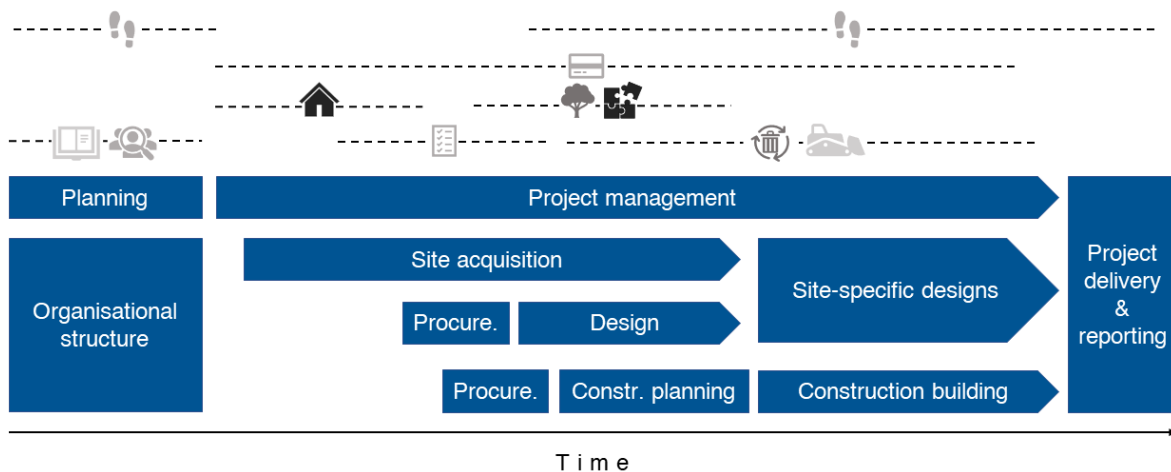


Figure 8: Intervention Point Mapping

The industry must focus on three main aspects:

Stakeholder engagement and collaboration to initiate early market dialogue with the industry actors, cities and policymakers to enable knowledge sharing and market innovation.

Multi-stakeholder pilot projects can help solve the chicken-and-egg situation between the industry, the market and regulators by generating positive incentive mechanisms.

Internal change management by building capabilities of professionals and workers and educating them on the value of clean construction. This helps in internal and external alignment to commit towards clean construction.

Communicating case studies and learnings from success projects on a global platform to scale and allow for broader uptake. The benefits of clean construction can be shared through project examples on visible sites to the local communities to build awareness around this topic.

Feasibility Matrix

Implementing clean construction measures at the Ingka Group is limited by two main constraints in varying degrees depending on market characteristics. Firstly, cost constraints for sustainable alternative activities and/or materials. Secondly, implementation feasibility in the local context of the project. The feasibility matrix, as shown in Figure 9, rates global

recommendations according to these constraints, while suggesting implementation strategies which are explained through the following steps:

1. *Cost saver potential* and *internal dependency* (top right) is recommended to be implemented globally.
2. *Cost-saver potential* and *external dependency* (bottom right) can be feasible for local implementation in developed markets.
3. However, global implementation is not feasible. Local feasibility assessment of individual markets is recommended. When not feasible, a high level of collaboration with relevant external stakeholders is encouraged to increase feasibility.
4. *Cost driving potential* and *internal dependency* (top left) can be implemented globally to take a front-runner position within Clean Construction.
5. *Cost driving potential* and *external dependency* (bottom left) implies market maturity is needed. To take a front-runner position, acting as a sustainability leader in the industry, it is recommended to express interest in developing and pushing the market by collaborating with external stakeholders to encourage development.

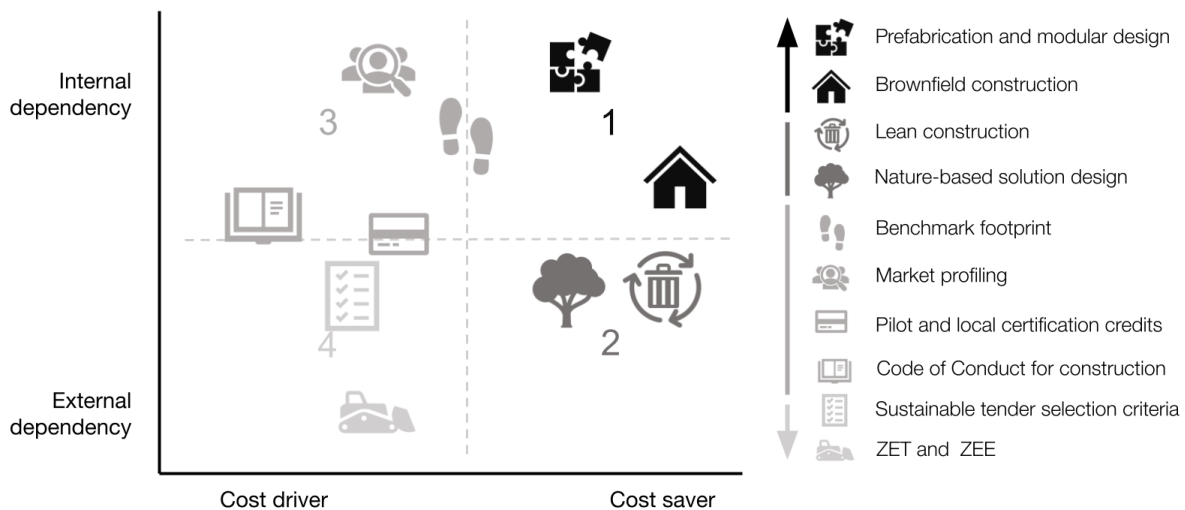


Figure 9: Feasibility Matrix

Conclusion

The topic of clean construction is still emerging, and the construction sector has long been neglected in the sustainability debate. Thus, the consulting group identifies gaps of know-how and capacities within the sector. In many ways, the industry must mature, to effectively become climate neutral. The team, together with the big group of experts and managers interviewed, see huge potential to save carbon emissions, to reduce environmental pollution and to increase welfare.

Ingka Group has made a shift in strategy, complementing its remotely located blue boxes by opening new customer meeting points in city-centre locations. Thus, the process of construction becomes important for the Ingka Group, opening opportunities as well as challenges. With a stated objective of *becoming people and planet positive*, the company has started an ambitious journey to develop a systematic approach to clean construction practices. This puts the Ingka Group in a unique position to become a sustainability leader in the industry.

In this context, influencing the flow of building materials should be the main focus to save carbon emissions while reducing cost. New procurement guidelines and lean building processes are crucial levers to achieve these benefits. Nonetheless, this indicates a great challenge for

organisational change, i.e., building stronger capacities on clean construction and a mind shift of organisational behaviour. The construction industry needs to embrace the C40 Cities Clean Construction Hierarchy in order to approach this issue holistically and to tackle these issues from multiple perspectives at the same time. With strong and influential leaders such as Ingka Group and a joint movement of the stakeholders in the industry, e.g., cities, legislators, manufacturers, contractors, citizens and consumers, change in the sector is possible.



Team Photo with the Supervisor, Håkan Rodhe and Planet Earth

References

- [1] Lizhen Huang, Guri Krigsvoll, Fred Johansen, Yongping Liu, Xiaoling Zhang. (2018). Carbon emission of global construction sector. *Renewable and Sustainable Energy Reviews*. Available at <https://doi.org/10.1016/j.rser.2017.06.001>
- [2] UNEP. (2018). The weight of cities. Available at <https://www.unep.org/news-and-stories/story/weight-cities>
- [3] CSE. (2020). Another Brick off the Wall. Available at <https://www.cseindia.org/another-brick-off-the-wall-10325>
- [3] Aishwarya Sriram. Invest in India – Construction Sector. (2021). Available at: <https://www.investindia.gov.in/sector/construction>
- [5] One Click LCA. (2021). Life Cycle Stages. Available at: <https://oneclicklca.zendesk.com/hc/en-us/articles/360015064999-Life-Cycle-Stages>
- [6] C40 Cities. (2020). Why cities need to address the construction sector’s hidden emissions. Available at: https://www.c40knowledgehub.org/s/article/Why-cities-need-to-address-the-construction-sectors-hidden-emissions?language=en_US
- [7] C40 Cities. (2020). How to reduce embodied emissions in municipal construction and lead by example. Available at: https://www.c40knowledgehub.org/s/article/How-to-reduce-embodied-emissions-in-municipal-construction-and-lead-by-example?language=en_US
- [8] Salvi et al. (2021) Association between Air Pollution, Body Mass Index, Respiratory Symptoms, and Asthma among Adolescent School Children living in Delhi, India. Available at: <https://pubmed.ncbi.nlm.nih.gov/34472517/>
- [9] Benachio et al. (2019). Green Supply Chain Management in the Construction Industry: A literature review. Available at: <https://iopscience.iop.org/article/10.1088/1755-1315/225/1/012011/meta>

List of interviewees:

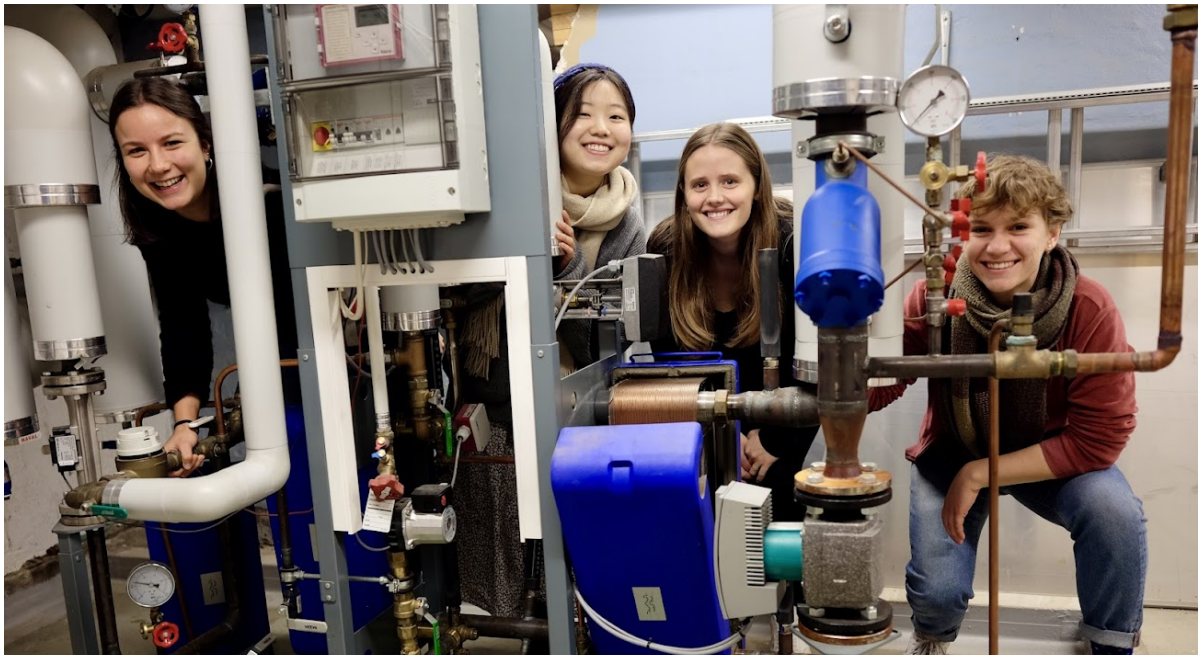
- Nußholz, Julia. Researcher & Project Manager. Saint Gobain. 08 October 2021.
- Kuricheti, Siva Ram. Technical Design and Engineering Manager. Ingka Group. 08 October 2021.
- Lis, Paulina. Technical and Policy Adviser. C40 Cities. 11 October 2021.

- Martenson, Philip. Senior Advisor. Climate Agency City of Oslo. 13 October 2021.
- Bruzell, Susanna. Sustainability Strategist. Lunds Kommun. 13 October 2021.
- Gorpade, Ashish Rao. Deputy Director South Asia. ICLEI. 13 October 2021.
- Garaud, Cecile. Clean Construction Programme Manager. C40 Cities. 14 October 2021.
- Cordoba, Linda. Expansion Manager Assistant. Ingka Group. 14 October 2021.
- Andersson, Johanna. Senior Project Leader. IVL Swedish Environmental Research Institute. 14 October 2021.
- Sen, Isha. Former Delhi Resident. IIEE. 14 October 2021.
- Mehta, Prerna Vijaykumar. Associate Director. World Resources Institute. 15 October 2021.
- Aasrud, André. Senior Clean Construction Advisor. C40 Cities. 15 October 2021.
- Guzmán, Emilio. Sustainability. IKEA. 15 October 2021.
- Sandilya, Srikar. Vice President. EY India Delhi Office. 15 October 2021.
- Devreese, Tessa. Clean Construction Programme Officer. C40 Cities. 18 October 2021.
- Narayan, Shruti. Regional Director South and West Asia. C40 Cities. 18 October 2021.
- Sindler-Larsson, Sandra. Establishment Manager. Ingka Group. 21 October 2021.
- Mahapatra, Sushmita. Real Estate Architect. Ingka Group. 20 October 2021.
- Grover, Sugeet. Programme Officer. Centre for Science and Environmental, New Delhi. 21 October 2021.
- Pedersen, Tom. Engineering Leader. Ingka Group. 22 October 2021.
- Kristian, Gerdsson. Engineering Manager. Ingka Group. 22 October 2021.
- Bravo G, Maricruz. Former Assistant Project & Cost Engineer. Turner Construction Company. 25 October 2021.
- Van Campfort, Nele. Former Strategy Business Development Manager & Circular Economy Specialist. Volvo Construction Equipment. 25 October 2021.
- Goesta Hornell, Per Erik. Expansion Manager. Ingka Group. 26 October 2021.
- Heldt, Lisa. PhD Researcher. IIEE. 28 October 2021.



LOW-CARBON HEAT TRANSITION

Nomad Energy



From left to right: Anna, Jihyun, Katla and Flora

Acknowledgments

We would like to thank IIIIEE for organising such engaging projects during these unusual and often challenging times. Getting a chance to work with the “real world” was a valuable experience. We thank our very supportive supervisor Lars Strupeit who gave us encouragement throughout. Also, thank you to Åke Thidell, our Fundamentals of Technical Systems teacher, for teaching us all the basics about heating technologies. A big thanks also goes to our classmates of EMP batch 27; this project has shown once again what a great support network EMP is, and we appreciate all the valuable comments, insights, provision of snacks and mental support. We are immensely grateful to our interviewees who responded to our questions with enthusiasm and energy, provided us with further connections, and spurred us on as we progressed. Finally, we would like to thank our contact at Nomad Energy, Peter Öhrström for supervising the project and being of great support throughout.

The Team

Anna Kraus is from Germany and holds a bachelor’s degree in International Business Administration. She has working experience in energy and environmental policy consulting and research, and the environmental NGO sector.

Flora Dicke from Germany obtained her bachelor’s degree in Philosophy, Politics and Economics. Throughout her studies, she gained work experience in sustainability and environment research.

Katla Eiríksdóttir from Akureyri, Iceland holds a bachelor’s degree in Tourism Studies with a minor in Business Administration where she focused on the CSR practices of tourism companies operating on glaciers.

Jihyun Park from South Korea holds a bachelor’s degree in Political Science. She has working experience in Environmental NGOs and an organisation dealing with ESG. She is interested in energy transitions and the circular economy.

The Low-Carbon Heat Transition in the UK

Enabling Heat Pump and Heat Network Readiness by Changing the Heating Regime

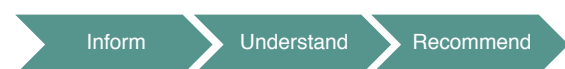
By Flora Dicke, Katla Eiríksdóttir, Anna Kraus, and Jihyun Park

Introduction

Context, Task & Objectives

The UK building stock is very old and heating is heavily dependent on gas. The current outrage about soaring gas prices in the UK, but also the COP26 held in Glasgow in November 2021, make the energy market of the UK a highly discussed topic. Additionally, the devastating consequences fossil-fuel dependent systems have on the mounting climate crisis call for urgent action and decarbonisation of the heating system. Against that backdrop, Nomad Energy conducted initial research projects focussing on a shift in heating behaviour that will eventually lead to an easier and more efficient transition towards low-carbon heating systems. By shifting to a constant heating regime and cutting peak demands, maximum capacity needs of heating technologies can be reduced. Thus, costs for installing low-carbon heating technologies will be reduced, driving the transition forward.

This research project is embedded in this context and can be divided into three parts: informing, understanding, and recommending.



We set out to raise awareness and inform various stakeholders about Nomad's proposal: changing the heating regime. Furthermore, we wanted to understand the different perspectives of stakeholders, to determine whether or not they are aware of the outlined approach, and to identify their perceived barriers and drivers. Finally, our task was to develop recommendations for future action.

The Client

Nomad Energy Solutions Ltd. (Nomad) is an Edinburgh, UK, based consultancy focusing on improving the energy efficiency, carbon performance as well as comfort and health performance of commercial, public, and industrial buildings. Nomad is innovative in its deployment of data and analytics and makes use of Artificial Intelligence to prepare buildings for the net-zero transition and alter their energy management.

Research Approach

To gain a thorough understanding of the background about the current technical status quo of the UK heating system as well as heating behaviour, we began reviewing relevant documents forwarded by the client as well as academic articles found throughout a literature review. Based on this initial research we identified different stakeholders involved and grouped into five categories: political actors, end customers, associations & networks, suppliers, and consultancies. To present our project to potential interviewees, we created a flyer including background information on the challenge and solution approach. Subsequently, we approached representatives from the different stakeholder groups and conducted 15 semi-structured interviews and one email interview. Following, we summarised key findings and identified the main drivers, barriers, and recommendations the interviewees shared. In addition, we facilitated a workshop with our client to present the findings and develop more concrete steps for ways forward.

Please note that interviews will not be cited due to disclosure agreements.

Background: UK Heating

In 2019, the UK passed laws to reduce its greenhouse gas emissions to net-zero by 2050. As heating counts for more than 20% of the emissions in the UK, there is both the need and the potential for large emissions reductions. To meet the net-zero target, the heating of the UK's building stock needs to be fully decarbonised by 2050 at the latest. [1]

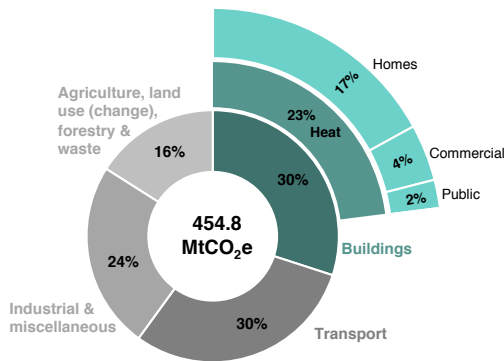


Figure 1: UK Emissions 2019
Adapted from [1, p.23]

However, looking at the current building stock in the UK, several challenges arise that hinder an easy decarbonisation of the heating system. First of all, the UK housing stock is very old, the oldest in Europe and most likely in the world, and thus building envelopes are often in poor condition. Bad insulation leads to high heat losses and inefficiencies. Furthermore, there is a high gas dependency, and over 80% of the dwellings are equipped with individual gas-fired boilers. Alternative heating systems, like District Heating Networks (DHN) or Heat Pumps (HP), are not very common. Only 2-3% of dwellings are connected to DHN at the moment, and the UK is lagging behind other European countries regarding HP installations. Studies have shown that the millions of gas boilers in the UK produce twice as much carbon emissions and eight times as much nitrogen dioxide than the nations gas-fired power stations combined. NO₂ emissions are linked to tens of thousands of early deaths a year in the UK. The Confederation of British Industry recently stated that to meet the UK's net-zero target, the installation of new gas boilers should be banned from 2025 on. [2]- [4]

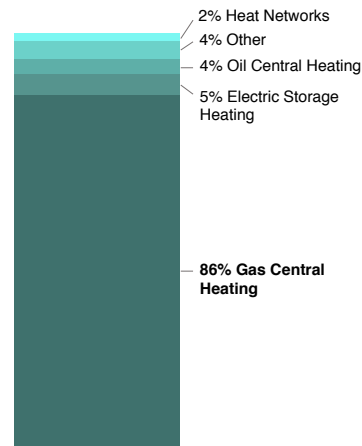


Figure 2: Different Sources of Heat in England
Adapted from [1, p.83]

As the housing stock in the UK changes very slowly over time, it is expected that the existing building stock will continue to be the major determining factor in the heat demand of decades to come. Thus, solutions must focus on improving and retrofitting the current dwellings rather than replacing them with new buildings. [4]

District Heating Networks in the UK

DHN supply the heat for buildings from a centralised heating source and then transfer the heat through insulated pipes to the customers. Thus, individual boilers in the dwellings are no longer necessary. Potential heat sources for the UK's DHN are mostly seen in waste heat from industry and heat from rivers and mines, making DHN highly valuable in the push for a more circular and sustainable economy.



District heating pipes for a new building in Lund
(Own Picture)

Certain characteristics of the UK heating market make the implementation of DHN challenging. These include the high share of natural gas, liberalised energy markets, and a highly centralised energy system with little involvement of local or regional stakeholders. However, DHN are seen as one important part of the puzzle to decarbonise the UK's heating and thus, the topic has found its place on the political agenda in the UK in recent years. It is estimated that to meet the UK's carbon targets cost-effectively, roughly 20% of the heat supply will need to come from DHN by 2050. [5], [6]

Heat Pumps in the UK

HPs are seen as a beneficial replacement for gas boilers in buildings situated in low-density areas. Generally, HPs run on electricity used to extract low-grade heat from a (ground, air, or water) source and convert it into high-grade heat for space heating. While the environmental performance of HPs depends on the electricity mix, it is recognised that they usually lead to substantial emission reductions compared to gas boilers. Furthermore, they are more efficient, and thus, the typical final energy required for heating can potentially be cut by four or more.



*An air source heat pump outside private housing
(Unknown Author, licensed under CC BY-SA-NC)*

In the UK, the HP market is still small. One major reason is the current gas grid: the majority of dwellings is supplied with gas, and those high-temperature systems are often incompatible with low-temperature technologies like HP. However, in transitioning to a low-carbon heating system, HP play an important role. This has also been recognised by political actors, and in

2020, the government announced the objective to enhance HP installations. Additionally, governmental funding programmes exist to support the consumer uptake of HP. [7], [8]

Challenge and Proposed Solution Approach

This research project is embedded in the question of how the low-carbon heat transition can be achieved in a cost-effective manner to build efficient new heat systems. Cost-effectiveness can, amongst other intervention points, be achieved by designing DHN and installing new infrastructure – like HP or pipes for DH – matching the actual capacity needs. Hence, a correct estimation of these capacity needs is crucial. This can be enabled by a consumer behaviour shift to a low-temperature constant heating regime early on in the transition process.

Looking at current consumer heating behaviour in the UK, building users tend to switch off the heating during the night (night-setback regime), which leads to a high demand for heating in the morning and a peaky heat profile (see Figure 3). While currently used individual gas-fired boilers are able to meet these demand peaks, certain challenges emerge when transitioning to a modern low-carbon heating system that consists of DHN and HP. The modern generations of such technologies are low-temperature systems operating at flow temperatures (the water temperature that is going into the radiators) of around 55-60°C and return temperatures (the temperature of the water after flowing through the radiators) around 40°C. Yet, currently deployed gas-boilers are commonly run at high temperatures; flow/return temperatures are around 82°C/71°C. These high temperatures, combined with the fact that in the UK heat emitters are rather large, enable rapid space heating especially in the morning after the heating was switched off at night. Systems running at lower temperatures, however, cannot achieve such a rapid heat-up.

