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Sustainable Futures: Learning from Copenhagen

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ABSTRACT

This article analyses and explores the implications of the "Copenhagen Lessons – 10 Principles to Build On", presented at the conclusion of the 28th UIA World Congress of Architects, "Sustainable Futures – Leave No One Behind" (held in Copenhagen, 2023). The principles address architecture's contribution to the UN Sustainable Development Goals (SDGs) and outline targets for the new practice needed to meet the goals. The article discusses how the principles can be localized and implemented to enable further, decisive action in the building industry, in educational institutions, among government officials and in society at large. The article is a contribution to a new language and framework of how to understand architecture and points to some of the many new architectural solutions, responding to local climate, culture, and challenges. The change needed to address social needs while protecting the planet is mayor, and the collective challenge demands a new way of talking about architecture and, crucially, new ways to design, plan and build as we go forward.

1. Introduction

The "Copenhagen Lessons – 10 Principles to Build On" were presented at the conclusion of the 28th UIA World Congress of Architects, "Sustainable Futures – Leave No One Behind" (held in Copenhagen, 2023). About 6.000 architects and stakeholders from 135 countries were present at the Congress – with many more having been active in the committees, conversations and activities leading up to and following the event in Copenhagen[1].

The purpose of the World Congress was to discuss, exchange and share insights on how architecture and urban planning can contribute to the UN Sustainable Development Goals (SDGs)[2] – and through that interaction among peers: accelerate the international society's ability to meet the targets by 2030.

The World Congress congregated for four intense days of meetings, knowledge exchange and inspiration, but the lead-up to those days spanned seven years. During those years, we had the privilege

[1] The UIA World Congress of Architects 2023 in Copenhagen. Available: https://uia2023cph.org/

[2] The UN 17 Sustainable Development Goals. Available: https://sdgs.un.org/goals

of meeting and working with gifted, inspiring people from all over the world, each working tirelessly to contribute to a better world through architecture. We experienced architecture employed in new, humble, daring and creative ways – demonstrating clearly, that the language of architecture goes well beyond that of the built element itself. We met architectural practices reacting to severe challenges of inequality, climate change and conflicts uprooting communities.

Meeting people from all over the world, from radically different places, and discussing architecture's ability to contribute to the SDGs, working together to advocate change globally and in each of our local contexts, is what generated the content of the Congress in Copenhagen and the hopeful, openminded energy, we experienced among those assembled. In the "Copenhagen Lessons - 10 Principles to Build On" we attempt to capture what we learned during those seven years of new collaborations and inspirations, with the aim of supporting future oriented conversations and strategy for stakeholders in the global building industry reaching for the goals.

In the following we present the 10 principles and the underlying problems they address. Secondly, we discuss localization in tree contexts, in Bangladesh, Palestine and Denmark, that illustrate architecture's contribution to the issues inherent in the principles. Finally