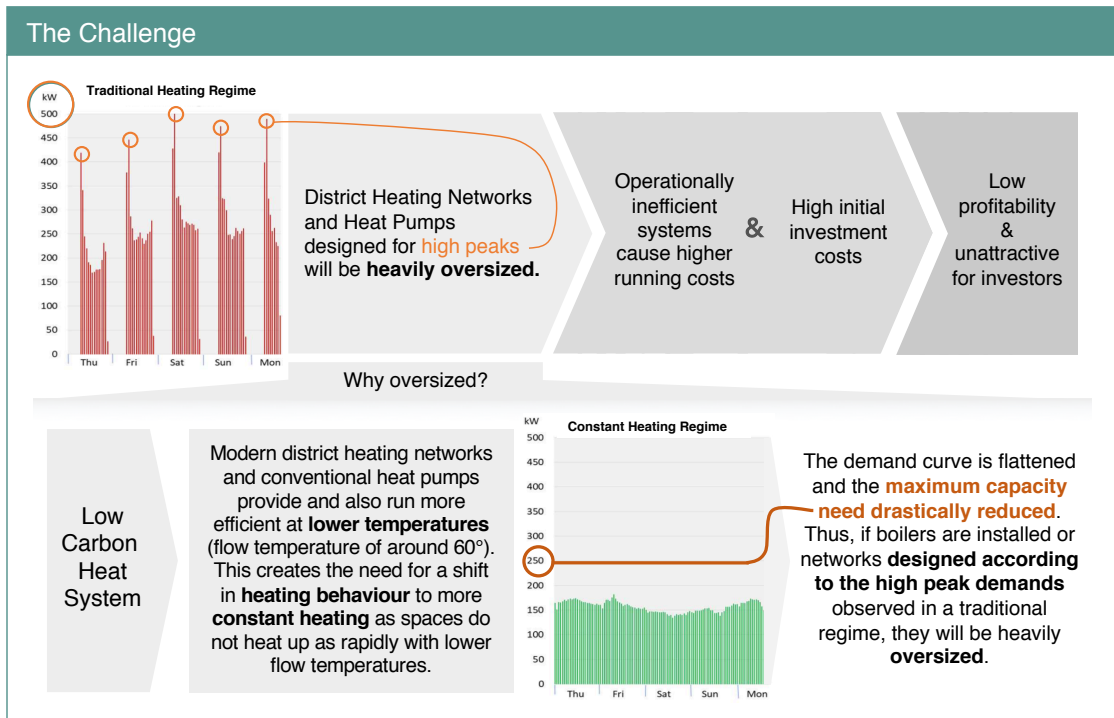


Figure 3: The Challenge

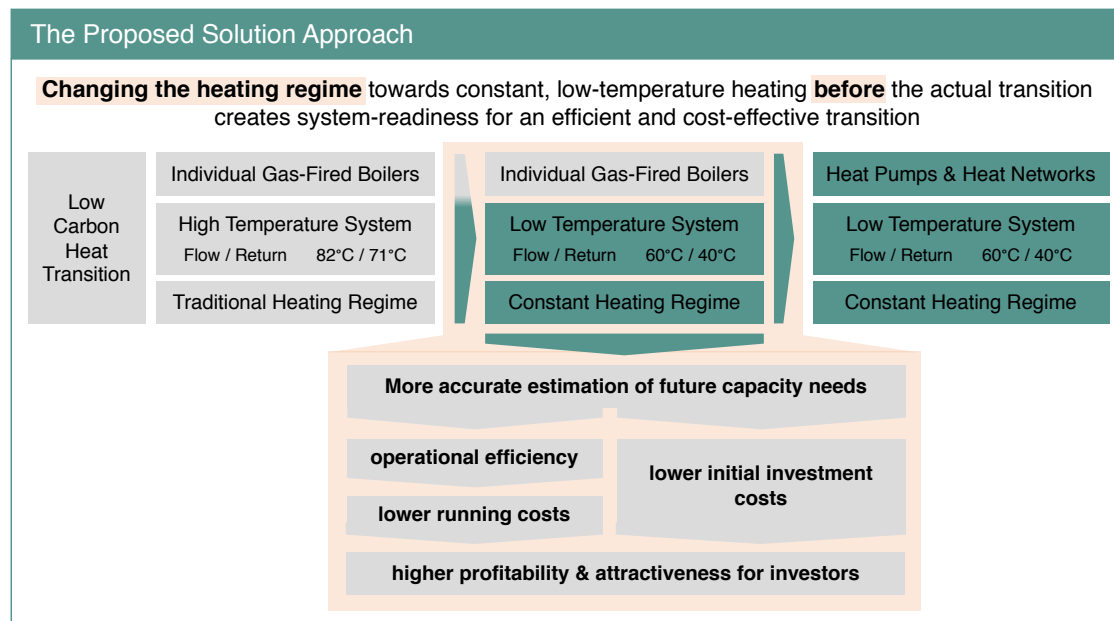


Figure 4: The Proposed Solution Approach

Yet, low-temperature systems increase efficiency as overall heat losses are reduced and come along with a broad array of benefits. [3]

To ensure comfort, however, a low-temperature system roll-out should come along with a heating behaviour change towards a constant heating regime. This is because lower temperatures only allow for a slow space heat-up

However, if low-temperature heat networks and heat pumps are designed and installed to cover the demand peaks caused by a night-setback regime, they would likely be over-dimensioned. This is because the constant heating – which is anyways required in a low-temperature system – flattens the demand curve and allows for an overall lower capacity. An example: an office

building run on a night-setback regime requires a boiler with a 500kW capacity to cover morning peak demands. If the building is run on a constant-heating regime, demand peaks never exceed a capacity need of 250kW. Hence, a smaller boiler would be enough to fulfil the heat demands of that office building. If, however, a new HP is installed based on the capacity of the old gas-boiler which covers the high morning peaks caused by a night-setback regime, the capacities of the new HP will exceed the capacities it will have to cover in a low-temperature constant heating regime

Thus, a promising, low-cost approach to attain a transition-ready heating system is to *focus on consumer behaviour*: There are strong indications that if building users and facility managers change their heating habits and, instead of turning off the heating at night, keep it running constantly, demand peaks can be avoided, and a flat heat profile achieved. If this behaviour change towards a constant heating regime is achieved *before* new low-carbon systems are designed and installed, capacities for the latter can be designed according to the actually needed (lower) capacities a low-temperature constant heating regime requires. This will result in *operational efficiency* – and resulting cost savings – as well as *lower initial investment costs*. Thus, profitability is higher which makes the transition more attractive for investors and consumers.

Next to more accurate sizing, constant low-temperature regimes have positive effects on indoor air quality and climate, comfort, health and safety as well as the durability of the in-house heating infrastructure.

Research Outcomes

Stakeholders: Level of Knowledge

As the topic of heating is very broad and affects a wide range of actors, either from the use-, supply-, or control-side, the initial list of identified stakeholders was long. Thus, we decided to group them into five categories that seemed most important for the transition: political actors, associations & networks, suppliers (of

DHN and HP), end customers, and consultancies. After the stakeholder identification and mapping, we conducted interviews with representatives from each group. It was specifically challenging to reach end-customers in this process; however, we were able to fill this gap by interviewing researchers focussing on end-customers. After analysing their responses, we gained a host of meaningful research outcomes.



Figure 5: Identified Stakeholder Groups

Within the stakeholder groups, there was a *common agreement about the need for low-carbon technologies* in the heating sector and the benefits of achieving that in a cost-effective manner. However, most of the stakeholders were *not aware of the solution proposal* and the advantages of shifting the heating regime before switching heating infrastructure. Yet, after receiving our explanation, most stakeholders reacted positively and agreed that the *proposal sounds reasonable*. A common point of scepticism, however, concerned the question of whether all building types would benefit from an early shift in heating regime: *"fabric-first thinking"* was predominant, meaning that stakeholder deemed the improvement of the building envelopes to be of greater importance than shifts in consumer behaviour. Furthermore, behavioural aspects were brought up in the majority of the interviews, with a common understanding that those would be hard to address as habits

and routines are difficult to change. Talking to installers and consultancies, it was confirmed that the solution proposal is not a common practice: when installing new infrastructure, the capacity is usually installed based on monitored historical demand data, and expected behaviour change is not considered.

Stakeholders: How to Get Them on Board

Since the five stakeholder groups play important roles in the heat transition process, developing an understanding for how to get them on board to support the transition is crucial.

Political actors usually deal with a range of topics, need to balance trade-offs, and have other concerns beyond environmental issues. Thus, they can be convinced by arguments around cost savings, consumer convenience, and health and safety. Nevertheless, more detailed empirical data and case studies on the solution proposal are needed to get political actors involved in the transition process.



UK Parliament, London
(Unknown Author, licensed under CC BY-SA-NC)

Suppliers usually tend to focus on technical aspects with regards to heating systems, and behavioural aspects are not a commonly discussed topic. Thus, there is a need to demonstrate the advantages of including consumer behaviour in their work. Advocating for continuous improvement of building standards and regulation can be another way of getting suppliers involved in the process, since those guidelines are strong signals to the market and suppliers.

Associations and networks, are mostly concerned about providing benefits to their member organisations, thus, highlighting what benefits they can get through the transition (e.g., lower maintenance cost, higher convenience) is an efficient way of engaging them.

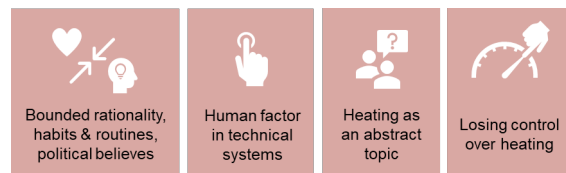
For *consultancies*, helping them to communicate the advantages of a constant heating regime to their customers is needed to get them on board. Additionally, they can be an ally in supporting strong government regulation, as strong guidelines usually help them to convince their customers to adapt to changes. Thus, with strong government regulations, consultancies can play a crucial role in re-designing the heating regime.

Lastly, for *end-customers*, it is important to convey the solution proposal with an understandable and easy language. In addition, it is crucial to understand their barriers (strong routines, concerns around costs etc.), and address those. Benefits of the behavioural shift such as cost savings, a lower environmental impact and higher convenience should be highlighted.

Barriers and Drivers for a Heating Regime Change

Numerous barriers and drivers were common among the five stakeholder groups and will be further elaborated in the following.

Barriers






Habits and routines preventing customers from switching to constant heating were the foremost mentioned barrier by most interviewees. Fundamentally, humans do not act *rationally*; thus, even if they have knowledge of what should be done, they might still behave differently. *Political beliefs*, such as denying climate change and general opposition to decarbonisation efforts, were also mentioned in terms of rationality. Fur-

thermore, the *human factor in relation to technical systems* has to be considered – even if people have automation systems, there is usually a way for them to bypass the system, resulting in suboptimal heating settings.





Moreover, most of our interviewees believe that most people neither understand heating nor their heating bills as they find the topic very *abstract*. Finally, moving away from gas boilers and toward low-temperature systems implies that people will feel that they are *unable to control their own heating*. This can be a significant barrier because people appear to have a strong preference for being able to control the temperature in their homes, turning the heat up high in the mornings and when they return from work. People *lose that control* to some degree when using a low-temperature system. Additionally, especially in the case of DHN, the apparent “loss” of a gas boiler or source of heat generation in the building can give people a feeling of losing control over their heating.

"There is a lack of understanding from customers, they might think that bad insulation and constant heating regime means constant heat loss as well."

 <p>Highly centralised political landscape around heating</p>	 <p>High initial costs of HP & DHN; traditionally low gas prices</p>	 <p>Strong narrative that turning heating off saves costs & emissions</p>
--	---	--

The narrative about heating in the UK has long been that *turning off the heat saves money and reduces emissions*. This can be seen as a big barrier, and people might think it is counter-intuitive to leave heating on constantly. *High initial costs* of HPs and DHN is further considered a barrier, especially when compared to a typical gas boiler. As a result, many individuals are hesitant to make the changeover. Furthermore, *traditionally low gas prices* tend(ed) to decrease the profitability of a switch to HP and DHN even more. The *highly centralised political landscape* around heating in UK is also important to consider. Traditionally, decisions about heating policy and infrastructure in the UK are decided

from the top down. Local or community engagement in energy-related decisions is low. For the transformation to a low temperature regime, a more inclusive bottom-up strategy which incorporates local knowledge and input will be required, especially for DHN.

 <p>Scepticism that behaviour change will benefit all/most buildings</p>	 <p>Poor building envelopes & fabric first thinking</p>	 <p>Lack of skills and workforce</p>	 <p>Ventilation</p>
---	--	---	--

On the more technical side of the transition, a few barriers were identified. The *poor building envelopes* of the UK building stock, as well as the dominant thinking of *"fabric first,"* were one of the most mentioned and highlighted barriers by our interviewees: interviewees thought it was more important to address insulation issues and retrofitting measures before changing behaviour. The interviewees expressed *concerns about the various types of buildings*, claiming that changing behaviour would *not benefit the majority of buildings*. There is a lack of publicly available data to meet this scepticism and to present data-based estimations of which building types or energy efficiency standards are needed to make a constant low-temperature heating regime feasible and beneficial. In relation to the building envelopes, *ventilation problems* were especially highlighted.



Building in the UK with poor building envelope (Unknown Author, licensed under CC BY-SA-NC)

According to our interviewees, ventilation is currently a problem in the UK and will continue to be so in the future. People are accustomed to

ventilating by keeping windows open to circulate air. Moving to a constant low-temperature regime, keeping the windows open as much will not be feasible because of the heat loss. Thus, educating users on proper ventilation will be an additional task for installers.

Furthermore, a *lack of skills and workforce* was discussed. Heat pump installers will be in high demand as the UK transitions to low-carbon technologies. Concerns were raised about the quality of installations, if installers will be in such high demand that they will try to be as time efficient as possible when installing these technologies. Further, that could result in failing to take the time to properly *educate* the system's users which could lead to "wrong" heating and dissatisfied customers.

Drivers



In general, the majority of our interviewees acknowledged that by shifting to a constant low-temperature regime early on, *cost savings* can be achieved, which are an important driver for the transition. The benefits of *convenience and comfort* were also emphasised. Keeping the heat on constantly means there is less to bother about for the consumer. Another driver that was mentioned often was the one of *health and safety*. A constant low temperature can generate a better climate in homes and balance humidity, which prevents mould. In relation to safety, high-temperature technologies, with their scalding hot radiators and pipes, have long been seen as a safety hazard (e.g., children burning themselves). Additionally, there are safety risks when handling gas and the possibility of gas explosions. Finally, looking towards the future, the demand to *cool homes* will increase in parallel with rising outside temperatures. Because HP and DHN also have the potential to cool, it is reasonable to expect that demand for these technologies will rise in the future years. Highlighting this factor to customers might incentivise them

to switch their heating (and cooling) system in the long term and to enable a cost-effective transition, change their heating behaviour now.

Recommendations

Overview

Changing the heating regime is a complex transition touching upon technological developments as well as behavioural factors. This section incorporates insight from *transition theory*, research findings from behavioural science focusing on *habits and routines*, *behaviour change*, and the role of *intermediaries* as well as conclusions from *policy mix* research for a better understanding of the challenges faced and to identify future pathways for the subject at hand. Lastly, recommendations for further collection of *data* are made, focussing specifically on addressing *fabric-first thinking*.

Transition Theory of Socio-Technical Systems

Socio-technical systems such as heating systems are constellations of various dimensions: technologies, material networks (e.g., heating infrastructure), actors and organisations as well as behaviours, habits, cultures, laws and policies. Currently established socio-technical systems are oftentimes hard to deconstruct and transform. However, there are external factors that can put pressure on an established system and open a window of opportunity for a change, such as in behaviour or technical infrastructure.

Important external factors putting pressure on the current heating system in the UK at the moment include the following:

- 1) overwhelming evidence on the effects a fossil fuel-based system has and global political negotiations (recent COP26 in Glasgow),
- 2) increased public attention to climate change and calls for radical transitions from protest groups like Fridays for Future and Extinction Rebellion, and
- 3) soaring gas prices.

It is important to recognise this window of opportunity and to make use of this favourable moment in time to inform central actors about innovations, like a change in heating behaviour, and to push for them to become mainstream.

Habits and Routines

People’s habits can be difficult to address since, at their core, habits are something that people do even without thinking about them as part of their routines. Understanding habits and routines is therefore of great importance to stimulate behavioural change: as habits are “less rational” behaviours, it follows that interventions running along rational lines (e.g., relying on information or incentives) may not be able to influence these behaviours effectively” [11, p.2].

To be able to change a habit or routine, one approach is to look at the practice itself, not the rational or thinking behind it. The practice of turning on and off a gas boiler needs to be examined more closely, i.e., what are people actually doing when they turn their boiler on, what image do they see of themselves after that has been done. In order to be able to identify these elements, different stakeholders should come together to brainstorm. The stakeholders would look at the practice in question and each bring their perspective to the table. When the practice has been examined and different elements of it identified, they can brainstorm about what elements need substituting or rearranging to achieve the desired behaviour change [11].

The Building Blocks of Behaviour Change

To address the behavioural change needed for the shift in the heating regime in a systematic way, the ABCDE framework can provide useful guidance. It emphasises the fact that behavioural change should be seen as a process and maps the different phases of a successful behavioural change management [12]. The process is divided into four phases that serve as the foundation for behavioural change management: Discover, Define, Design and Deploy.

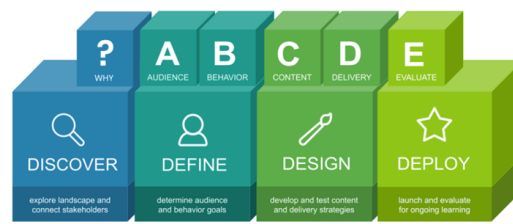


Figure 6 : “The Building Blocks of Behaviour Change” by See Change Institute [12] (© 2021 See Change Institute)

For Nomad, this framework highlights the importance of planning the behavioural change in a systematic way, building on the landscape analysis and audience determination done during this project. This will allow them to design tailored and more efficient strategies and support an ongoing learning process.

The Role of Intermediaries

Intermediary actors take on crucial roles in communicating information and values, establishing social networks, and sharing knowledge. Especially for the behavioural change that is needed with regards to the heating regime, intermediaries have to be involved. Insights from behavioural science have shown that end-customers are more receptive to change if the messenger is someone they trust. Those trusted intermediaries can be individuals or a group of people within organisations, such as frontline workers of public bodies, local authorities, non-governmental organisations, consumer associations, the banking sector, or consultancies [13].



Trusted Intermediaries in Action (Own Picture)

In that regard, Nomad can act as an intermediary themselves, by engaging in activities such as knowledge creation and the sharing of case studies, or by establishing social networks. In addition, it is crucial that they also get other intermediaries on board and find strong allies to support their mission.

Policy Mix

Shifting the heating regime is complex as it involves a large variety of actors, technological innovations, and their social application. Thus, the need for *strategic policy mixes* becomes evident [14].

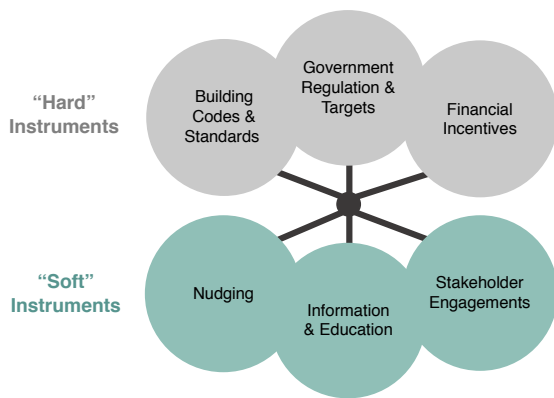


Figure 7: Instruments for a Policy Mix

A broad variety of instruments needs to be included in such policy mixes. Importantly, they should never be looked at in isolation, but rather the mix and the interaction of the different instruments should be considered. On the one hand, “harder” measures such as government guidelines, building codes and financial instruments are needed to guide the change. Firstly, *government guidelines* include both broader targets such as the UK’s net zero target to guide the general direction of the transition, as well as bans (e.g., newly installed gas boilers) or minimum efficiency standards. Second, to address the major concerns around costs, *financial incentives* are crucial and have proven to be successful in the past (e.g., the renewable heat incentive or grants for heat pumps). Differentiated tariffs could specifically target the change in heating behaviour: cheaper tariffs at night could help cutting the morning peak. Thirdly, changes in *building codes* such as the CIBSE code of

practice were highlighted by various stakeholders as being crucial to change the heating regime as they are used as major guiding documents by consultants and building managers.

However, those hard instruments often do not sufficiently account for behavioural aspects. If the human factor is not considered, those measures will likely lead to discontented customers. They might either not see the need for the transition at all, or might switch technology without changing heating behaviour, ending up dissatisfied with room temperatures. Thus, *information and education* are also crucial to include the customers in the transition. Importantly, as the topic is centred around behavioural change, simply providing information will also not be sufficient, as behavioural barriers (status quo bias, inertia) are hard to overcome. To address this, *stakeholder engagement* is crucial and should start with mapping out the relevant stakeholders and gain an understanding of their concerns, to be able to address those in the process. Continuous stakeholder feedback should also be considered to deal with challenges along the way. *Nudging* can be a helpful instrument to steer consumers into the desired direction and can be combined with technologies, e.g., setting the default in Building Management Systems to a constant heating regime.

Data Addressing Fabric-First Thinking

As mentioned before, what became evident in the majority of interviews is that while most stakeholders generally understand the solution proposal, they are sceptical that it will benefit all (or most) buildings. Fabric-first thinking was predominant, meaning that the stakeholders think that the building envelopes have to be improved first, before the switch to a constant heating regime. However, as comprehensive refurbishment of the building envelope comes with high investment costs, this thinking is a major barrier.

The first solution addressing this is *changing the narrative*. It should be highlighted that in

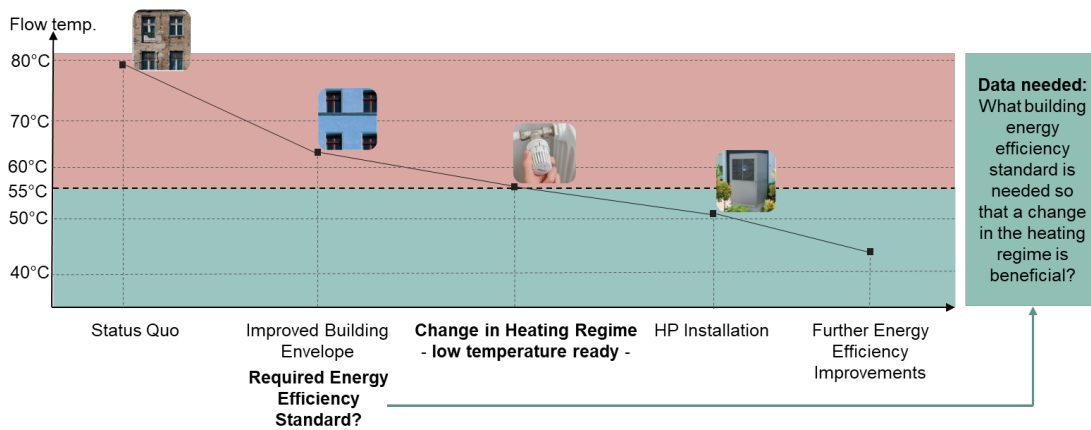


Figure 8: Data to determine required energy efficiency standard. Adapted from [15]

order to be ready for low-temperature systems, buildings do not need complete refurbishment, but rather a few targeted measures in combination with constant heating are enough. Investment costs do not necessarily need to be high, and in the long run, costs can be saved due to the improved efficiency [15].

However, while it is understood that for many dwellings in the UK a switch to constant heating would bring benefits, there is a knowledge gap with regards to what types of buildings will benefit and what building energy efficiency standard is needed. This should be addressed with further research focussing on *demonstrating the effects on various dwelling types*. Certainly, making general recommendations for all buildings without having a holistic and complex data overview is impossible. However, as it has become evident while engaging with the different stakeholders, those complete datasets are not necessarily needed. Instead, being able to demonstrate successful case studies is sufficient to convince people that the approach would work with similar dwellings as well.

Conclusion and Outlook

During this project, a thorough analysis of the UK heating market and heating behaviour has been conducted. In order to facilitate a transition towards low-carbon heating systems like HP and DHN, the focus has been on a shift in heating behaviour from a peaky heating profile due to night setbacks towards a more constant

heating regime. This brings – in most cases – efficiency improvements already with the old infrastructure, but more importantly, it enables a more cost-efficient transition to low-carbon systems. If the shift towards a constant heating regime is achieved before the new infrastructure is installed, capacities can be designed according to the actually needed (lower) capacities a low-temperature constant heating regime requires.

Various stakeholders that play a role in this transition have been identified during this project and interviews have been conducted to identify barriers and drivers they see in the transition. Most importantly, behavioural barriers such as inertia and status quo bias have to be overcome, and the common (mis)understanding that the building fabric needs to be improved before heating behaviour can be changed has to be addressed. However, momentum is seen with various pressure points favouring a heating transition, including the increasing gas prices, increased public attention to climate change, and the recent COP26 in Glasgow.

Based on this, recommendations have been made including insights from transition theory and behavioural sciences. Importantly, a policy mix including both harder regulations and softer instruments addressing behavioural aspects is needed. Intermediaries are crucial to communicate the message and influence a sustained behaviour change. Lastly, specific case studies to address fabric-first thinking are needed. Next to those general recommendations that should be advocated for in order to reach the transition in

the heating regime, we gave Nomad more concrete recommendations tailored to them to move forward. These are centred around providing information, conducting case studies, connecting with other stakeholders, and engaging in networking.

With further work to be done, we are confident that a change in the UK's heating regime is possible and will ultimately lead to an easier transition towards low-carbon heating systems.

References

- [1] BEIS (Department for Business, Energy & Industrial Strategy), 'Heat and Buildings Strategy - Presented to Parliament by the Secretary of State for Business, Energy and Industrial Strategy by Command of Her Majesty'. 2021.
- [2] D. Carrington, 'UK's home gas boilers emit twice as much CO₂ as all power stations – study', *The Guardian*, 2021. [Online]. Available: <https://www.theguardian.com/environment/2021/sep/29/uks-home-gas-boilers-emit-twice-as-much-co2-as-all-power-stations-study>
- [3] H. Lund *et al.*, '4th Generation District Heating (4GDH): Integrating smart thermal grids into future sustainable energy systems', *Energy*, vol. 68, pp. 1–11, Apr. 2014, doi: 10.1016/j.energy.2014.02.089.
- [4] J. Piddington, S. Nicol, H. Garrett, and M. Custard, 'The Housing Stock of The United Kingdom', breTRUST, 2020. [Online]. Available: https://files.bregroup.com/bretrust/The-Housing-Stock-of-the-United-Kingdom_Report_BRE-Trust.pdf
- [5] BEIS (Department for Business, Energy & Industrial Strategy), 'Heat Network Zoning', 2021. [Online]. Available: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1024216/heat-network-zoning-consultation.pdf
- [6] J. E. Nielsen and P. A. Sørensen, 'Renewable district heating and cooling technologies with and without seasonal storage', in *Renewable Heating and Cooling*, Elsevier, 2016, pp. 197–220. doi: 10.1016/B978-1-78242-213-6.00009-6.
- [7] Business Sweden, 'Opportunities for Swedish companies in the UK heat pump market', 2021.
- [8] B. Greening and A. Azapagic, 'Domestic heat pumps: Life cycle environmental impacts and potential implications for the UK', *Energy*, vol. 39, no. 1, pp. 205–217, Mar. 2012, doi: 10.1016/j.energy.2012.01.028.
- [9] G. M. Huebner, M. McMichael, D. Shipworth, M. Shipworth, M. Durand-Daubin, and A. Summerfield, 'Heating patterns in English homes: Comparing results from a national survey against common model assumptions', *Build. Environ.*, vol. 70, pp. 298–305, Dec. 2013, doi: 10.1016/j.buildenv.2013.08.028.
- [10] 'Everything you need to know about low temperature heating (LTH)', VASCO, Jul. 03, 2015. <https://vasco.eu/en-gb/blog/radiators/everything-you-need-know-about-low-temperature-heating-lth> (accessed Oct. 14, 2021).
- [11] A. Darnton, B. Verplanken, P. White, and L. Whitmarsh, 'Habits, Routines and Sustainable Lifestyles: A summary report to the Department for Environment, Food and Rural Affairs', AD Research & Analysis for Defra, London, 2011. Accessed: Nov. 01, 2021. [Online]. Available: <http://sciencesearch.defra.gov.uk/Default.aspx?Menu=Menu&Module=More&Location=None&Completed=0&ProjectID=16189>
- [12] B. Karlin, H. Forster, D. Chapman, J. Sheats, and S. Rotmann, 'The Building Blocks of Behavior Change: A Scientific Approach to Optimizing Impact', The See Change Institute, 2021. [Online]. Available: https://seechangeinstitute.com/wp-content/uploads/2021/08/2021_See-Change_Building-Blocks-of-Behavior-Change.pdf
- [13] R. E. Bush and C. S. E. Bale, 'The role of intermediaries in the transition to district heating', *Energy Procedia*, vol. 116, pp. 490–499, Jun. 2017, doi: 10.1016/j.egypro.2017.05.098.
- [14] K. S. Rogge, F. Kern, and M. Howlett, 'Conceptual and empirical advances in analysing policy mixes for energy transitions', *Energy Res. Soc. Sci.*, vol. 33, pp. 1–10, Nov. 2017, doi: 10.1016/j.erss.2017.09.025.
- [15] VDPM e.V, 'Muss ein Gebäude gedämmt werden, um "klimaneutral zu sein? [Does a building have to be insulated to be "climate neutral"?)', 2021. [Online]. Available: https://www.vdpm.info/wp-content/uploads/2021/07/Downloads-VDPM-Factsheet-Niedertemperatur-Readiness_Juli-2021.pdf



SUSTAINABLE E-MOBILITY

Opibus



From left to right: Elaine, Emma, Jiqing and Isha

Acknowledgements

We would like to thank IIIIEE and Opibus for giving our team the opportunity to work on this exciting project. The help and suggestions from our teachers, classmates and staff from Opibus were a tremendous driving force for us to complete the project.

A heartfelt thank you to our wonderful supervisor Lisa Heldt. She was very responsive and provided guidance throughout this project: your timely and continuous feedback ensured we delivered high value to our client. We also appreciated the valuable and constructive suggestions from Håkan Rodhe and other instructors. We would also like to extend our appreciation to Juliana and Johanna, from Opibus, who made working with the rest of the team seamless and ensured our project would be of value to them. Finally, we would like to express our sincere gratitude to all the people who took their time to participate in our interviews and give valuable insight that shaped the outcome of our project.

The Team

Emma Kurvits is from Sweden and has a BSc. in Sustainable Enterprise Development from Jönköping University. Beside her studies she has been working for two years at wind power company.

Elaine M'Nkubitu is from Kenya and has a BSc. in Computer Science from Duke University in North Carolina. She worked for three years as a software developer before starting her master's.

Isha Sen is from India with a BE degree in IT. Before coming to IIIIEE, she worked in IT, and the policy domain of an environmental NGO. Presently, Isha is interning with Thule AB in Sweden.

Jiqing Chen is from China and has a BSc. in Environmental Engineering. She has technical knowledge and has internship experience focusing on wastewater and municipal garbage treatment.

Opibus Sustainability Strategy

Integrating Sustainability in the African E-Mobility Industry

By Elaine M'Nkubitu, Emma Kurvits, Isha Sen and Jiqing Chen

Context

As one of the biggest contributors to greenhouse gas (GHG) emissions, the transport sector requires a solid incentive and joint global efforts to reduce carbon emissions to meet the 1.5-degree climate goal, one of the most ambitious goals in the Paris Agreement [1]. Electric vehicles (EVs), which are battery-powered, play a vital role in reducing GHG emissions and can replace traditional internal combustion engines (ICEs) [2]. EVs running on low-carbon power can help eliminate greenhouse gas emissions and air pollution and reduce dependency on oil-based fuels. Besides that, EVs can show two to four-times more efficiency than ICE vehicles thanks to battery technology advancement [3].

Unlike Europe, North America and other developed areas, Africa is a continent where the manufacturing sector is still relatively small and facing massive demand for industrialising their economies. The transport industry in Kenya is expanding at a rapid pace with public investments into infrastructure. Moreover, predicted population growth and rising middle-class income will significantly grow the vehicle fleet from the 2019 vehicle population of 2.5 million, considering that the average number of newly registered vehicles has exceeded 200,000 annually since 2014. Economic growth will significantly contribute to air and noise pollution and congestion, and thus a subsequent increase in GHG emissions [4].

The electrification of micro-mobility is a good way for Africa to move the whole transport sector towards a more sustainable future. As part of governments' visions to transform the transportation sector into a low-carbon, efficient and reliable system, e-mobility will facilitate social and economic growth in Africa. Additionally, it

offers a new business opportunity for many companies [4]. Kenya is one of the fastest growing nations in sub-Saharan Africa and currently relies heavily on imports of second-hand cars (85% of imported fully built units) [6]. Opibus's business model lies at this intersection, by converting second-hand ICE cars to electric vehicles.

The Client

Opibus is an e-mobility start-up in Nairobi, Kenya, and was founded in 2017. Opibus focuses on all-electric conversion kits for existing vehicles (buses, land rovers, tuk-tuk) and motorcycles. The company also offers solutions for the installation of solar energy systems and charging infrastructure.



Inside Opibus - EV company in Kenya

Opibus's business model and products are inherently linked to sustainability as they are working towards achieving electrification and reducing CO₂ emissions in the mobility sector in Kenya. The company is already expanding into other markets in Africa. As a fast-growing start-up, there are increasing reporting requirements and interest in their sustainability strategy from stakeholders. Therefore, it is imperative that the company bring forth a sustainability strategy to

inform its operations and quantify and steer its impact [5].

Task Description

The overarching goal of this project was to create a sustainability strategy for Opibus. We structured this goal into three main parts: to 1) conduct a materiality assessment to identify the critical sustainability areas where Opibus should intervene, 2) provide integrated KPIs to track the company's sustainability performance, and 3) develop an action plan for the company to integrate the identified sustainability areas into their daily operations and guide their future sustainability initiatives.

This report starts by presenting the research approach used for this project, followed by findings through a PESTEL analysis. Thirdly, we discuss the main project components in detail, including material topics, sustainability KPIs and an Action Plan. This report concludes with a future outlook and the way forward for Opibus.

Research Approach

The approach we took to reach our goal of developing a sustainability strategy for Opibus was divided into 4 phases. The method is illustrated in the flowchart in Figure 1.

Phase 1: Research

First, we reviewed relevant literature to develop a deep understanding of the electric vehicle (EV) industry and its sustainability challenges. We also looked at development trends both at the global level and specific to the African and Kenyan context by reading industry and government reports. Based on the literature review, we performed stakeholder mapping and a PESTEL analysis to derive the opportunities and challenges that Opibus is currently facing or will face in the near future. Simultaneously, we performed benchmarking in the automobile industry by analysing automobile companies' sustainability reports (Ford, Tesla, BYD and Toyota) to identify broad relevant materiality topics in the automobile sector.

Phase 2: Interviews

Second, we conducted a total of 18 interviews with internal and external stakeholders relevant to Opibus. The internal stakeholders were representatives or top managers of the different departments within Opibus. They supported us in creating an operational process flow map of Opibus's internal operations.

The external stakeholders were selected based on who directly or indirectly influenced Opibus or were impacted by the company. This included customers, peer start-ups, suppliers, industry experts, NGOs, and investors. The interviews helped us revisit and refine the initial PESTEL findings and assisted in tailoring the materiality topics to Opibus.

Phase 3: KPIs and Action Plan

The background research and interviews provided us with a list of material topics relevant to Opibus. We prioritized some of these and used them to come up with indicators and created a KPI tracking document for Opibus. We then followed this with an Action Plan containing guided instructions and strategy to streamline sustainability actions within the organisation. During this process, we utilised GRI standards and the GHG Protocol to guide us.

Phase 4: Creating Final Deliverables

In this phase, we conducted a workshop with Opibus employees from different departments. We gained many insights from their perspectives through interactive activities during the workshop, which helped us refine the three main deliverables based on their feedback. Additionally, we continued working with the project manager in Opibus to finalise the deliverables.

In the following few sections, we will give more details about these 4 phases, including main findings, material topics and our recommendations.

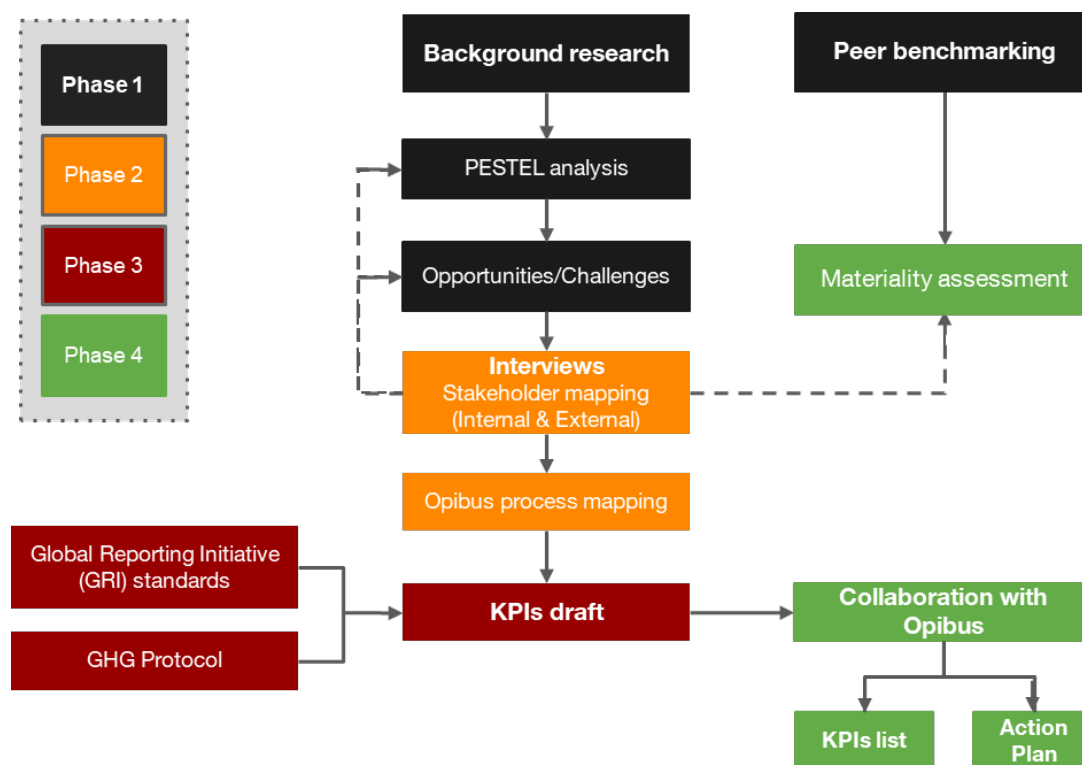


Figure 1: The research approach of this project

Findings

Phase 1 & 2 of the project was structured around the PESTEL analysis to understand the broad macroscopic trends in the EV sector in Kenya and Africa. The analysis provided valuable insights to position the significance of sustainability measures now and in the near and distant future.

Political

Opibus, with its core business of converting vehicles with internal combustion engines into electric vehicles, relies heavily on the availability of second-hand cars in Kenya. Africa imports second-hand cars from the rest of the world, which provides a huge business opportunity for Opibus. However, with Kenya Vision 2030, a blueprint for the rapid industrialisation of Kenya by 2030, which aims for systematic reduction of imports of used parts and cars and increasing local production, we foresee a challenge of resource scarcity for Opibus. Based on the interviews, we conclude that local manufacturing of vehicle components will reduce cost and align

with Opibus’s goal for increased local manufacturing. Moreover, there is a growing movement among the EV business for policy advocacy to introduce standards and policies on EV manufacturing in Kenya. This will further promote local manufacturing of components, developing charging infrastructure and increasing incentives for the uptake of EVs. Currently, there are tax incentives in place to increase the market share of EVs. However, there is a need for a policy push for battery management and charging infrastructure for increased EV uptake.

Economic

Since the EV market in Kenya has started to grow at a fast pace and Opibus is one of the top players in the growing industry, we predict competition in the near future. However, this is perceived to be favourable for the growth of the EV industry, according to Opibus and the other interviewees. Moreover, the interviews stated that there is increasing global and regional confidence in the industry on the part of investors and consumers. EVs change the cost structure of automobiles compared to their ICE

counterparts. Whereas there is a lower upfront cost for ICE vehicles and higher fuel costs, EVs have higher upfront costs and lower use and maintenance costs. Increasing petrol prices strengthens the business case and comparative affordability of EVs. However, the EV market is affected by the price volatility of raw materials and the lack of local suppliers manufacturing batteries. Kenya, and Africa in general, is also a very price-sensitive market, which is important to consider.



The Opibus factory

Social and Technological

There is a consensus that EVs do not solve the congestion problem created by combustion vehicles, but rather adds to it through new vehicles on the road. However, since Opibus retrofits second-hand cars, it does not add more cars to the road. On the contrary, it succeeds in extending the lifespan of existing cars. Further, the cultural perception of “waste is value” understands that the value of a car or a component can be retained beyond its standard lifespan. Used components or ICEs are sold in the second-hand market, thus creating business avenues for Opibus. Further, this industry is expected to create employment for a skilled workforce in the next few years. However, the interviews highlighted the consumer apprehension of EV vehicles in comparison to their ICE counterparts with regards to performance, especially considering that charging infrastructure and battery performance have not matured yet. The frequent power outages and national electricity grid instability is another barrier to battery charging. Moreover, the interviewees indicated that with current battery

performance, batteries take between 30 minutes to 3 hours to charge, depending on the type of the battery available on the Kenyan market, underscoring the trade-offs between affordability and performance.

Environmental

EVs are designed around low GHG emissions during the usage period. If the EV is charged using renewable energy, the contribution to GHG emission in the use phase is net zero [9]. However, from a lifecycle perspective, EVs have serious implications for raw materials extraction, manufacturing, and the end-of-life (EOL) phase. Battery manufacturing often relies on conflict minerals and may have social and legal implications in a country where the manufacturing conditions are not stringently monitored. Further, Lithium batteries need to be carefully handled or they may have toxic and other harmful effects. Although interviewees acknowledged the need for EOL handling for repurposing or recycling, they considered this reality to be far in the future. The fast-growing nature of the industry is also expected to drive innovation to design assembly line equipment enabling high material efficiency in the production of an EV

Legal

Currently, there are no laws or policies in place specifically for EVs in Kenya, however, increasing global standards for EV and EV components is expected to build a regional legal framework. In addition, companies using international financiers need to adhere to certain environmental and social standards agreed between the parties to secure financing, for example regarding parts recycling and battery management. Presently, national laws exist on importing used components, motorbike assembly and manufacturing components.

Establishing a Sustainability Strategy for Opibus

Material Topics

Materiality assessment is an analysis carried out to determine topics that have impact on a business and are also important to the stakeholders. The assessment is based on a GRI approach and helps prioritise environmental, social, and corporate governance (ESG) issues that can be used to guide sustainability reporting. It is carried out by gathering information from internal and external stakeholders of the company, and the outcome is a matrix that ranks the material topics based on the impact the topic has on the business and the importance the stakeholders assign to it [7]. Impact in this sense means the effect (negative or positive) the company has on the economy, environment and/or society [8]. The results vary based on factors like the sector under which a company operates, the size of the company and its business model.

Approach

While conducting the materiality assessment for Opibus, various methods of information gathering were included. A top-down approach was initially used, including reviews of sustainability reports of peer companies in the automobile industry, both in the electric and conventional mobility sectors. As the number of companies in Africa with business models similar to Opibus's is very limited, the reports were from companies in the U.S. and Asia. General background research on the EV industry, both globally and with a focus on the African and Kenyan context, was conducted simultaneously. The identification of material topics was further based on an iterative process as new findings were realised from extensive interviews. This helped better determine the topics that were most appropriate to Opibus.

Outcome

The outcome of the assessment was a total of 15 material topics divided on the three pillars of sustainability: economic, environmental, and

social (see Figure 2), according to the reporting process of GRI standards. The topics were then ranked in a matrix according to value to the business and importance to stakeholders (see Figure 3).



Figure 2: Material topics

Apart from the material topics, four additional overarching topics were also identified: collaboration, policy advocacy, stakeholder inclusiveness, and battery management. These topics emerged especially from the stakeholder interviews but are not included as material topics per se due to their interconnectedness to each other as well as all the material topics. Additionally, these topics need to be addressed at the industry level or in collaboration with peers. These topics are highly relevant to acknowledge as they will be important in steering the business case and for the development of the industry. Since the EV industry is still in its early stages, a lack of standards and policies is a challenge. Opibus being a leader should thus continue working with both the government and other peers and organisations to shape the landscape. Collaboration with other players in this field can yield economic advantages such as identifying opportunities for industrial symbiosis. Especially the management of batteries when they are no longer usable for the vehicles will require development of industry standards and collaborative and innovative solutions.

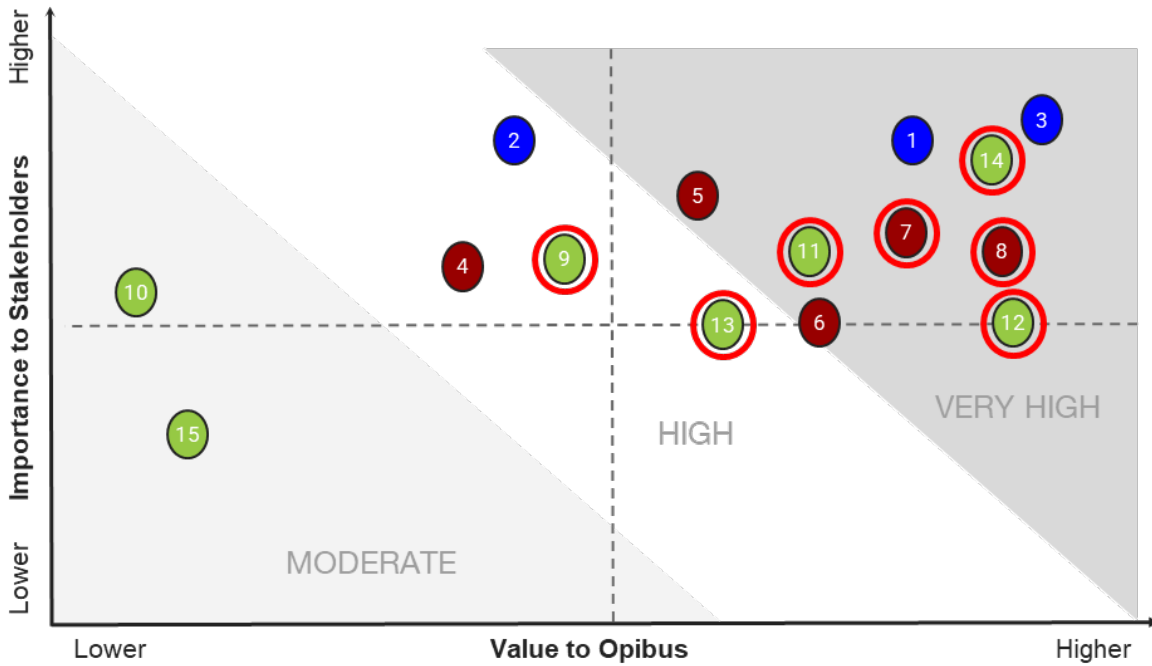


Figure 3: Material ranking

Out of the total 15 material topics, 7 were identified as key topics; GHG emissions, Energy use, Resource efficiency, Waste, Sustainable supply chain management (SSCM), Employee wellbeing, and Gender equality. The key topics were chosen based on three criteria 1) their ranking and relevance to the current business state 2) areas where the consulting team has more knowledge and expertise and can provide the most value, e.g., all economic topics were excluded as expertise on these is better held internally by the company, and 3) the topic relevance and ability for setting KPIs.

KPIs

Based on the seven finalised materiality topics, we designed KPIs to capture Energy, GHG emissions, Waste, and GHG emissions from purchased goods and transport. To supplement the information to capture KPI, we created datasheets based on the comprehensive data capturing framework of GRI reporting. Our rationale for selecting the GRI framework for data collection was that it could act as a good first step in a comprehensive data collection to

enable Opibus to report their sustainability performance in the future using the GRI, SASB, or Integrated Reporting standard. Furthermore, we provide the Environmental Performance Dashboard to analyse the performance through graphs, and a GHG tracker for tracking emissions per year. Figure 4 below is a snapshot of the KPI tool and datasheets provided to Opibus.

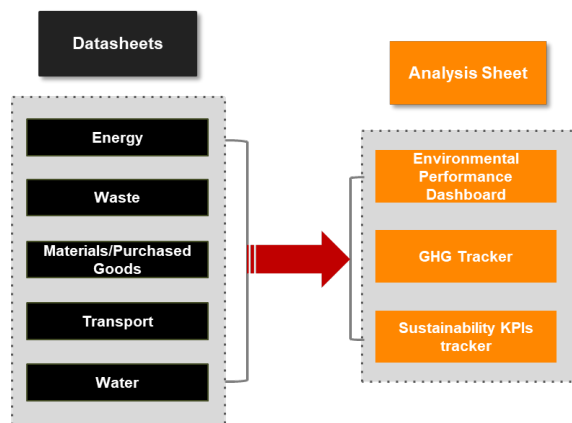


Figure 4: KPIs tracking and Datasheets

To streamline the GHG tracking with the possibility of reporting to Science Based Targets (SBT) in future, we have categorised GHG calculation

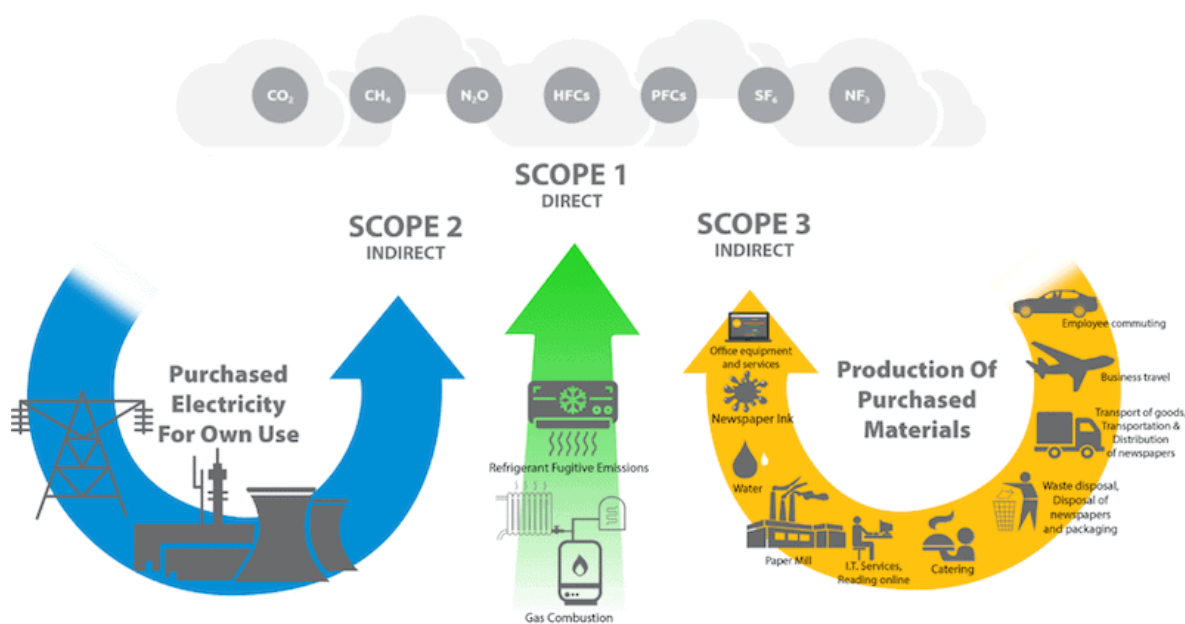


Figure 5: Overview of GHG protocol scopes and emissions. (Adapted from greenelement.co.uk)

based on three scopes of the GHG Protocol framework. Direct organisational emissions through Scope 1, and indirect emissions through Scope 2 and Scope 3 (See Figure 5 above).

Scope 1 is the emissions produced on site or by objects owned by the organisation, such as ICE company cars, manufacturing equipment, or generators. Scope 2 is the emissions produced elsewhere but linked to the purchase of grid electricity, heating and cooling used on-site. Scope 3 is the upstream and downstream emissions related to logistics or purchased goods, end of life, supply chain, etc. The KPIs feed into the Action Plan for streamlining operations and strategic actions, as described in the next section.

Action Plan

Based on our findings, the materiality assessment and the KPIs, we came up with some actions that we recommended that Opibus incorporate into their sustainability strategy. We divided them into two categories: Streamlining operations and strategic actions. All our recommendations considered the context of Opibus as

a start-up. Therefore, we made sure each action was easy to integrate into the existing operations. Our recommendations also build upon each other so that undertaking one makes it easy to implement the others.

Streamlining Operations

Our proposed suggestions were based on the need to establish a strong foundation upon which other future sustainability initiatives can be undertaken.

As shown in Figure 6, the first action had a detailed process flow map that showed the inputs and outputs in all the processes undertaken by Opibus. This would help them in identifying the processes that have an environmental impact. Such a process map will also help the company identify hotspots and can-do targeted improvements.

The process flow map will then feed into the Quality Management System (QMS). Opibus currently has a QMS in progress. However, it is not finalised, which means it is not ISO certified. Having found that quality was one of the most

important material topics, we recommended that they should finalise the QMS and get it certified. This will give their products credibility and increase customer satisfaction while also making it easier to develop other management systems.

With the QMS in place, it will be easy to create the Environmental Management System (EMS). QMS and EMS have many similarities, so if the QMS is finalised, developing the EMS will be straightforward. However, since QMS is not a requirement for EMS, we suggested that EMS can also be created as a standalone, especially if Opibus wants to prioritise sustainability.

We have dived deeper into various components of the EMS, including what value they will bring to Opibus. For example, by having defined organisational roles and responsibilities, sustainability can become a company-wide initiative that all departments contribute to. Furthermore, the KPIs can guide the process of coming up with environmental objectives and targets.

As part of the EMS, we also advised that they have a regular Plan-Do-Act-Check cycle to monitor their progress and carry out improvements as needed.

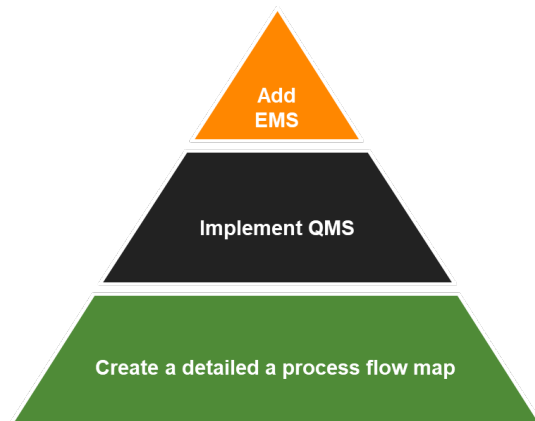


Figure 6: Actions for streamlining operations

Strategic Actions

Our strategic recommendations were influenced by the expected growth of Opibus in the next few years. As stated earlier, the e-mobility industry is growing rapidly in Africa, and Opibus, being a pioneer in the market, will see huge growth.

Therefore, our suggestions are meant to ensure that Opibus will be ready, sustainability-wise, when this exponential growth happens. The recommended actions are centred around data collection, reporting and capacity building

We provided guidance on the data that Opibus should start collecting, including ,but not limited to energy use, emissions, waste and information on employee safety and wellbeing. The company already has some of this data, but our goal was to have it consolidated and presented in a way that makes it easy to work with. Data collection is also central in ensuring that the KPIs that were agreed upon can be tracked and thus tied to the environmental objectives and targets in the EMS.

Furthermore, operationalising the KPIs and integrating them into the company’s daily operations will also promote accountability and increase awareness about sustainability internally.

Thirdly, we suggested that the company should carry out more comprehensive reporting. They already do communication on progress (COP) for UN Global Compact principles, but this is not sufficient to cover all aspects of sustainability. We therefore proposed using GRI standards to guide their reporting. This was further supported by the fact that we had already conducted a materiality assessment for them and identified their key topics.

Lastly, we recommended conducting internal sustainability training as this could have several benefits for the company. Apart from making sustainability a company-wide initiative, it could promote innovation and lead to reduced environmental impacts.

Challenges and Limitations

Due to confidentiality, we were not able to communicate with supplier representatives directly, but instead relied on Opibus’s supply chain manager and a board member of one of Opibus’s suppliers as proxies. Similarly, we were not able to get a representative from the government. However, a few of the stakeholders we interviewed had worked with the government in

some capacity on e-mobility and were able to share insights about the role of the government in the industry.

The other challenge was related to capacity building to ensure the project would be carried forward seamlessly after our handover. For this, we made sure to involve our contact person throughout the project and ascertain that the recommendations we made would be feasible to implement. We considered this for our final deliverable and made sure that it was in a format that could easily be adopted for internal workshops at Opibus. We have also provided reference material that is useful for understanding sustainability. Overall, the aim was to make the deliverables practical and actionable in Opibus's everyday reality.

Conclusion

For a busy start-up, time is a scarce resource and navigating the sustainability landscape can be overwhelming with both increasing expectations from stakeholders and multiple approaches, tools and reporting systems to decide on when steering the business toward sustainability. Identifying and prioritising key aspects that can provide high impact and, at the same time, provide value for the company is therefore of eminent importance.

This project has assisted in tailoring a starting point for Opibus to continue building their sustainability strategy around, based on comprehensive and inclusive background research and interactive engagement. This has been translated to specific areas of data collection and actions points for the company to undertake. The strategy provided has been developed to be ready for immediate action, including near-future steps, to make the process tangible and comprehensible while at the same time producing valuable inputs that can be communicated to stakeholders. As Opibus is a pioneer in the EV industry in Africa, they have the opportunity to become sustainability leaders and set the standards for the entire industry.



Traffic in Nairobi



Workshop with Opibus

References

- [1] UNFCCC, "The Paris Agreement." <https://unfccc.int/process-and-meetings/the-paris-agreement/the-paris-agreement> (accessed Nov. 01, 2021).
- [2] CLASP, "E-mobility - Solar Appliance Technology." 2021.
- [3] "Efficiency: How EVs Use Fuel Better," Clean Charge Network, Oct. 27, 2020. <https://cleanchargenetwork.com/efficiency-how-evs-use-fuel-better/> (accessed Nov. 01, 2021).
- [4] GIZ, "Electric mobility in Kenya - The facts." 2019.
- [5] "Opibus." <https://www.opibus.se/> (accessed Nov. 01, 2021).
- [6] State Department for Industrialisation. (2019) "Draft National Automotive Industry". Republic of Kenya. <https://www.industrialization.go.ke/images/downloads/policies/draft-national-automotive-policy-february-2019.pdf>
- [7] Goby. The strategic value of ESG Materiality Assessment. (n.d.). <https://www.gobyinc.com/esg-solutions/strategic-value-of-esg-materiality-assessments/>
- [8] Global reporting initiative. GRI 101: Foundation. (2016). <https://www.globalreporting.org/standards/media/1036/gri-101-foundation-2016.pdf>
- [9] Pero, F. D., Delogu, M., & Pierini, M. (2018). Life Cycle Assessment in the automotive sector: a comparative case study of Internal Combustion Engine (ICE) and electric car. *Procedia Structural Integrity*, 12, 521–537. <https://doi.org/10.1016/j.prostr.2018.11.066>

List of interviewees:

- Japheth Ruttoh, Manufacturing Manager at Opibus, 7th Oct 2021
- Mahmoud Hermes, Production Manager at Opibus, 11th Oct 2021
- Shem Muriithi, Research and Communications Assistant at AEMDA, 13th Oct 2021
- Felix Muchiri, Head of e-Mobility at Drivelectric, 13th Oct 2021
- Lumbi Muchui, Mechatronics Engineer (R&D) at Opibus, 13th Oct 2021
- Mikael Gånge, Sales Manager at Opibus, 14th Oct 2021

- Alex Muchilwa, Policy Manager at Opibus, 14th Oct 2021
- Siv Ahlberg, Manager, Nordic Climate Fund, 14th Oct 2021
- Lucas Kranck, Founding Partner at Ascent, 14th Oct 2021
- Johanna Alander, Supply Chain Manager at Opibus, 15th Oct 2021
- Natalie Gravett, Graduate Transport Planner/Modeler at Arup (U.K.), 15th Oct 2021
- Alex Makalliwa, General Manager at Solar E-Cycles, 18th Oct 2021
- Jackline Wambui, HR Manager at Opibus, 21 Oct 2021
- Marieke Geurts, Private Equity Investment Principal at Ascent, 21st Oct 2021
- Herman Kwoba, Transport and Climate Change Project Officer at GIZ, 22nd Oct 2021
- Shantha Bloemen, Managing Director & Founder at Mobility for Africa, 22nd Oct 2021
- David Damberger, Customer, Managing Director at M-KOPA, 26th Oct 2021
- Loïc Amadò, Customer, Co-Founder & Managing Partner at Ambo Ventures, 29th Oct 2021



ENVIRONMENTAL DIPLOMACY

Stockholm+50



From left to right: Jansen, Lina, Hedda, Takeshi Benjamin and Thomas (supervisor)

Acknowledgements

The authors would like to thank all our interview subjects, whose honesty illuminated the issue of sustainable consumption with a wide breadth of perspectives. In particular, this report would not have been possible without the tremendous support of the *IIIEE Alumni Network*, whose responsiveness to interview requests demonstrated a strong, community dedication to addressing the pressing environmental challenges facing humanity today. We would furthermore like to thank our IIIEE faculty supervisors, *Thomas Lindqvist, Håkan Rodhe* and *Weine Wiqvist*; as well as our client collaborators at the Swedish Ministry of the Environment, *Jessica Brunnberg, Hedvig Petersson, Sofia Tingstorp* and *Ambassador Johanna Lissinger-Peitz*.

The Team

Jansen Haneline is from the US and holds a BS in Anthropology and a BA in International Studies from Western Carolina University. He has experience researching the history of human-environment relationships and the social and governance aspects of permaculture.

Lina Ahmed is from Sudan and holds a first-class degree in Chemical Engineering from the University of Khartoum. She has work experience in climate negotiations, program coordination, climate action project management, and social innovation labs. She was identified as a 2019 youth climate champion by UNDP Sudan.

Hedda Rae Roberts is from the UK and holds a BA from the University of Oxford in Politics, Philosophy and Economics. She has work experience researching human wellbeing and the SDGs, and in large-enterprise circular economy initiatives, and conference management.

Takeshi Benjamín Kaji is a dual US-Icelandic citizen and holds a BA in Human Evolutionary Biology from Columbia University. He has work experience in Arctic affairs, conference management, and as a political staffer.

Starting Conversations

Approaches to Discussing Sustainable Consumption Transformations in the Developing World

By Lina Adil Haider Ahmed, Jansen Mitchell Haneline, Hedda Rae Roberts and Takeshi Benjamín Kaji

Introduction

Fifty years since a host of developing countries threatened to boycott the 1972 U.N. Conference on the Human Environment, what has changed in the world of environmental diplomacy? Next June, the Government of Sweden will host Stockholm+50, a United Nations General Assembly meeting commemorating the 50th anniversary of the historic Stockholm Conference. Rather than (re)negotiating existing multilateral agreements, Stockholm+50 is meant to facilitate the *implementation* of existing agreements meant to bring the global community together to combat climate change, restore biodiversity, and protect the human environment in other domains. Yet, as successful as the 1972 conference was in international agenda-setting and institution-building, fundamental trade-offs between the right to development and environmental protection remain unresolved.

This report summarizes a project commissioned by the Stockholm+50 Secretariat within the Swedish Ministry of the Environment with such sensitivities in mind. Specifically, the IIIIEE consulting team explored how one specific subject – sustainable consumption – might best be incorporated into the agenda of the Stockholm+50 meeting in a constructive, solutions-oriented manner. After all, consumption is an impact multiplier affecting all the planetary boundaries and should therefore be of universal interest.

Yet, to put it bluntly, why should low-income countries be interested in discussions about sustainable consumption, when it is the rich world's overconsumption that is largely responsible for the major global environmental challenges of

modernity? Despite common interests in combatting anthropogenic climate change, biodiversity loss, and other threats to the human environment, the question how “common but differentiated responsibilities” should be fairly differentiated in practice remains a sticking point in environmental diplomacy.

Approach

In order to address the need to move dialogue on sustainable consumption forward at Stockholm+50, the IIIIEE team conducted a five-week project consisting of desktop research and qualitative stakeholder interviews. Interview subjects were primarily identified from within the IIIIEE's alumni network, with attention to representing global differences in national development status as much as possible, and with an attempt to represent diverse viewpoints from various sectors. We conducted semi-structured interviews with guiding questions intended to elicit responses that illuminated the issue of sustainable consumption transformations in developing countries from the following angles:

- Framings of sustainable consumption
- Implementation barriers
- Solutions and co-benefits
- Responsibilities of developed countries

Perspectives from the desktop research and interviews were gathered with the intention of helping Stockholm+50 Secretariat employees better inform the background documentation and concept notes for Stockholm+50 leadership dialogues. In effect, these findings serve as recommendations for setting the agenda for an important venue of international environmental

cooperation in such a way that all stakeholders find discussions meaningful and important.

In total, we conducted 25 interviews with subjects from 17 countries. A list of interviews participants with non-identifying information can be found at the end of this report.

Background

The rapid industrialisation of emerging economies has simultaneously lifted hundreds of millions out of poverty while leading to the emergence of hundreds of millions of new consumers, who are to a large extent emulating the unsustainable consumption patterns present in the developed world. By 2030 there will be 3 billion new middle-class consumers across the world buying cars, upgrading smartphones, and moving into bigger homes. Such trends present an urgent need to re-examine consumption.

Sustainable Consumption Reframed

To date, there is a strong correlation between human development, as measured by the human development index (HDI), and increased material footprints, as shown in Figure 1. Industrialisation and mass production are the key means by which economies have developed. Yet, consumption-fuelled growth and growth-fuelled consumption raise material footprints and the exploitation of natural resources. The environmental implications of these historical development paths is highly troubling: on a finite planet, such pathways are a physical impossibility.

According to Earth Overshoot Day, if everyone on the planet were to live like the residents of Sweden, we would need 3.8 Earths to meet the material needs of consumption [1]. In this context, there is a necessity to decouple advances in HDI from material footprints by changing consumption patterns. After all, sustainable consumption as defined by UNEP requires that “our use of services and related products responds to basic needs and better quality of life, while minimising the use of natural resources, toxic emissions of waste and pollutants ... so not to jeopardise the needs of future generations” [2].

Regrettably, no country currently inhabits the “sustainable consumption sweet spot” in Figure 1. Still, it is worthwhile examining ways to “flatten the curve” of HDI footprints, so to speak.

Figure 2 points to the difficulties of approaching international discussions of sustainable consumption with a common, multilaterally negotiated reference framework. Green-coded countries where SDG12 (sustainable consumption and production) “has been achieved” happen to be countries that also face significant challenges in meeting basic human needs and advancing HDI. Advancing discussions of sustainable consumption within the framework of the United Nations and other multilateral institutions therefore requires careful work to avoid the valorisation of poverty, simply because it tends to be less resource-intensive than wealth.

The concept of sustainable consumption means different things in different contexts, as the arrows in Figure 1 illustrate. For the developed world, it is about scaling back excess. For people living in one of the myriad developing country contexts, there is an urgent need to advance human welfare while avoiding rich-world patterns ecologically destructive overconsumption.

In the book *Consumptionomics*, Chandran Nair argues that developing countries bear responsibility for leapfrogging the Western world’s history of resource-intensive development trajectories, especially those in Asia, due the raw multiplicative power of population [6]. Moral debates inevitably arise in such discussions, especially concerning the broader inequities underpinning differences in consumption levels. Moving forward, discussions should be sensitive to these realities.

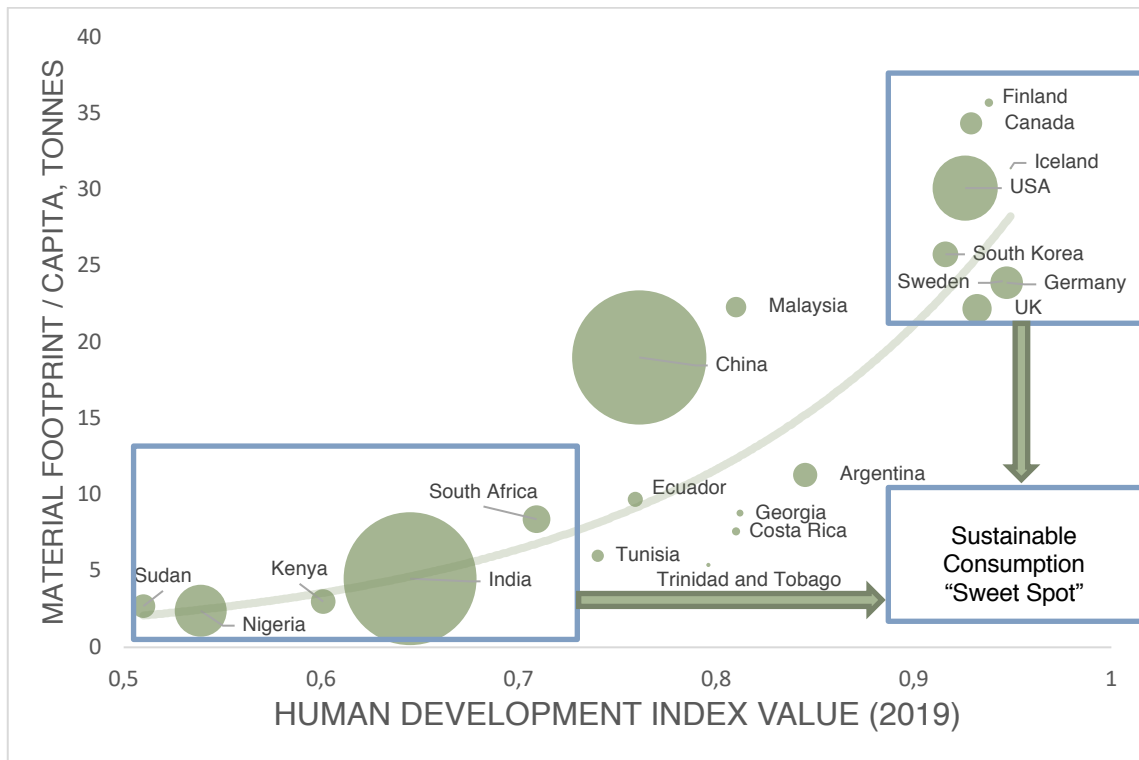


Figure 1: The relationship between human development and material footprint. Data from [3] and [4]

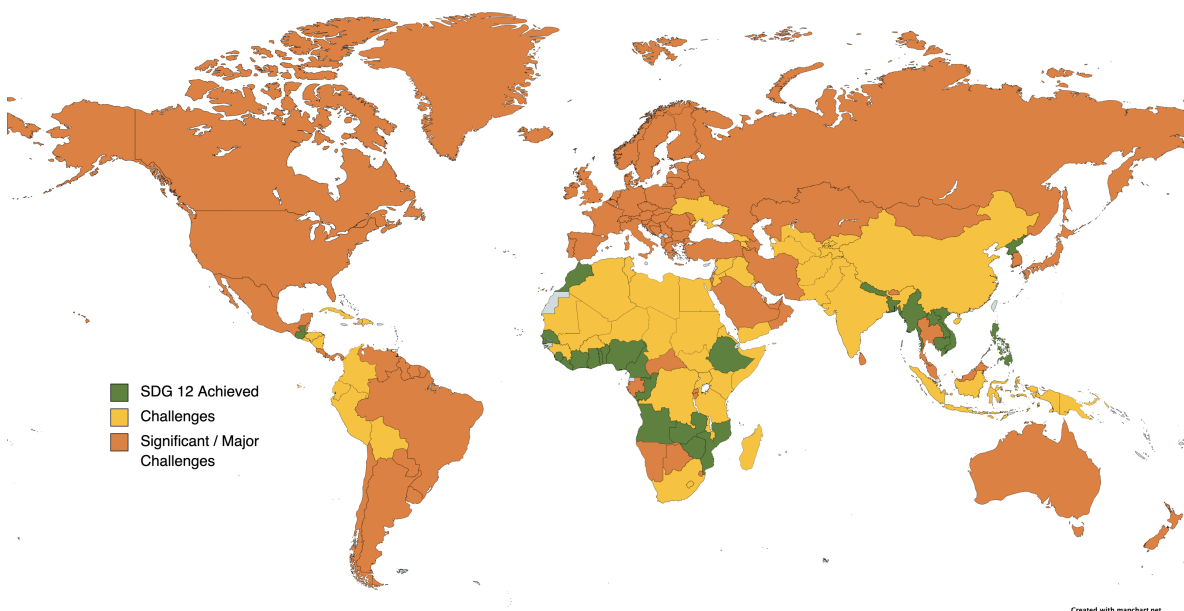


Figure 2: Map of performance against SDG12, Sustainable Consumption and Production. Data from [5]. Created on mapchart.net. Licensed under CC BY-SA 4.0

Summary of Findings

Approaches to Reducing Material Use Intensity and Carbon Footprints

A 2021 report published by the Berlin-based think tank Hot or Cool provided a taxonomy for categorizing different options for reducing the carbon footprints of individuals and industry [7]. Our report has taken these options and expanded them to categorize approaches for material-footprint reductions. The categories are as follows: absolute reductions, modal shifts, and efficiency improvements. No one approach is better than another nor more applicable to a specific country, individual, industry, or activity. Absolute reductions and modal shifts are more concerned with consumption while efficiency improvements are concerned with production.

Approaches for Material Footprint Reduction

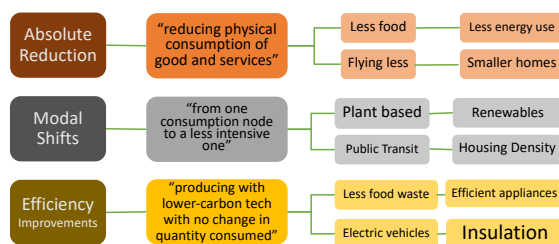


Figure 3: Approaches for material footprint reduction. Adapted from [7]

Consider this taxonomy within the context of our project: As populations in developing or low-income countries frequently face challenges of securing basic needs, absolute reduction may not be the most appropriate in some of these context settings, but many opportunities still exist. Absolute reductions are often accompanied by modal shifts, and this duality may be encouraged as part of a long-term plan to reduce rich-world material footprint in stages rather than abruptly. It should be acknowledged, however, that advocacy for modal shifts may only be possible for those in privileged positions who have the means available to make such a change. Efficiency improvements may simultaneously reduce the footprints of existing rich-world consumption patterns while expanding developing-

world access to basic needs without increasing material footprints substantially.

Opportunities for different approaches to reducing material and carbon footprints depends on local context, nationally and regionally. Many of our interview subjects provided examples demonstrating how contextual parameters such as location, income, and consumption nodes must be considered when determining the best approach to a particular situation. The three approaches discussed here have possible applications in a variety of contexts ranging across the HDI spectrum. Still, to generalize, developing countries may find most of their opportunities to advance human wellbeing through efficiency improvements or modal shifts that allow them to leapfrog the materially intensive models through which Western countries have advanced their HDI historically. Meanwhile, developed countries have the greatest potential to reduce lifestyle footprints through absolute reductions.

In order to advance the implementation of multilateral environmental agreements, we have recommended that the Stockholm+50 leadership dialogues incorporate discussions of such approaches in specific contexts. Alongside this recommendation, we have provided a portfolio of sample cases and suggest an examination of the extent to which they can serve as export models for other countries.

The Determinants of Consumption Patterns

While the above approaches to material footprint reductions may be helpful in understanding the macro-level changes needed for sustainable consumption transitions, they do not consider elements of individual choice/action, or policy/governance contexts. Put another way, the three general approaches may be sufficient in an omnipotent technocracy — imagine an alternative reality in which the world consisted of Sweden alone.

But in reality, individual behaviour is influenced by many contextual factors. In order to analyse

the various insights that our interview subjects provided about how individual consumption patterns are established, we refer to three categories introduced to us by a governmental employee of the City of Gothenburg: knowledge, motivation, and infrastructure. These three first-order concepts resurfaced throughout our other interviews. They intersect and form local contextual paradigms that determine the feasibility of consumption decisions, sustainable or otherwise. Several examples from our interviews showed that the three categories act in consort and that it may be unproductive to discuss them in isolation.

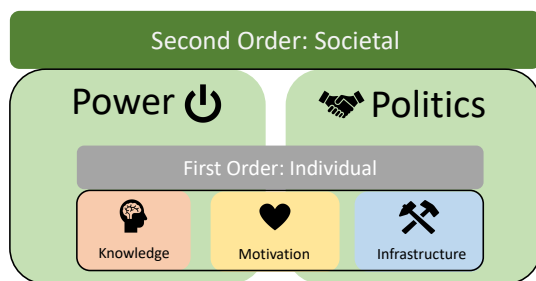


Figure 4: Determinants of consumption

Knowledge

Without knowledge, how does an individual, corporation, or government know where or how to act? How do you know which approach is best for reducing material footprints?

Our interviewees discussed the ways in which knowledge determines consumption patterns from many different perspectives. Interviewees from Georgia highlighted that a holistic and interdisciplinary environmental education helps to make individuals more aware of the issues we face and better equipped to address them. Education of younger generations is likely to be most impactful, as unlike older generations, they are not yet “stuck in their ways” and are generally more willing to learn. Similarly, interviewees from Argentina discussed their work at a land trust that aims to help the Argentine populace build collective knowledge on the role of national parks and rewilding land in providing ecosystem services. As a result, they have found that people spend more time in nature and pay more

respect when visiting or conducting economic activities nearby.

From a different perspective, our interviewees from Trinidad and Tobago highlighted how marketing and information on digital platforms shape our consumption choices and behaviours, often in an unsustainable direction. In their local context, they observed how marketing campaigns were leading consumers to prefer imported products over local produce. In such situations they highlighted the importance of information and knowledge dissemination regarding the environmental impacts and health ratings of the two options, to enable consumers to make informed choices.

Several interviewees highlighted the importance of data in driving sustainable production transformations. Interviewees involved in supply chain sustainability discussed the potential for data to enable better understandings of material hotspots, improve resource efficiency, and develop efficient infrastructures and land-use planning.

Motivation

As individuals become knowledgeable and gain access to change-enabling infrastructure, a lack of motivation may hold them back from making consumption choices that reduce their personal material and carbon footprints. If the average citizen feels that their choices have no impact, why should they act? Our interviews suggested that the answer to this question is situated in communities, and that motivation is best developed in a social context. Communities are often formed on shared principles and values, religion, spirituality or nationhood, shared aspirations for the future, and socially normal activities or hobbies.

One interviewee from Germany described one form of a lack of motivation as being afraid to “step out of line” or break social norms to reduce one’s consumption footprint. Yet, if people see change in others they identify with, such as peers from the same generation, it can inspire and motivate them.

An interviewee in Costa Rica discussed the particularly 21st-Century role of “influencers” in motivating people to act or change their behaviours. Influencers, as identified by another interviewee in China, can be anybody from a celebrity with a mass social media following to rural lifestyle video bloggers, and even Heads of State. This interviewee also stressed that solutions must include an element of education in reshaping Hollywood-inspired aspirations.

Infrastructure

The role of infrastructure in determining consumption patterns is the most observable and quantifiable. For example, multiple interviewees from Georgia mentioned how people living in Tbilisi, an urban landscape designed for private cars, find it very difficult to travel by bicycle or public transport. An interviewee from England argued specifically that the blame for unsustainable lifestyle choices cannot be placed on the individual when choice enablers are lacking.

One interviewee from Kenya gave the example of trees as infrastructure. After decades of deforestation, a community initiative to build tree nurseries has begun growing local species for planting and re-establishing the forests that used to surround rural farms. With more trees, farmers protect their farms from the threat of soil erosion.

Power and Politics

At a higher level, power and politics influence the first-order determinants of knowledge, motivation, and infrastructure. Individuals with power have a greater ability to influence the three individual determinants in any given context. The populations of industrialized nations tend to have greater opportunities to expand educational opportunities and live in more urbanized environments with access to efficient transportation infrastructure (with the notable exception of the United States). National and international governance conflicts, negotiations and compromises have determined the differential levels of access that communities have to natural resources, both historically and currently. Power and politics as second-order

determinants of consumption are closely related and have shared roots in the history of colonialism and globalization.

We recommend that the Stockholm+50 leadership dialogues incorporate discussions of how knowledge, motivation and infrastructure can promote sustainable consumption patterns in different contexts, with a reflexive understanding of how power and politics shape current distributions and can shape the future.

Co-Benefits of Sustainable Consumption

If there is to be any sort of low-hanging fruit in building constructive dialogue on sustainable consumption transformations, the win-win opportunities of co-benefits can serve as a sensible entry point for discussions.

A common perspective is that GDP growth (a component of SDG8) has positive synergies with human development advances (SDGs 1-7) and negative trade-offs with environmental integrity (SDGs 11-15). This is a linear, deterministic understanding of development impacts: when an economy grows, so does HDI, but the environment suffers. However, our interviewees provided several promising examples of co-benefits, whereby attempts to reduce society’s material footprint provide opportunities to promote human welfare.

Human health has served as a classic example of how societies can “flatten the curve” of development impacts by reducing the material-footprint-to-HDI ratio. At the level of the individual, mobility initiatives and infrastructure improvements that enable people to choose active transport modalities such as bicycling and walking provide direct health benefits by promoting exercise. At the psychological level, one informant from Hong Kong referenced recent progress in “science of happiness” research regarding the well-being benefits of limited personal consumption.

At the political level, one informant from Georgia stated that environmental protection

concerns rank low among most citizens' political priorities, due to more immediately pressing development concerns. However, "when health problems [resulting from poor local environmental health] are observed, this can be a significant driver for private citizens to push governments to act." From this example, health-related co-benefits can be understood as an opportunity for galvanizing political action for environmental protection.

The fight against hunger is another domain of sustainable consumption co-benefits. One interviewee from Tunisia gave the example of his country's agricultural climate adaptation plans, with pending updates to the national "agricultural map" (*carte agricole*). Admittedly, an export-dominated industrial agricultural industry may produce more calories per unit of investment in financial currency terms, but agricultural maps produced with local needs and climatic conditions in mind may indeed promote both local food security and reduce negative environmental impacts such as soil deterioration. Further, orienting agricultural policymaking towards long-term food systems resilience requires the protection of land systems and ecosystem services.

Taking a more profit-orientated perspective, one informant from China's Yunnan Province spoke of the high regard Chinese consumers hold for the province's high-quality, specialized foods, especially mushrooms, which are heavily dependent on healthy ecosystems. In such cases, co-benefits of ecosystem management primarily concern job creation, although production for both local consumption and export also support local food security.

More generally, reducing transborder material flows through localized circular economy initiatives provides a co-benefit opportunity concerning economic resilience in the face of supply chain disruptions. As we have seen in the recent pandemic-related supply chain bottlenecks, as well as in the isolated case of the blockage of the Suez Canal by the Ever Given, developing economies that are overly dependent on either imports or exports may not be able to provision

human needs through imports or maintain profitability through exports under similar scenarios. Strengthening local economic flows therefore provides an opportunity to capture more value at home while limiting systemic risks.

Fundamentally, an informant from Costa Rica made the point that "the quality of the environment is intertwined with quality of life. Our natural environment is life-sustaining and so we need to have consumption habits that are aligned with environmental protection: there is no alternative."

Implementation Barriers

Moving beyond low-hanging fruit, discussions of sustainable consumption transformations should also focus implementation barriers in various contexts, and how to overcome them. Despite the significant opportunities for co-benefits in sustainable consumption transformations, the implementation gap remains pronounced. Throughout our consultation process, interviewees discussed many barriers to implementation, particularly in developing country contexts, which can be categorized into three overarching themes: economic barriers, political barriers, societal barriers.

Economic Barriers

Many of our interviewees shared the perspective that the ability to engage in the topic of sustainable consumption often comes from a position of privilege, and that companies, governments, and individuals alike need slack resources to voluntarily cut down consumption or waste from production. Meanwhile, those without such resources often lack the conditions to consume sustainably or face more pressing challenges in terms of meeting basic needs, where significant capital investment for basic infrastructure is lacking, be it for energy, water, waste management, or transport.

Several interviewees highlighted the important role that bilateral and multilateral finance and development aid plays in sustainable consumption transformations. However, many major economies are still investing in unsustainable

infrastructure overseas, leading to carbon and resource lock-in in developing countries. It was highlighted that there is an urgent political imperative to ensure international financing and development aid projects are oriented towards sustainable consumption transformations in developing countries.

At the same time, many interviewees reiterated the need for sustainable infrastructure projects to be highly sensitive to local contexts. Often, the technologies and policies which assisted transformations in one context cannot simply be transferred to another context, as infrastructure relies heavily on how people engage with it, which in turn is impacted by local knowledge, values and culture.

Interviewees from the private sector also highlighted that there are significant corporate interests in business-as-usual consumption pathways. Corporate profits that raise shareholder value also provide employment opportunities for many people. Despite the potential for sustainable business model innovations and circular economy opportunities in reuse, repair, refurbishment, remanufacturing and recycling, many interviewees highlighted that such models still promote growth.

In many industries, productivity and technology gains drive lower unit prices, which enables higher consumption. While lower prices are beneficial where they serve basic human needs, efficiency gains in the production of non-essential products, resulting from profit motives, are likely to lead to further production. Since supply can create its own demand, this fuels further nonessential consumption.

One interviewee also highlighted that corporations are beginning to invest in more circular practices only in developed markets, where a value premium is attached to sustainability. Another interviewee questioned whether value premiums for “greener” products even existed in the rich world, and thus argued that there is little reason to expect them to be a useful model for developing economies.

A recurring theme throughout our interviews was that global corporations have a responsibility to uphold the same standards overseas as they do in domestic markets; however, this can be difficult in emerging markets where a lack of regulation prevents a level playing field.

Political Barriers

Throughout our consultation process, many interviewees underlined that good governance is a central issue when discussing sustainable consumption transitions. One interviewee from a producer responsibility organisation in Georgia, highlighted how deposit-refund schemes have proved to be a cost-effective way to manage consumer waste in many European countries, yet rely heavily on effective governance and may not therefore be an appropriate export model for countries rife with corruption. Other interviewees discussed how corruption limits the funding available for infrastructure projects: for example, embezzlement scandals scare away investors.

Interestingly, many interviewees highlighted the role for high-HDI countries to export best practices in terms of good governance models and the rule of law, suggesting that SDG16 has a vital role to play for the achievement of SDG12. But once again, the importance of contextual variations was highlighted. There is also the issue of capacity building and institutional knowledge necessary for durability, such that sustainability-oriented infrastructure and policies do not deteriorate when external assistance is removed.

Interviewees also called attention to the fact that sustainable consumption transformations require a systemic approach to governance, with alignment among local, regional, and national actors. Within the context of circular economies, it was also emphasised that such initiatives involve both upstream and downstream processes and involve multiple disparate actors across many sectors, which again presents significant governance challenges.

Many interviewees ruminated on the difficulties of rethinking ways of life. Self-determination and identity emerged as fundamentally

important concepts in such discussions. In particular, interviewees stressed that it can be problematic for governments to enter the private sphere and mandate behaviour changes, even when it is for the benefit of the planet.

Societal Barriers

Many interviewees also identified that consumption, in developed and developing countries alike, has long been our primary tool of distinction whereby individuals signal their upward mobility through the acquisition of goods and reputable brands. One interviewee noted that consumption has become closely tied with our understanding of success and achievement. Another argued that in developing countries, "there is not a widespread environmental consciousness to drive sustainability. People need to know the benefit it will bring to them, their family, their society."

In this light, many interviewees asserted the necessity of building sustainable consumption patterns from the bottom up, reframing the discussion in terms of co-benefits and using education and democratic participation to push transformations. However, many acknowledged that such processes are slow and will likely take generations.

On the other hand, interviewees also drew attention to the skilful way in which the private sector has been able to shape our preferences, fuelling our want for newer and more products. Connectivity is an important determinant of consumer behaviour, and digital platforms are increasingly important for product discovery and pre-purchase research. Worryingly, however, for those at the same income level, the more "connected" consumers are, the more they spend on durables and premium products [8].

Hard Truths, Wicked Problems and Trade-Offs

The uncomfortable truth about consumption is that it contributes to a contradictory double bottom line: consumption has been the only way that we know to increase welfare and improve

living standards, but it is costing us the planet. Throughout our interviews, the conversation around reframing sustainable consumption in a way that is relevant for developing countries illuminated a set of trade-offs, hard truths and wicked problems.

Right to Development

Many interviewees pointed out that economic development cannot happen without environmental impacts. Poor countries want to realise the gains of economic development straight away, yet this is often environmentally harmful. One interviewee pointed to the predicament of environmental externalities when individuals struggling to meet basic needs are attracted to the lowest-cost options available.

Moral Implications

The reach of colonialism as a historical and present form of injustice was a recurring theme throughout our interviews. With colonialism in mind, let us briefly reconsider the project's guiding question: "How can sustainable consumption be framed in a way that is relevant for lower-income countries?"

A set of justified worries come along with this conversation from developing countries' perspectives, particularly the risk of history repeating itself and the emergence of oppression in a different suit, be it green imperialism or sanctions imposed for not abiding with Western-imposed understandings of sustainability.

Consumption transformations ask us to examine and challenge our way of going about life in a profound way. Hence, discussions must acknowledge the sensitivities of the historically oppressed and the risks they face. Interviewees stressed the need for developing countries to develop their own consumption models with civic participation and citizen buy-in, and sensitivity to local context.

Still, the us-versus-them narrative of conflict between developing and developed countries has proven to be an unconstructive approach to international dialogue, including those regarding environmental issues. Importantly, unpacking

the interlinkages between global economies, lifestyles and consumption requires that all parties approach conversations with humility, compassion and a willingness to tackle shared global challenges.

Reflections

Our interviews with diverse stakeholders from around the world illuminated the myriad ways in which sustainable consumption can be understood and brought to light some of the many co-benefits associated with the transition. We believe these are an excellent starting point for engaging developing countries in constructive dialogue, and moving forward, there are many opportunities for aligning sustainable consumption principles with development priorities to ensure that needs are met and quality of life is advanced with lower material footprints than in the past.

Nonetheless, we share the view that there is no single set of right answers to achieving a future of sustainable consumption, but that countries will have to experiment, putting forward a large package of policies that simultaneously target a huge range of activities, whilst remaining sensitive to local needs and context. Some options appropriate for certain countries may not suit others, but at the fundamental level, we must all learn to manage “our appetites, expectations, [and] fears” such that our consumption becomes more consistent with the Earth’s carrying capacity [6].



Figure 5: Influence pathway and timeline

For such learning to occur, the global community needs to pursue difficult discussions and debates in a constructive, solutions-oriented manner, with honesty and good will. The discussions that took place at the 1972 Stockholm Conference determined, in part, the reality we know today, and it is our sincere hope that the conversation-starters we provided the Stockholm+50 Secretariat will influence the agenda in a way that enables productive outputs and outcomes that benefit all.

References

- [1] Earth Overshoot Day, 'How many Earths? How many countries?', *Earth Overshoot Day*, 2021. <https://www.overshootday.org/how-many-earths-or-countries-do-we-need/> (accessed Nov. 02, 2021).
- [2] UNEP, 'Sustainable consumption and production policies', *UNEP - UN Environment Programme*. <http://www.unep.org/explore-topics/resource-efficiency/what-we-do/sustainable-consumption-and-production-policies> (accessed Nov. 02, 2021).
- [3] UNDP, Ed., *The next frontier: human development and the Anthropocene*. New York, NY: United Nations Development Programme, 2020.
- [4] United Nations Statistics Division, 'SDG Indicators Database'. United Nations, 2021. [Online]. Available: <https://unstats.un.org/sdgs/unsdg>
- [5] J. D. Sachs, C. Kroll, G. Lafortune, G. Fuller, and F. Woelm, 'Sustainable Development Report 2021', Cambridge University Press, 2021. Accessed: Oct. 26, 2021. [Online]. Available: <https://www.sustainable-development.report/>
- [6] C. Nair, *Consumptionomics: Asia's role in reshaping capitalism and saving the planet*. John Wiley & Sons (Asia) Pte Ltd, 2011.
- [7] L. Akenji, M. Bengtsson, V. Toivio, and M. Lettenmeier, '1.5-Degree Lifestyles: Towards A Fair Consumption Space for All: Summary for Policy Makers', Hot or Cool Institute, Berlin, 2021. [Online]. Available: <https://hotorcool.org/1-5-degree-lifestyles-report/>
- [8] N. P. Ojha and Z. Ingilizian, 'How India will consume in 2030: 10 mega trends', *World Economic Forum*, Jan. 07, 2019. <https://www.weforum.org/agenda/2019/01/10-mega-trends-for-india-in-2030-the-future-of-consumption-in-one-of-the-fastest-growing-consumer-markets/> (accessed Oct. 29, 2021).

List of interviewees:

Researcher, Sustainable Consumption Institute
United Kingdom

Civil servant, City of Gothenburg, Sweden

Civil servant, Intergovernmental organization, Georgia

Unspecified, Private sector, Costa Rica

Corporate sustainability employee, private sector,
Hong Kong

Civil servant, National government, Trinidad and Tobago

Researcher, Collaborating Centre on Sustainable
Consumption and Production, Germany

University professor, Western Carolina University,
United States

Entrepreneur, NGO, Kenya

Executive, NGO, Georgia

Executive, Aliados, Ecuador

Lawyer, The Conservation Land Trust, Argentina

Manager, Intergovernmental, Sweden

Diplomat, National government, Sudan

Founder, Wealth of Flows Consulting, Hong Kong

Executive, Private sector, Hong Kong

Public official, National government, Costa Rica

Program coordinator, Sitra - The Finnish Innovation
Fund, Finland

Circular Society Committee Member, Icelandic Youth
Environmentalist Association, Iceland

Consultant, Proforest, Malaysia

Corporate sustainability employee, ECOM Trading,
China

Manager, Intergovernmental organization, Georgia

Executive, NGO, Georgia

Activist, NGO, Georgia

Program coordinator, NGO, Tunisia



CIRCULAR ELECTRONICS

TCO Development



From left to right: Josefine, Yi-Jiun, Sonja and Emma

Acknowledgements

We would like to thank all members of the Circular Electronics Initiative for this valuable learning opportunity. This project would not have been possible without your support. To everyone who was interviewed or participated in the workshop, we are grateful for your time, knowledge, and insights. We are especially thankful to Andreas Nobell, Alexandra Wu and Jessica Richter for your guidance and support throughout the project. A sincere thank you also to our supervisor, Leonidas Milios, for your complete trust in us. Finally, a big thank you to our classmates for your great feedback and positive energy throughout this course! This project not only made us better professionals but also sharpened our communication and analytical skills.

The Team

Emma-Kate Chetty is from South Africa. She holds a B.Sc. in Chemical Engineering and a certificate in Design Thinking where she worked on creative solutions to social challenges. She is interested in the circular economy and how to encourage these activities in the Global South.

Josefine Henman is from Sweden. She holds a B.Sc. in Environmental Sciences in which she had a specific focus on the sharing economy. She is interested in urban sustainability policy and sufficiency strategies.

Sonja Leyvraz is from Switzerland. She holds a B.A. in International Studies, after which she completed internships in the field of development cooperation. She is interested in the context of urban policy.

Yi- Jiun Lin is from Taiwan. She holds a B.Sc. in Life Science (Biology) and an MBA and has work experience in energy/industrial transition policy research in Taiwan. She is interested in the policy and practice of the circular economy.

Starting Points for Collaboration

Finding a Way Forward for the Circular Electronics Initiatives

By Emma-Kate Chetty, Josefine Henman, Sonja Leyvraz and Yi-Jiun Lin

Task Background

Today, irresponsible production and consumption of electrical and electronic equipment (EEE) causes environmental issues throughout its lifecycle, starting with resource depletion of scarce metals and minerals needed for production [1]. Then, high energy consumption throughout the manufacturing phase leads to large greenhouse gas emissions, worsening climate change. Finally, EEE waste is the fastest growing waste stream in the world. More than 50 million metric tonnes of e-waste is produced per year, but only 20 percent is safely recycled. The waste not appropriately dealt with may cause water and soil pollution, with severe impacts on human health and ecosystems [2].

Shifting from a linear to a circular electronics industry can contribute to solving these problems. Increasing the circularity of the electronics industry means that the products, components and materials are looped back into the system. Here, products are designed for longer lifespans, durability, repairability, disassembly, and recyclability. Moreover, when products cannot be used any longer, the components can easily be used for refurbishment or remanufacturing. Recently, the industry has seen increased promotion of circularity, and amongst other initiatives, the Circular Electronics Initiative (CEI) has emerged.

The CEI aims to encourage organisations and consumers to take a more responsible approach to the electronic goods they use. The initiative

originates from the Circular Electronics Day, a communication campaign launched in 2018 focused on raising public awareness of circular consumption of electronics [3]. Recognising that an annual activity and communication are insufficient, the organisations involved decided to expand their cooperation. Hence, the CEI was formally established in 2020. Currently, TCO Development, a non-profit organisation, is the project lead and managing the initiative.

By the end of October 2021, the initiative has attracted 24 organisations, including non-profit organisations, research institutes, and global and local businesses (see Figure 1, 2 and 3). In order to become a member, organisations are expected to sign a declaration and to some degree share their knowledge, experience, and time for promoting and engaging in circular electronics activities.



Figure 1: The non-profit members of the CEI



Figure 2: The research institute members of the CEI



Figure 3: The business members of the CEI

At present, the members of the initiative would like to move beyond the focus on information dissemination (“talking the talk”). They hope to explore mutual interests, opportunities and clarify a future strategy (“walking the walk”). Therefore, one of the members, IIIIEE, provided assistance for the CEI with this university course to explore ways for the initiative to work forward.

Task Description

Our task was to identify potential starting points for the CEI to move forward, taking into account its members’ expectations and capacities to contribute.

In this task, we see our value-add as consisting of the following components 1) we provided each member with the opportunity to contribute their ideas and vision for the CEI, 2) we employed our analytical skills and background knowledge to synthesise and analyse these contributions, and 3) we designed and hosted a workshop where members build on ideas brought forward in the interviews and created common ground to move forward.

This report begins with an overview of the background of the initiative and task, and then presents our approach, including background research, interviews and workshop design. Next,

the key findings from interviews and the workshop are introduced separately. Following this, seven recommendations are proposed to help the CEI move forward step by step.

Our Approach

In order to complete the task, our process included five key steps (see Figure 4)

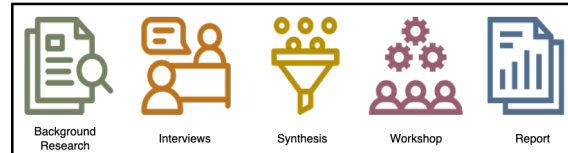


Figure 4: The five-step approach

First, we conducted background research on each CEI member organisation. The aim of this research was to understand each organisation, their activities and their general commitment to promoting circular electronics. As part of this background research, we were given an opportunity to visit Inrego, a member of the CEI, in Täby, Sweden (see image below). Inrego buys, upgrades, repairs and sells used IT products and is one of the global leaders in this market. We received a tour around the facility from Sebastian Holmström, showing us examples of the kind of knowledge and skills an organisation involved in circular electronics possesses and what activities they are involved in.



The team visit to Inrego

Our background research also included exploring the landscape of member-based initiatives in the sustainability sector. The research on other initiatives was used both as a benchmark to the CEI, and to familiarise ourselves with the processes and activities of other initiatives. Apart from informing the next steps of our approach, the background research — on the CEI members as well as on the other initiatives — were organised further as two of the deliverables for our client.

Second, we conducted semi-structured interviews with 17 out of the 24 CEI members. We developed an interview guide which focused on what the members expect from the CEI and how they view their relationship with the CEI in the future. Some key questions included motivation for joining, perceived challenges, and their contributions to the CEI.

In the third step, a synthesis matrix was used to compile and summarise the answers in the interviews. This helped to gain an overview and compare members' answers. Then, the answers were grouped into common themes in a separate document to identify shared ideas among the members.

The fourth step, the design of the workshop, was informed by the interview findings and the background research. A more detailed description of how this was done is outlined in the findings section below. The workshop was online and conducted on the Mural platform. Our key objectives for the workshop were for the members to:

- 1) Get to know each other.
- 2) Brainstorm ideas on what the CEI should do.
- 3) Build on ideas that were brought up in the interviews on next steps for the CEI.

With these objectives in mind, we had three key activities included in the workshop; 1) an exercise where the members were invited to map out all potential collaborations between each other, 2) a brainstorming activity where we let the members think creatively about what the CEI should do and achieve, and 3) an activity where the members could build on solutions put forward

in the interviews on some of the key challenges identified.

Our fifth and last step was to use the workshop and interview results to develop recommendations. We developed seven recommendations which considered our joint findings from each step as well as a potential timeframe for implementation. This timeframe is based on the prioritisation made in the workshop, as well as our understanding gained during the interviews of what steps must be taken first.

In addition to a report presenting the seven recommendations, we delivered a number of supporting documents and tools to the client (see Box 1). While some of these (including the report) were targeted to all CEI members, others were developed with a future potential project manager in mind and were thus sent only to TCO Development.

Box 1: The deliverables

To all CEI members	To TCO Development
<ul style="list-style-type: none"> - Client report (incl interview and workshop summaries) - Workshop Mural - Members matrix 	<ul style="list-style-type: none"> - Members info matrix - Interview matrix - Other initiatives matrix - Member bios - Interview guide

Findings

Background Research

Other initiatives. To provide constructive suggestions regarding membership models for benchmarking other initiatives against the CEI, we researched five initiatives encountered throughout the course of this project: Nordic Circular Hotspot, Cradlenet, the Haga Initiative, Refresh, and RE Action Japan.

All of these initiatives were found to have either a coordinator or a board to manage the operations. While most of the initiatives have membership fees, some also obtain governmental or research funding, if the host members are participating in relevant research projects. Besides,

TCO DEVELOPMENT

to attract members with the same ambitions or interests, most initiatives clearly state their final and midterm goals, the benefits of participation, specific requirements for members, and membership fees on their websites, thus assisting candidate organisations in assessing the costs and benefits of participating in the initiative.

In general, the membership fees are proportional to 1) the benefits of joining the initiative, and 2) the size and type of the organisation. For instance, the membership fee of the Haga Initiative is much higher than the fees of the other four initiatives. Correspondingly, the members of the Haga Initiative can access expert support about emission reduction practices, attend exclusive events with high-profile business leaders and policymakers, etc [4]. In contrast, the membership fee of RE Action Japan is the lowest amongst the five initiatives. Accordingly, the members merely benefit from the administrative support and relevant knowledge from other members [5]. Additionally, most initiatives charge higher fees to large-scale companies, but impose lower payment on non-profit organisations and start-ups. Furthermore, to avoid crowding potential members out, Nordic Circular Hotspot encourages members to dedicate 50 hours in-kind (per year) rather than a membership fee [6].

Interview Findings

Reasons for joining. The two most common reasons for becoming part of the CEI were a general interest in the topic of circular electronics, and that partaking in the initiative aligns with the vision of their organisation. A willingness to collaborate with other businesses involved in circular electronics was also mentioned, as well as to educate and inform customers and partners about circular electronics. Furthermore, a few of the interviewed members pointed to the fact of TCO Development being in the lead of the initiative as a reason for why they joined.

Vision for the CEI. When it comes to what the members want the CEI to be and do in five years from now, many of the interviewees shared a vision of the CEI being a trustworthy and

influential platform. Further, it should be sharing information and good practice of circular electronics to the public in order to raise awareness, change public perception and influence policy makers. A few members wanted to see the current model of the CEI scaled up, with more members joining, expanding globally, more activities taking place, and the member network growing stronger. The CEI being a research hub with student participation was mentioned, as well as making the initiative become a trade organisation for circular electronics organisations (e.g., providing expertise to authorities on legislative matters).

Critical issues. What most interviewees considered to be the single most critical and realistic issue for the CEI to work on was extending the lifetime of electronics. A full list of what were perceived as critical issues is provided in Box 2 below.

Box 2: Perceived critical issues

- Promote reuse
- Standardisation
- Extending lifetime of electronics
- Expanding use phase
- Repairability
- Consumer impact awareness
- Broader understanding of terminology
- Circular procurement
- Spreading information
- Drive awareness of need for behaviour change
- Product Environmental Footprint methodology
- Communication material
- Advocate for pro-circular law change
- Fight planned obsolescence

Target audience. As for the audience the CEI should target in the future, most interviewees pointed to external audiences, including public and professional procurers, other businesses, governments, and policy makers. While some members indicated that they would focus on one of the groups listed above, others suggested a broader approach targeting several audiences. A few members envisioned the CEI to also consider its own members as a target audience

(e.g., by focusing on creating opportunities for internal projects between members).

Avoiding greenwashing. The members' opinions on greenwashing and potential measures to prevent organisations from using the CEI as a tool for greenwashing somewhat diverged. While most members indicated that they would like to avoid the CEI being used for greenwashing purposes, there were different opinions as to how strict rules should be to enforce this. Several members expressed that they do not want to exclude potential members that are currently not performing well in terms of circularity but are genuinely seeking to improve. Accordingly, most interviewees preferred a more inclusive approach with regards to member recruitment (i.e., being open to a wide range of organisations rather than being limited to the ones that are very circular already). However, in several cases, members advocated for this stance with reservations (e.g., new members need to show commitment; establish a membership admission process). Some members envisioned a structure with different levels of memberships, with the "most circular" members in the core group.

Challenges. Members' perceived challenges for the CEI can be divided into external and internal challenges. The external challenges were either of cultural (e.g., reused devices are perceived as being of lower quality), political (e.g., lack of incentives), or industry-related in nature (e.g., competitiveness between industry players; complexity of supply chains). Internal challenges concern the CEI more directly and can be organised into four main categories. The first is a lack of organisational structure and uncertainty as to what the structure should be. Second, the interviewees perceived a lack of shared vision for the CEI that would guide the way forward. Third, lack of funding was perceived as a challenge to build the CEI as a network. Fourth, a few interviewees mentioned potential difficulties in keeping members motivated and engaged.

Solutions. The solutions brought forward focused on the internal challenges. With regard to the perceived lack of organisations, several members suggested that there should be a lead of some sort, for instance a core group, a steering committee or a project manager. Furthermore, some members suggested breaking up in working groups. As for the funding, a few members suggested a membership fee or to seek external funding, whilst others remained more unspecific. Furthermore, members underlined the importance of defining shared goals.

Benefits. The benefits members would like to get from participating in CEI can be broadly divided into three categories: networking, exchanging knowledge, and exerting collective influence. In terms of networking, members mentioned that they would like to make connections for future collaborations, be it for business value, research, or other projects. Related to this, most members mentioned that they are interested in knowledge sharing. Most remained in general terms, but some specified the topics they would like to learn about (e.g., hazardous chemicals; life cycle analysis). In the third topic, exerting collective influence, members mentioned that they would like to change legislation or public opinion. Aside from these three categories, two interviewees also mentioned that they would like to work together with students.

Contributions. In terms of what they could contribute to the CEI, most members indicated that they could provide data, knowledge and skills to share with the network. A few members also suggested that they can contribute with time, others with their network. These contributions are mainly limited by the time and financial resources of the company (especially for smaller organisations), and uncertainty regarding the benefit that they will gain from the CEI. Nine members declared that they would be willing to contribute financially, depending on the amount and the future goals of the CEI, while six members were unsure whether they could contribute at all. One member declined the possibility of a financial contribution.

Interview Analysis and Workshop Design

As a whole, the interviews show commonalities as well as some conflicting ideas among the members regarding their expectations and their capacities to contribute to the CEI. The following section describes how the key findings of the interviews outlined above were used to inform the design of the workshop with the members.

First of all, a recurring theme in the members' answers was sharing knowledge, skills, experience, and data with each other. This suggests that there is potential for more collaboration between the members. The first exercise of the workshop was therefore designed in order for the members to map out potential collaborations, and illustrate the possibilities amongst themselves. Further, by emphasising the potential of the initiative in such a way, this exercise was thought to answer to the challenge brought up in the interviews of how to keep members motivated.

Secondly, while the interviews indicated a common understanding among the members regarding certain aspects of the way ahead for the initiative (such as creating opportunities for internal collaboration), opinions seemed to vary regarding what the CEI should work on specifically, and what audience it should be targeting. Therefore, we saw the need for giving the members a chance to brainstorm together on these matters, in order to get inspired by each other's ideas as well as to see where their visions diverge. With this in mind, we designed the second exercise in such a way that participants were invited to first brainstorm freely, then read each other's inputs, and lastly think about and discuss the feasibility and desirability of the ideas by categorising them on a how-now-wow chart. Ideas that were considered easy to implement but had lower desirability were to be classified in the quadrant "now," innovative breakthrough ideas (high desirability and easy to implement) in "wow," and ideas for the distant future (high desirability but difficult to implement) in "how" (see Figure 6 below).

Lastly, in addition to the need of finding a shared vision for the CEI outlined above, another three main internal challenges could be identified from the interviews: finding the right organisational structure, raising funds, and ensuring the credibility of the network. To identify ways of overcoming these challenges by building upon the members' own ideas, we collected the solutions brought up most often in the interviews, turned them into seed ideas, and let them be the foundation of the third exercise of the workshop. Each of the participants would then be invited to add sticky notes to these ideas — yellow for adds and builds, green for what they liked about the idea, pink for what they perceived as associated challenges, and blue for what they could contribute with in the implementation. The seed ideas derived from the interviews and the internal challenges they relate to can be seen in Box 3 below.

Box 3: The seed ideas that members mentioned in the interviews

Internal challenge	Seed idea
Organisation	<ul style="list-style-type: none"> - Establish working groups - Employ a project manager/secretariat - Establish a steering committee/core group
Funding	<ul style="list-style-type: none"> - Seek external funding - Introduce a membership fee
Credibility	<ul style="list-style-type: none"> - Develop criteria for member recruitment - Introduce review process of members

Workshop Findings

Twelve CEI members were able to attend the workshop and showed great engagement. In the first exercise, members drew lines between each other based on their perceived potential for collaboration. The lines quickly added up, as can be seen in Figure 5.

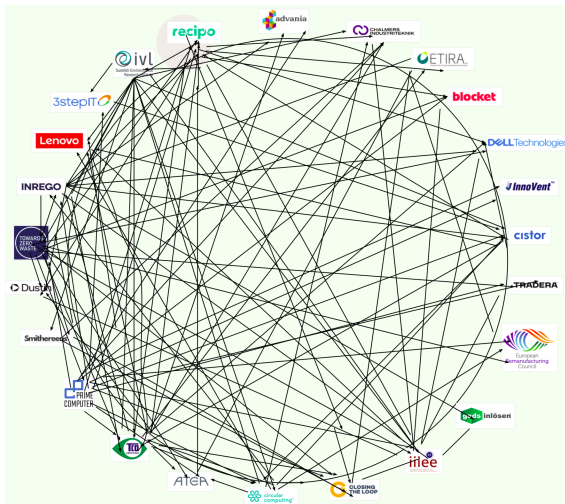


Figure 5: The collaboration map

In the second exercise, members produced a great number of ideas and placed them on the how-now-wow chart (see Figure 6). These can be divided into five main categories: communication, network building, political and legislative issues, knowledge generation and sharing, and specific projects.



Figure 6: The how-now-wow chart

In the third exercise, members built on the seven seed ideas that were identified in the interview analysis, as can be seen in Figure 7. There was also another seed idea added by a member, which was to develop a 2–3-year plan. In the next step, the members voted on which idea they would prioritise with three votes. The three

ideas that received the most votes were: employ a project manager or a secretariat, develop a 2–3-year plan, and seek external funding.

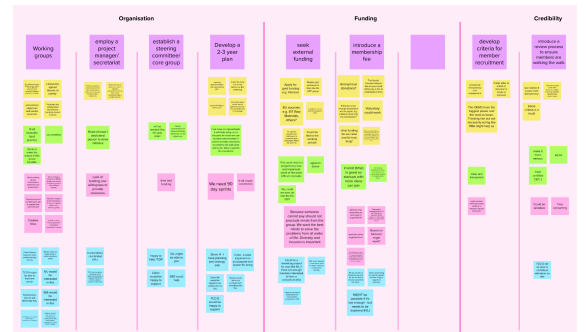


Figure 7: The seed ideas that were discussed in the workshop

Finally, in the closing activity of the workshop, members indicated that it is still unclear what the plan for the next steps is, especially considering funding and the lead of the initiative. What had become clearer throughout the workshop was that there is strong motivation in the group for establishing priorities for the initiative. The members further pointed out that there is great potential for collaboration in the group and that CEI can become an important platform.

Workshop Analysis

The outputs of the workshop were very much in line with the findings of the interviews. First, there was great interest in collaborating with other members of the CEI as shown by the lines drawn in the first exercise. Further, ideas as to what the CEI should do are still relatively divided among the five categories that we identified and must be further discussed. There seems to be consensus as to what the main challenges are and approaches for solutions, as the third exercise indicates, and a shared perspective on what the difficulties in implementing these solutions could be. The voting gives an indication of what members would like to see implemented first.

Recommendations

The combined findings of the interviews and workshop were used to inform our final recommendations. The interviews gave insights into specific individual preferences and the workshop allowed for a more collaborative result. We have proposed seven recommendations to the CEI on ways to move forward. These are split into three time-specific categories of recommendations. Green for immediate steps, which aim to keep the momentum going and set the base for moving forward. Yellow for midterm steps to do as soon as possible, which should aid to

secure resources and build organisational structure to ensure continuation of the initiative. Lastly, pink, which are longer-term steps, which aim to ensure credibility and divide tasks within the CEI. Within these chronological categories, recommendations are also loosely ordered according to their level of priority. While we understand that hiring a project manager soon would be highly preferable, we do not think this recommendation can be considered an immediate step given organisational restraints mentioned in the interviews. Hence, what we recommend the CEI to do immediately should be possible to do without a project manager in place.

Set up a LinkedIn Group

WHAT

Set up a platform for collaboration and for sharing knowledge such as best practices, work stream topics, and current projects. This platform could develop into a shared library.

WHY

- The potential for great collaboration and motivation is growing, but there is a lack of knowledge on each other. Moreover, having a better understanding of each other could aid in building a common vision.
- The members have expressed their willingness to contribute to this networking and sharing opportunity. LinkedIn is simplistic and already in use by many members.

HOW

- Set up a LinkedIn group with all the CEI members.
- Explain the purpose of the LinkedIn group and describe who each of the members are (use **Organisation Matrix & Member Bios**).
- Post results from the workshop held as part of this project to describe how the workshop made clear that there is motivation amongst members.

POINTS TO CONSIDER

- Who is taking the lead? Someone must take responsibility for setting up and managing the group.
- Keep in mind that to go from a “talking” to “walking” group, a LinkedIn group should be seen as a first step to go further, not as an achievement in itself.

Workshop to Identify Goals

WHAT

Hold a workshop to determine what the CEI should achieve. Building on the themes of communication, network, political and legislative issues, knowledge sharing, and projects from workshop exercise 2. Setting minor and major goals within a timeframe should be the objective of the workshop.

WHY

The key issues of defining a shared vision, common goals, and to answer, "Where does the CEI add value?" need to be considered in more detail. The members are motivated to make a difference through the CEI but need to agree on what should be the initiative's focus.

HOW

- In the run-up: gather brief inputs from members on potential goals to a) set expectations for the workshop, b) collect inputs from members that will not be able to attend the workshop and c) have starting points for the workshop.
- During workshop:
 - 1) Brainstorm goals 2) feasibility chart 3) prioritisation.
 - Time frame exercise where goals are placed on a timeline.
 - Mural application could be used.
- Follow-up: share goals with all members.

POINTS TO CONSIDER

- Who is taking the lead? Some members expressed interest in being part of a core group. We suggest these (or others) form a small workshop planning group.
- To ensure participation from members might be difficult.

Seek External Funding

WHAT

Apply for external funding for projects and/or for the whole initiative.

WHY

- Need funding for e.g. a project manager.
- Could potentially use the funding for different projects (e.g., research centred projects).

HOW

Suggestion on where to look for funding: Vinnova, Swedish Environmental Agency (Naturvårdsverket), EU GPP group & Postkodlotteriet.

POINTS TO CONSIDER

- Who is taking the lead? Members that indicated interest to help applying should be included.
- The need for concrete projects/goals that initiative is working on to apply for funding.

Set up a Membership Fee

WHAT
Introduce membership fees.

WHY

- Need funding for e.g. a project manager.
- Majority of interviewed members were open to paying a membership fee.

HOW
Nordic Circular Hotspot has a membership contribution that is based on financial contribution or number of contributed hours. A similar structure for the CEI should be considered since it incorporates flexibility and inclusivity in the types of members joining.

POINTS TO CONSIDER

- Design the membership fees in a way that does not exclude smaller organisations.
- It should be clear to the members how they benefit from this with full transparency.
- Maximum fee to avoid larger actors from dictating the initiative direction due to their contribution.

Hire a Project Manager

WHAT
Employ a project manager for the CEI administration and coordination between working groups.

WHY
The need for member coordination, facilitation of LinkedIn group, administrative work and to take the lead on certain activities is clear.

HOW
TCO Development to hire someone new or to hire an external person.

POINTS TO CONSIDER

- This needs to be funded in some way.
- TCO Development was a preferred lead by some of the interviewed members.

Develop Recruitment Criteria

WHAT

Identify main criteria for new member recruitment and define the required level of ambition for them.

WHY

To ensure the credibility of the initiative and minimising the possibility for using the CEI to greenwash.

HOW

- The recruitment process should include a sign-up sheet which is reviewed by core group/project manager.
- Suggested ideas:
 - Adopt a science-based criteria framework.
 - Potential members submit their roadmap to circularity or other related metrics.
 - Public letter of intent or inclusion in Code of Conduct.

POINTS TO CONSIDER

- Defining the criteria could be quite a “political” issue. Based on interviews, there were diverging opinions between the members on whether the initiative should remain open to everyone or rather exclusive. However, a certain willingness to improve is a common opinion for recruitment.
- Criteria might exclude organisations genuinely working to improve, but who are not there yet.
- Should consider to which extent the current members should be reviewed on such criteria.

Establish Working Groups

WHAT

Create working groups for relevant topics with one lead per group.

WHY

To promote actions, and to drive progress and innovation. This could facilitate the collaboration possibility identified on tangible issues/projects.

HOW

Suggestions for group division include:

- *Thematic*: based on common topics.
- *Lifecycle*: where members in the same electronic lifecycle phase group together.
- *Dynamic*: where different members are dispersed among the working groups.

POINTS TO CONSIDER

- Minor & major goals should be set before working groups are created.
- Be aware of creating silos and decide how to present findings to the whole group.
- Commitment from members is needed. Some members have expressed interest in taking the lead or being involved.

Conclusion

The aim of this project has been to identify potential starting points for the CEI to move forward. By conducting interviews with almost all of the members, and by designing the workshop to be very interactive, we ensured that the members were listened to. Thus, while the seven recommendations are a result of our own conclusions, they are as much the outcome of a process of co-creation with the CEI members.

Looking ahead, we see great potential for the CEI to amplify its impact on the electronics industry. It is clear that there is a lot of motivation among the members, and we believe that our recommended first steps will be of good help in channelling this motivation for the way ahead.

References

- [1] TCO Certified, “Circular IT Management in Practice,” TCO Certified, Stockholm, Sweden, 2020. [Online]. Available: <https://tcocertified.com/2020-impacts-and-insights/>
- [2] Baldé, C. P., Forti, V., Gray, V., Kuehr, R., & Stegmann, P, “The global e-waste monitor 2017: Quantities, flows and resources.” United Nations University, International Telecommunication Union, and International Solid Waste Association, Bonn/Geneva/Vienna, Germany/Switzerland/Austria, 2017. [Online]. Available: https://collections.unu.edu/eserv/UNU:6341/Global-E-waste_Monitor_2017__electronic_single_pages_.pdf
- [3] Interview with Cassandra Julin, Head of global PR, Normative.io. (the communication manager in charge of CEI in TCO Development before September of 2021). October 21, 2021.
- [4] Haga Initiative. (n.d.). Become a member <https://www.hagainitiativet.se/en/Become-a-member> (accessed Oct. 11, 2021)
- [5] RE Action Japan. (n.d.). 再エネ 100 宣言 RE Action について). <https://saiene.jp/about> (accessed Oct. 13, 2021)
- [6] Nordic Circular Hoptpot. (n.d.). NCH Partnership Programme <https://nordiccircular-hoptspot.org/partnership> (accessed Oct. 18, 2021)

List of interviewees:

- Adam Gjerdrum, Sustainability Circular Lead, Dustin. October 21, 2021
- Alexandra Wu, Project Manager, IVL. October 15, 2021
- Andreas Nobell, Development Manager, TCO Development. October 20, 2021
- Camilla Cederquist, Project Manager Sustainability, ATEA Sweden. October 19, 2021
- Cassandra Julin, Head of global PR, Normative.io. October 21, 2021
- David Fitzsimons, Director, European Remanufacturing Council. October 18, 2021
- David Hensher, Communications Manager, Recipo. October 13, 2021
- Elin Bergman, Chair of Expert group for small and medium-sized companies for the Delegation for Circular Economy, Cradlenet. October 22, 2021
- Javier Martinez, President, ETIRA. October 24, 2021 (Replied interview questions by email)
- Jessika Richter, Postdoctoral Research Fellow, IIIIEE. October 18, 2021
- Johan Brändström, Doctoral student in circular economy, Högskolan i Gävle. October 18, 2021
- Jordan Lisle, Business Development Director, Innovent Leasing. October 11, 2021
- Josefien de Kool, Marketing & Communications Coordinator, Closing the Loop. October 19, 2021
- Katherine Shabb, Project management and environmental consultant, One Planet Sovereign Fund, October 26, 2021
- Louise Whitaker, Head of Marketing and Sustainability, Cistor. October 20, 2021
- Sebastian Holmström, Circular Strategy Lead, Inrego, October 14, 2021
- Steve Haskew, Head of the Global ITAD, Circular Economy, Sustainability and Social Leadership, Circular Computing. October 19, 2021
- Sofia Hagelin, Head of PR and communication, Tadera. October 19, 2021
- Tero Marjamäki, Head of Communications & Sustainability, Blocket. October 22, 2021
- Thomas Hedin, Environmental Affairs Manager North Region, Lenovo. October 11, 2021
- Valentin Boutmy, Sustainability Manager, Prime Computer. October 21, 2021



INDUSTRIAL CLIMATE ACTION

UNIDO



From left to right: Jannick, Caitlin, Finn and Frank

Acknowledgements

We would first like to thank the IIIIEE professors and coordinators for facilitating such an interesting and special project. We are particularly appreciative to our project supervisor, Katherine Shabb, whose astuteness, reassurance, and positive energy helped us throughout the project. We would also like to give many thanks to Scott, Tareq, and Fiona at UNIDO for the opportunity to work on such an inspiring project and for providing us with feedback and insights into the inner workings of UNIDO. We thoroughly enjoyed our experience and look forward to seeing the climate agenda continue to develop at UNIDO.

The Team

Caitlin Birkholz is from the United States. She holds a bachelor's degree in Finance and Information Systems from the University of Washington and has worked as a corporate sustainability consultant specifically in agricultural supply chains.

Finn Goodall is from the UK. He holds a bachelor's degree in International Development from the University of Sussex. Previously, he worked for sustainable business and finance consultancies in Finland and Sweden.

Frank Bimpong is from Ghana and holds a bachelor's degree in Development Planning from KNUST, with an interest in natural resource management, local government systems, and public policy.

Jannick Leukers is from Germany and holds a bachelor's degree in business. He worked in different capacities in the automotive industry, most recently within international and strategic workforce planning.

Climate at UNIDO

Supporting the Set-Up of a Climate Framework & Strategy

By Caitlin Birkholz, Finn Goodall, Frank Bimpong and Jannick Leukers

Introduction

Our client, the United Nations Industrial Development Organisation (UNIDO) was founded in 1966 with the mission to promote and accelerate industrialisation in developing countries. Since then, it has gone through several structural changes to improve inclusivity, sustainability, and equity. Today, our consultancy team are involved in the latest structural change to further embed climate into UNIDO's mandate.

In 2013, UNIDO's mandate changed along with the adoption of a new Lima Declaration that chartered new development priorities for Inclusive and Sustainable Industrial Development (ISID). UNIDO's new vision of ISID aims to provide "income generation, rapid and sustained increase in living standards for all people and provides the technological solutions to environmentally sound industrialisation" [1]. Currently, there are efforts to mainstream climate action within UNIDO's work and their ISID mandate. To successfully do this they look towards member states' industrial climate priorities to better support a green industrial development transition.

To this date, the Paris Agreement from 2015 remains the central international treaty on climate change. In the parties' Nationally Determined Contributions (NDCs) they communicate their ambitions for mitigating emissions and adaptation efforts to build resilience to the impacts of climate change. Throughout this project, we have analysed the NDCs to see the overlap with UNIDO's ISID mandate to create recommendations and research for how UNIDO can further streamline climate in their work to support member states' climate objectives. [2]

Project Overview

Introducing UNIDO

UNIDO at a glance

Full name: United Nations Industrial Development Organisation

Member States: 170

Founded: 1966

Headquarters: Vienna, Austria

Mandate: promote industrial development for poverty reduction, inclusive globalisation, and environmental sustainability

UNIDO works to advance ISID in its member states. This mandate incorporates multiple Sustainable Development Goals (SDGs), but the largest overlap is found in SDG 9 – Industry, Innovation, and Infrastructure.

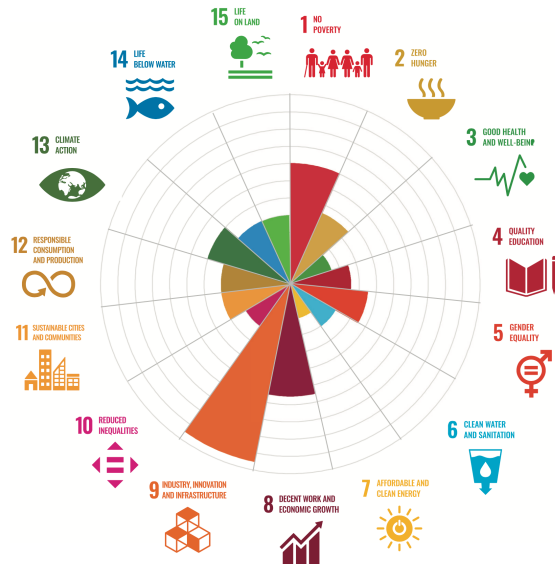


Figure 1: Contribution of ISID across SDGs [3]

How UNIDO aims to promote this is best illustrated by its theory of change. By means of

technical assistance, policy advice, norms and standard setting, and convening different actors UNIDO aims to build and strengthen knowledge and institutional capacities. This, in turn, creates shared prosperity, economic competitiveness, and environmental sustainability from industry.

As part of the pillar *Safeguarding the Environment*, many of today’s projects are related to climate change. However, these ambitions are not formalised and lack coherent communication.



Figure 2: UNIDO’s integrated results chain [3]

Climate Framework & Strategy

UNIDO is currently in the initial process of developing a climate framework and strategy. The climate framework at UNIDO aims to accelerate climate action throughout the multiple departments and work with internal and external stakeholders to integrate climate throughout the organisation’s projects. This climate framework works towards efficiency and coordination of climate action to promote the ISID mandate.

To develop a climate framework and strategy, a greater understanding of member states’ climate priorities is needed. As this can enable UNIDO to mainstream climate considerations when facilitating technology and knowledge transfer and generating finance to accelerate the transition to carbon-neutral industries. Climate-

related considerations for a framework and strategy are being presented at a conference in late November, in which our findings will be used as preliminary research for greater engagement.

Our Task

The consultancy task presented to us was to undertake top-down research upon member states’ NDC priorities and where they overlap with the UNIDO ISID mandate. This should serve as an overview of how and where UNIDO can mainstream climate action into ISID work to support the countries’ achievement of their climate objectives. The outcome of this research was to provide UNIDO with:

- Opportunities to differentiate member states’ engagement on climate action based on different needs and priorities
- Analytical research to support the creation of a climate framework and strategy
- Understand challenges and synergies between climate action and industrial development

Process & Methodology

Data Analysis & Background Research

To inform and guide our analysis, we gathered various country-level data for all UNIDO member states. Aiming to get a holistic overview, this comprised information from multiple categories and sources. We included economic and socio-economic statistics but also more specifically climate-related data (emissions from various perspectives as well as adaptation or vulnerability indices). To avoid being too generic, we focussed on industry-related metrics, such as the share and carbon intensity of manufacturing added value (MAV) within a country’s economy. Further, we included country clusters (both economic and regional) to make comparisons fruitful and structure our approach.

Country Profiles



To continue our research and support UNIDO's end goal of developing a new climate strategy, our team researched overall climate and ISID priorities within UNIDO member states. Given the complexity of this task, we applied a cluster also used by UNIDO to structure our research [4]. The grouping into Least Developed Countries, Developing Economies, Emerging Industrial Economies, and Industrialised Economies is purely descriptive and based on a country's economic and industrial output. Utilising these categories, we sought to identify key similarities and differences between the country groups' mitigation and adaptation strategies related to industrial development. For each country group, we reviewed country NDCs as well as meta-analyses to answer the following questions and develop a holistic profile. Our three research questions were the following:

1. *How are countries in this development category currently talking about SDG 9?*
2. *What are the overall NDC objectives and climate-related challenges for this type of country based on their level of development?*
3. *How can UNIDO support these countries' climate and development objectives given UNIDO's current capabilities?*

Structuring our research by economic development allowed our team to identify the largest opportunities for UNIDO to incorporate climate into their ISID mandate and gain member state buy-in for a new UNIDO climate strategy.

Limitations

It is important to note that there are certain limitations to both the data analysis and the country profiles. It would not have been time-efficient to build elaborate statistical models. Therefore, we

relied on relatively simple comparisons between the country clusters and, rather than taking these quantitative differences as the outcome itself, utilised them as guidance to focus our analysis. Throughout this project, we noticed on several occasions that the level of abstraction was still very high. To counteract this and make it transparent, we conducted a lot of country-level research and illustrated findings and their ambiguity with examples.

Climate & ISID

The threat of climate change is becoming increasingly evident. The challenge for governments, policymakers and industry is to develop policies and business models that are carbon neutral and climate-resilient. Notwithstanding the contribution of industrialisation to greenhouse gas (GHG) emissions, some countries consider industrialisation as pivotal in addressing challenges like reducing poverty, providing jobs, and catching up economically [5].

Industrialisation is seen as a pathway for achieving higher economic prosperity as well as reduced inequality [6]. However, climate change mitigation and adaptation, low-carbon industrialisation and green growth have become important for countries to implement. This, therefore, calls for industrialisation that is both inclusive and contributes to holistic sustainable development across all dimensions. UNIDO refers to this as ISID.

As much as UNIDO contributes to a wide range of the 2030 agenda goals, SDG 9, representative of their ISID mandate, takes a special position for the agency. Assisting their member countries with incorporating climate ambitions into their industrial activities requires awareness of the trade-offs and synergies between SDG 9 and SDG 13 (Climate Action).

Synergies & Trade-Offs

As stated earlier, it is imperative to understand the trade-offs and synergies between UNIDO's mandate to promote ISID and climate action. To do that, we reviewed papers examining the

trade-offs and synergies, specifically between SDGs 9 and 13. The limited body of research considering the relationship between the two SDGs identified diminishing trade-offs with an increasing number of synergies [7].

UNIDO’s ISID strategy on the other hand also looks at producing more with less and assisting with the economic growth of member states with less environmental impact. This, according to the agency, is to rope in all member states, the private sector, multinational development institutions, and all parts of the UN system.

Country Profiles

Overview

One central piece of our data analysis is the breakdown of SDG references within countries’ NDCs. We based this on a publicly available meta-analysis and included our country clusters for UNIDO member states to structure the data [8]. With a focus on SDG 9 linkages, we were able to determine countries’ priorities on the level of sub-targets, if countries’ emphasised mitigation or adaptation measures, as well as to read through their concrete statements.

Figure 3 shows, clustered by country group and region, how many references to SDG 9 and sub-targets there are. This is expressed as average mentions per country in the respective group – the higher the number (or the darker the shade of green), the more mentions.

As outlined in the methodology section, we also gathered several statistics on how the country groups differ in terms of various economic and climate-related metrics. Six of these are presented below and indicate how stark the relative differences are. Studying patterns and trends over time at different levels of granularity helped us structure and inform our analysis.

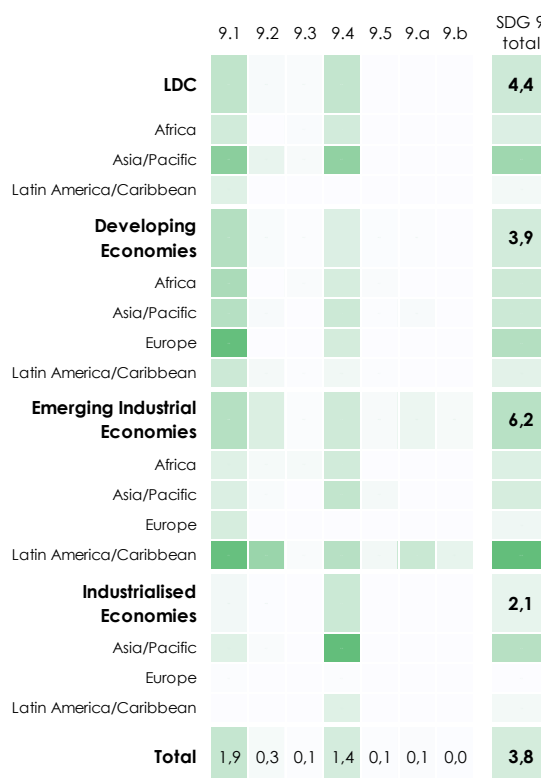


Figure 3: Linkages to SDG 9 by sub-target in NDCs expressed as average mentions per country

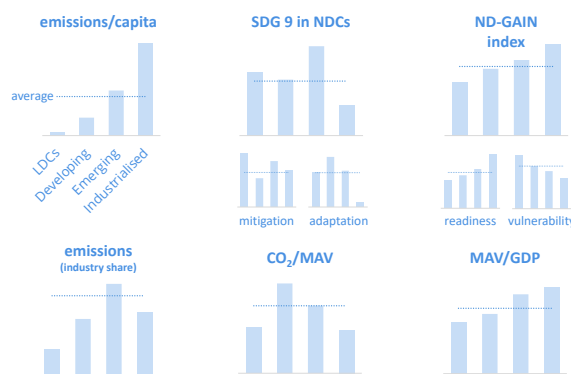
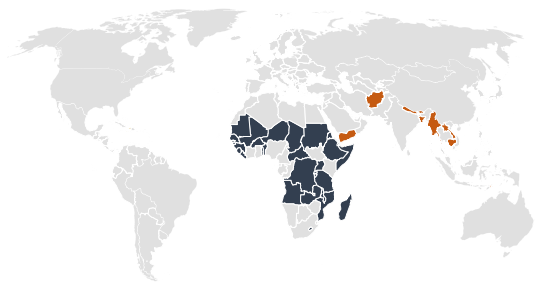


Figure 4: Statistics comparing the four country groups to provide context

While the country group *Industrialised Economies* was part of the database and occasionally used as a backdrop, we did not include a dedicated country profile. As these countries are more relevant in their capacity as donor countries, we replaced it with an analysis of trends in climate finance.

Least Developed Countries (LDCs)



• Asia (13), • Africa (33), • Latin America / Caribbean (1)

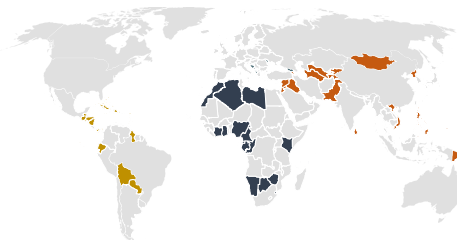
Least Developed Countries (LDCs) are primarily located in Africa, and nearly half are landlocked developing countries or small island nations. Due to these geographical constraints, LDCs face an immediate threat of repeated climate-related natural disasters contributing to chronic poverty. While there is a clear and urgent need for climate-resilient infrastructure and adaptation measures within LDCs, our analysis of SDG 9 climate targets revealed a misalignment between climate realities and country-level planning. Mitigation is mentioned roughly twice as many times as adaptation, even though LDCs produce only around 3% of global emissions and contribute to roughly 1% of global manufacturing production. However, it is important to note that not all LDCs are at the same level of development. Asian LDCs produce almost twice as many industry-related emissions as African LDCs and receive roughly twice as much international infrastructure funding [9].

Overall, LDCs' climate-related commitments focus on developing renewable energy systems and supporting sustainable forestry and agricultural industries. Within LDCs' mitigation targets, energy is a priority for 100% of the countries with a specific emphasis on increasing solar power. Currently, however, 80% of mitigation targets are at least partially conditional [10]. A 2019 calculation by UNCTAD found that half of the people living in LDCs do not have access to electricity, especially in rural areas [11]. Supporting the development of resilient electricity systems can have major positive downstream impacts on LDCs' future development but limited infrastructure, grid connectivity and

available technologies create barriers to meeting these targets. Additionally, as of 2017, while 52% of LDC electricity came from renewable sources, only 1% was sourced from solar and wind, while the rest came from hydropower leading to energy risks related to increased droughts [12]. Developing a diversified and decentralised electricity grid with a mix of wind, hydro and solar can enhance LDC resilience and lay the groundwork for greener industrial development.

Agriculture and food security were the top adaptation priorities for most LDCs with an additional focus on water management [13]. This aligns with the important role natural resources play in LDC economies, with nearly 70% of the population working in the agriculture sector [14]. Within Africa, climate-smart agriculture development is a top priority. Climate-smart agriculture can increase crop productivity, support rural income generation, increase resource efficiency, and preserve soil health through targeted farm management practices. Within LDCs, there is a specific need for knowledge and technology transfer to adopt climate-smart agriculture to increase yields and produce high-quality exports. There is also a large need to increase agricultural processing to add value to raw materials for exports and grow regional economies. In developing climate-resilient agricultural sectors, LDCs will need support across UNIDO's core offerings including technical assistance, policy advisory, knowledge transfer and standard setting to maintain food security and develop sustainably.

Developing Economies (DEs)



• Asia / Pacific (24), • Latin America / Caribbean (21), • Africa (17), • Europe (5)

Countries that fall within this group are described as having less-developed industries.

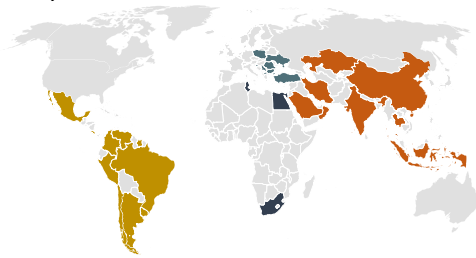
They are also identified as countries with low per-capita income. Their economies are characterised by a high share of agriculture and agro-based manufacturing, especially compared to industrialised economies [15]. Countries associated with this group are driven by industrialisation as a pathway for socio-economic growth.

Our review of the NDCs for this group, which was also corroborated by a study done by the UN Climate Change Secretariat, identified sectors of prioritisation for mitigation and adaptation. For mitigation, they included energy, transport, waste, land-use, land-use change and forestry, agriculture, industrial processes and product use, and buildings. Adaptation on the other hand prioritised water, agriculture, health, ecosystems, and infrastructure.

Some of the overarching findings from our analysis of DEs' SDG 9 priorities as stated in their NDCs comprised of:

1. Low research and development (R&D) support in terms of percentage share of GDP (average of 1.2%). An example is the R&D share in developing countries such as Ghana and Nigeria of 0.38% GDP and 0.13% of their GDP, respectively. In comparison, industrialised economies allocate a substantially higher portion to innovation, exemplified by Sweden (3.34%) and Japan (3.2%).
2. Mitigation and adaptation financing: It was identified that climate finance to mitigation activities as of 2019 was at 64% (down from 70% in 2018), and 25% to adaptation activities (up from 21% in 2018). Although DEs have indicated more adaptation measures in their NDCs especially around water, agriculture, land use, and land-use change, more than half of climate finance targeted mitigation activities, primarily within infrastructure, energy, and transport.

Emerging Industrial Economies (EIEs)



- Europe (11), • Latin America / Caribbean (10),
- Asia / Pacific (9), • Africa (4)

The EIEs consist of rapidly growing countries – economically, technologically, and digitally. EIEs are predominantly in eastern Europe, Latin America, and Asia. Due to the rapid growth found in EIEs, they currently produce the largest industrial share of emissions out of all the economic clusters, matched with political mandates often favouring their right to traditional fossil-based industrial development. Therefore, often limited political will hampers the adoption of environmental regulations and taxes, energy and resource efficiency, and green technologies to reduce the negative impact of rapid industrialisation [16]. Moreover, EIEs face immense urbanisation and growth of mega-cities creating hotspots for emissions and vulnerability to climate change impacts, such as flash flooding, heat waves, and rainstorms [17, 18].

Our NDC analysis of EIEs' adaptation and mitigation targets echo and highlight the socio-economic trends mentioned above. EIEs are the country cluster with the most SDG 9 related NDC targets. Here, mitigation targets linked to SDG 9, have primarily focused on two components.

1. Developing sustainable and resilient infrastructure, which promotes fuel switching in buildings, passive heating/cooling, and urban planning for recycling and re-use of waste, renewable promotion in built environment and transport – all closely corresponding to the mitigation concern of rapid urbanisation.
2. Retrofitting and upgrading industries with renewable energy, industrial energy and resource

efficiency, and development of national circular economy industrial plans. EIEs require greater assistance for clean technology transfer and policy support to develop industrial circular economy policies.

In terms of adaptation targets, the EIE NDCs have a predominant focus on climate-resilient infrastructure of housing, roads, coastal regions, and transportation systems in cities.

From the EIEs' NDC targets, UNIDO can play a large role to help facilitate knowledge, finance, and technology transfer to enable cleaner production methods and retrofitting industries already highly developed in EIEs. By developing measurable and trackable data of industries, renewable energy use, resource efficiency, and cleaner production methods can enable greater policy and standard development.

UNIDO's Role

Based on our finding of climate and ISID priorities within the three development categories, we created illustrative recommendations for UNIDO to highlight potential areas where they could support countries to reach their climate and development targets. This information provided UNIDO with a better understanding of their role in global climate action and offered insight into how UNIDO can leverage their existing skillset to engage member states going forward. Below are a few high-level examples to illustrate where we believe UNIDO can be a leader using UNIDO's existing four core offerings.

Technical Assistance

Least Developed Countries need support in developing capacity within government institutions to calculate climate risks and develop bankable projects. This can increase countries' access to development finance, specifically for adaptation projects where available funding is limited but necessary.

Emerging Industrial Economies need support in retrofitting existing industries through technology transfer and energy efficiency measures. Tailored technical assistance can help countries

in tracking mitigation efforts and make informed development choices.

Policy Advisory

Least Developed Countries and Developing Economies face difficult development and climate trade-offs. However, there is an opportunity for UNIDO to support member states in creating industry regulations and environmental policies early on to limit dirty development and harmful path dependencies. UNIDO can support these countries in ensuring relevant stakeholders are aligned to the climate agenda and are working collaboratively.

Emerging Industrial Economies are looking to accelerate circular economy efforts in a range of industrial sectors to facilitate resource efficiency and industrial symbiosis. UNIDO can support this initiative through advisory and knowledge sharing to increase the adoption of best practices.

Standard Setting

Developing Economies are looking to increase access to international markets and comply with growing private sector sustainability standards. UNIDO can enable information sharing and training to increase producers' ability to manufacture quality exports in line with global emissions targets.

Emerging Industrial Economies are looking to gain access to ESG markets and meet the demand from investors for non-financial sustainability reporting. UNIDO can support SMEs and industry sectors in meeting these reporting requirements to increase the flow of private capital into EIE businesses and facilitate the green transition.

Convening & Knowledge Transfer

Least Developed Countries and Developing Economies both require technology transfer within the energy, transport, and agriculture sector to develop cleanly. Promoting knowledge sharing amongst UNIDO member states can foster relationships among value chain actors and increase access to technologies critical to these

countries' green development. For example, technologies such as solar-powered sanitation, electric transport, and climate-smart agriculture tools are all crucial to sustainable development within these countries.

Co-Benefits

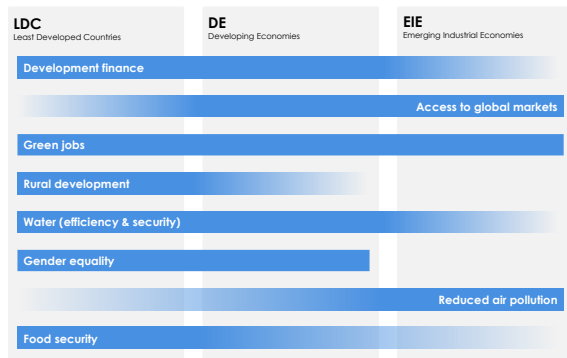


Figure 5: Co-benefits of industrial climate action by country group

We further examined typical co-benefits of industrial climate action to provide UNIDO with guidance for how to best approach different member states and argue for incorporating climate ambitions into their industrial policy. We outlined the general reasoning and paid special attention to how the arguments apply to varying degrees to certain country types (as shown in Figure 5 by the different shades of blue). To illustrate our analysis, we include the example of why GHG mitigation can help gain or maintain access to international markets:

Implementing carbon-reducing measures is increasingly beneficial not only for ecological but also for economic reasons. With growing scrutiny being directed to the entire value-chain (by both consumers and producers) reducing embedded emissions is central for remaining competitive as price and quality are no longer the only criteria for procurement. The Science Based Targets initiative is one example where companies are committing to reduction targets, which often include emissions along the corporate value chain (scope 3, mandatory if constituting at least 40%). In addition to staying attractive to climate-aware international buyers, GHG reduction will also become more

important from a cost perspective. The EU's proposed Carbon Border Adjustment Mechanism seeks to extend the pricing effect of its emissions trading system to imported goods, primarily targeting heavy industry (e.g., cement, steel, aluminium). There are further trade-related benefits of climate action, such as waivers of WTO rules for intellectual property rights for green technologies [19].

These trends most immediately apply to countries that already are large exporters of industrial products. However, it is also relevant and important to consider for industries just being built.

To complement our analysis and provide guidance for the interaction with rich UNIDO member countries, we examined the trends and state within climate finance and looked at donor priorities.

Climate Finance

This section aims to shed light on the state and trends within the sphere of climate finance. UNIDO should be aware of these circumstances when formulating a climate strategy for two reasons: 1) Being familiar with the donor countries' priorities can help with creating buy-in from these member states for creating the framework and strategy; 2) recognising the context of climate finance in UNIDO's strategy will make it more relevant and thereby effective overall. It is central to acknowledge that funding is both a necessary precondition for any project and subject to rapid and extensive change.

The current state of climate finance is interesting in the sense that it is hotly debated and will be a major topic at COP26 (which at the time of writing this report is currently taking place). There seems to be a reasonable consensus that as of today the available funding is insufficient [20, 21, 22]. However, how to increase it (by whom, through which instruments, and with what focus) is far less clear. UNIDO with its (technical) expertise should work within that space to attract existing and increase overall funding and guide it towards its most effective

utilisation. For this, it is useful to consider trends in actual spending as well as commitments and guidelines by donor countries and other institutional investors, such as multilateral development banks.

Rich countries likely failed to meet the 2020 target of providing 100 billion USD per year in climate finance to developing countries (2019: 80 billion). Even this amount is considered only a fraction of what is needed for limiting warming to 1.5 (or even 2 degrees), which in turn supports the assumption that we will (have to) see a major increase in the future. Therefore, it is valuable to examine how the money is spent currently and where there are gaps or required shifts. One trend (see Figure 6) is that multilateral finance increased steadily and in 2019 made up the biggest share, overtaking bilateral funding [23]. Hence, the climate strategies and guidelines of multilateral development banks should be closely considered for UNIDO’s climate plans. One example of shifting priorities can be found in the World Bank’s Transformative Climate Finance Report which emphasises the need for funding more systemic changes [24]. Further, there are more resources dedicated towards mitigation and middle-income countries leaving a gap for support of adaptation and LDCs [20, 25]. As several countries (Denmark, UK, Netherlands) have committed to counteract this imbalance [21], this is something that UNIDO could also support.

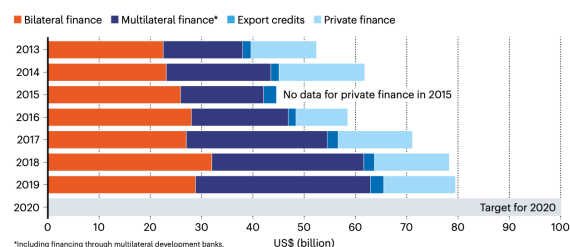


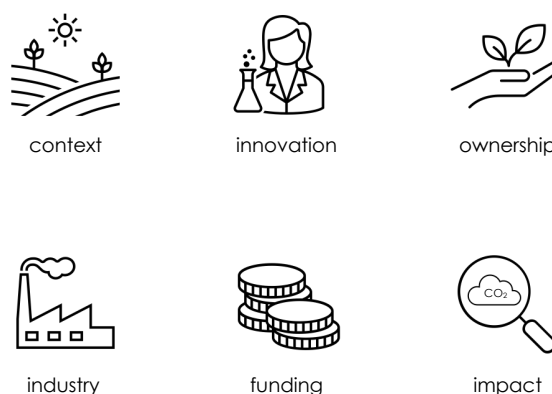
Figure 6: 100 billion \$ target: rich countries’ climate finance contributions by source [21]

Another important development UNIDO should pay attention to is the formulation of regulatory frameworks for (private) investment. The most prominent example is the EU Taxonomy, which is expected to have far-reaching impacts beyond

Europe. The underlying logic of this classification system has two important implications: 1) Its centrepiece, a set of six environmental objectives, contains two that are specifically dedicated to climate (mitigation and adaptation), highlighting its importance in the field of sustainable finance; 2) there can be no adverse effects on any of the objectives, so even if the focus of an action is not climate, it must not make the situation in terms of adaptation or mitigation worse. This mechanism requires that there be some form of impact assessment across these categories for any project that is to be considered environmentally sustainable.

Overall, there are several ways in which UNIDO can engage with donor countries and other financing institutions to maximise their positive climate impact.

Key Takeaways



Pay Attention to Local Contexts

Throughout the project we realised that while structuring and abstracting information and making generalisations is useful and necessary to a degree, recognising regional and context-specific differences is crucial. Even after the division into the country groups and structuring the analysis by region, for many factors the variation was still very high making general statements difficult. To accommodate for this, we looked at a lot of country-specific documents and examples and tried to make the diversity within the groups explicit. We support UNIDO’s plans of a regionally differentiated approach to

devising and especially implementing a climate strategy.

Support Homegrown Innovation

In our research, we often came across the need for technology and knowledge transfer from high- to lower-income countries. This is a good and necessary step. However, it must not stop there. The focus should be to build capacities and allocate funds that enable local research and innovation. This approach has several benefits: 1) It comprises more than just the environmental dimension of sustainability and can generate long-term prosperity; 2) utilising local knowledge allows for more targeted innovation which is suited to the respective context; 3) expanding the number of people (with different perspectives) researching and working on climate solutions increases the likelihood for significant breakthroughs. UNIDO should continue their work in capacity building and promote funding of local R&D activities.

Avoid Extractive Institutions

Related to the former point, resources (both physical and intellectual) should be built and tended. Any project that disregards how it will benefit not only the environment but also the community in the long-term risks extracting resources and reinforcing inequalities. With climate protection becoming more mainstream comes the danger of certain actors trying to exploit good intentions for their own benefit. UNIDO should take precautions to avoid partnering with institutions that pursue immediate private gains instead of persistent and holistic forms of sustainability. Resource ownership should be prioritised.

Grow Awareness of Industry's Role

Industry transition is still underrepresented in the climate debate. While, on average, the updated NDCs recognise its importance more than the initial versions [26], industry remains the by far least mentioned sector in countries' mitigation priorities [27]. We think that by emphasising both the importance and co-benefits of decarbonising the industrial sector UNIDO can

encourage more climate ambition and action within ISID. One significant part of this is to widen the scope of what is meant by decarbonising industry. For an effective and accessible approach, this should not only cover green hydrogen steel production or use of renewable energy but also good housekeeping measures and resource efficiency.

Engage with Climate Funding Realities

Going back to the chapter on climate finance, to closely work with the different actors and guidelines in this sphere is a precondition of having a substantial impact. This refers to strategic cooperation with donor countries and financial institutions as well as systematically working with receiving countries to create "bankable" projects.

Make a Climate Impact Assessment Mandatory

Finally, we recommend implementing a compulsory assessment of climate impacts for each project. This is irrespective of the activity's main focus. To at least consider climate in everything UNIDO does can help the organisation to streamline its climate action and make it easier to calculate its overall footprint. In addition, quantification of climate impact becomes increasingly important for securing finance. Again, that is the case for both climate projects and other endeavours, with the example of the EU Taxonomy requiring verification of no adverse effects on climate.

References

- [1] UNIDO, 'Introduction to UNIDO Inclusive and Sustainable Industrial Development'. 2015
- [2] UN, 'Paris Agreement on Climate Change,' 2015. [Online]. Available: https://unfccc.int/sites/default/files/english_paris_agreement.pdf.
- [3] UNIDO, 'Medium-Term Programme Framework 2022-2025', Vienna, Jul. 2021.
- [4] UNIDO, 'Industrializing in the digital age'. Vienna, Oct. 2019.
- [5] W. Naudé, 'Climate change and industrial policy,' *Sustainability*, vol. 3, no. 7, pp. 1003–1021, 2011, doi: 10.3390/su3071003.
- [6] Y. Li, 'Towards inclusive and sustainable industrial development,' *Dev.*, vol. 58, no. 4, pp. 446–451, 2015, doi: 10.1057/s41301-016-0055-8.
- [7] C. Kroll, A. Warchold, and P. Pradham, 'Sustainable Development Goals (SDGs): Are we successful in turning trade-offs into synergies?' *Palgrave Commun.*, vol. 5, no. 1, pp. 1-11, 2019, doi: 10.1057/s41599-019-0335-5
- [8] E. Northrop, H. Biru, S. Lima, M. Bouye, and R. Song, 'Examining the Alignment Between the Intended Nationally Determined Contributions and Sustainable Development Goals,' *World Resources Institute*, Washington D.C., Sep. 2016.
- [9] SDG Tracker, 'Goal 9: Industry, Innovation and Infrastructure. Our World in Data,' Nov. 2021. [Online]. Available: <https://sdg-tracker.org/infrastructure-industrialization>.
- [10] UNEP DTU Partnership, 'Pocket Guide to NDCs Under the UNFCCC,' Jun. 2020. [Online]. Available: <https://unepdtu.org/wp-content/uploads/2020/09/2020-pocket-guide-to-ndcs.pdf>
- [11] UNCTAD, 'Over half of the people in least developed countries lack access to electricity,' Nov. 2021 [Online]. Available: <https://unctad.org/topic/least-developed-countries/chart-july-2021>.
- [12] UNCTAD, 'Harnessing technologies for transformational electricity access in LDCs in The Least Developed Countries Report,' 2017, UN, 2018, pp. 57–84. doi: 10.18356/1e8b62ff-en.
- [13] IIED, 'LDC NDCs: adaptation priorities and gaps to address', London, Jun. 2019.
- [14] UNCTAD, 'Sustainable agriculture and food security in LDCs,' Geneva, May. 2011.
- [15] S. R. Lambert, N. E. Elamin, and S. F. Cordoba, 'Build-Back-Better from COVID-19 With the Adoption of Sustainability Standards in Food Systems,' UNCTAD, Research Paper No. 61, Geneva, Mar. 2021.
- [16] K. Sohag, M. Al Mamun, G. Uddin and A. Ahmed, 'Sectoral output, energy use, and CO₂ emission in middle-income countries', *Environmental Science and Pollution Research*, vol. 24, no. 10, pp. 9754-9764, 2017, doi: 10.1007/s11356-017-8599-z.
- [17] UN, '68% of the world population projected to live in urban areas by 2050'. [Online], May 2018. Available: <https://www.un.org/development/desa/en/news/population/2018-revision-of-world-urbanization-prospects.html>.
- [18] CDP. 'Cities at risk'. [Online], 2021. Available: <https://www.cdp.net/en/research/global-reports/cities-at-risk>.
- [19] B. Paul and C. Vicky, *The Trade and Climate Change Nexus: The Urgency and Opportunities for Developing Countries*. The World Bank, 2021. doi: 10.1596/978-1-4648-1770-0.
- [20] T. Carty, J. Kowalzig, and B. Zagema, 'Climate Finance Shadow Report 2020: Assessing progress towards the \$100 billion commitment', *Oxfam*, Oct. 2020. doi: 10.21201/2020.6621.
- [21] J. Timperley, 'The broken \$100-billion promise of climate finance — and how to fix it', *Nature*, vol. 598, no. 7881, pp. 400–402, Oct. 2021, doi: 10.1038/d41586-021-02846-3.
- [22] J. Thwaites and J. Bos, 'A Breakdown of Developed Countries' Public Climate Finance Contributions Towards the \$100 Billion Goal', *WRIPUB*, 2021, doi: 10.46830/writn.20.00145.
- [23] OECD, *Forward-looking Scenarios of Climate Finance Provided and Mobilised by Developed Countries in 2021-2025: Technical Note*. OECD, 2021. doi: 10.1787/a53aac3b-en.
- [24] World Bank Group, 'Transformative Climate Finance: A New Approach for Climate Finance to Achieve Low-Carbon Resilient Development in Developing Countries', Washington, D.C., Jun. 2020.
- [25] UNEP, 'Adaptation Gap Report 2020', Nairobi, Jan. 2021.
- [26] F. Sanchez and A. Nilsson, 'Is industry transition now a priority in the latest round of NDCs?', *Leadit*, Oct. 2021.
- [27] UNFCCC, 'Nationally determined contributions under the Paris Agreement: Synthesis report by the secretariat', Bonn, Sep. 2021.



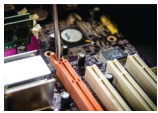
FINAL REMARKS





REFLECTIONS

Despite continued limitations from the pandemic, our batch has demonstrated flexibility and adaptability in managing to work with a diverse range of clients, both in terms of sectors and geographical context. During this course, we gained invaluable experience and have helped pave the way forward for our clients, sustainability-wise. Below are our reflections:



A takeaway for Team Axis was the importance of incorporating a variety of internal and external stakeholders' views into our discussions and recommendations. This project also highlighted the benefits and competitive advantages companies can gain by planning early for upcoming legislation and moving toward circularity.



Team CVRA experienced the complexity of business values and market advantages of sustainability certifications. The need for benchmarking, common definitions and a global framework to evaluate the available schemes became evident. The wine producers in Alentejo should share the efforts to strengthen the regional brand in international markets.



A key learning for Team Ingka Group was the necessity of multi-stakeholder approaches to push sustainability in industries with complex value chains, such as the construction sector. Further, the benefits of using models and frameworks to guide actions were understood by the group, while recognising that no such tool can provide a silver-bullet solution.



Team Nomad learnt that the shift towards low-carbon heating technologies is complex, not merely technical, and including behavioural aspects is crucial. Throughout the master's programme, we gained knowledge on a wide range of topics, from behavioural policy interventions to heating technologies, and are able to discuss those on a professional level.



Team Opibus was inspired by the company's commitment to sustainability beyond their business model. It was eye-opening to see sustainability efforts in a different cultural context. For start-ups like Opibus, it is important to have a strong foundation for sustainability, as this makes it easier to build upon in the future and can also become a pace-setter for others.



Team Stockholm+50 experienced a double crash course in sustainable consumption discourse and environmental diplomacy. Integrating these material learnings into agenda-setting at a high international level, we reflected on how the choices of the past have determined today's reality, and how today's choices will determine the future.



For Team TCO Development, a key takeaway was how important bottom-up, member-based initiatives are for changing current paradigms. Moreover, the team experienced the importance of co-creation in the process of developing a common strategy, as it is necessary to create ownership and buy-in for the next steps.



Team UNIDO realised that client requests are not always clear and precise. It is crucial to be attentive, particularly during the first meetings. We could not count on being presented with a clearly defined scope but had to actively engage with the task and set priorities ourselves. Taking initiative and proposing our own way forward was central to our project's success.



THE IIIEE

The International Institute for Industrial Environmental Economics, IIIEE, is an international and interdisciplinary centre at Lund University. Established by the Swedish Parliament in 1994, IIIEE has a mandate to advance sustainable solutions to catalyse climate neutrality and resource-efficient economies. The institute is committed to producing rigorous, impactful, and solutions-oriented interdisciplinary research, focused on the following four research areas: Business Management and Practice, Consumption Governance, Urban Transformation, and Policy Interventions.

With an ambition to advance preventive strategies, policies and systems supporting sustainable development, the following topics are taught and researched at IIIEE through PhD and master's programmes: environmental law, extended producer responsibility, environmental management systems, life cycle assessment, corporate environmental management and environmental policy evaluation. The two master's programmes focus on Environmental Sciences, Policy and Management (MESPOM), and Environmental Management and Policy (EMP). These programs aim to educate future leaders and change agents with the knowledge, skills, and networks to drive sustainability transitions.

The institute has developed five Massive Open Online Courses (MOOCs), including *Greening the*

Economy: Sustainable Cities, which ranked among the 2021 Best Online Series of all time by Class Central. Along with engaging in multidisciplinary research and activities, the institute brings together cultures from all parts of the world and recruits students from various disciplinary backgrounds. This year's Batch 27 is made up of students from 18 different countries, with backgrounds in anthropology, business administration, economics, engineering, environmental science, life science, political science, international studies, accounting, and ecology. By bringing together people from all parts of the world, the institute ensures a global perspective and provides a platform for the generation of creative synergies and solutions.

The staff at IIIEE are committed and actively involved. The programme opens the door to a wide range of international environmental careers. The 900+ alumni represent more than 110 nations who are now active in consulting, industry, research, NGOs, and in national governments and international institutions, contributing to advancing the environmental agenda. After graduation, students continue sharing knowledge and cooperating through the alumni network, meeting regularly at alumni conferences. For more information on the IIIEE Alumni Network, please visit <https://www.iiiee.lu.se/education/alumni-network>. For more information on IIIEE, please refer to www.iiiee.lu.se.



LUNDS
UNIVERSITET

iiiee

THE INTERNATIONAL INSTITUTE FOR
INDUSTRIAL ENVIRONMENTAL ECONOMICS

LUND UNIVERSITY
International Institute for
Industrial Environmental
Economics

P.O. Box 196, Tegnérplatsen 4
SE-221 00 Lund, Sweden
Tel +46 46 222 02 00
www.iiiee.lu.se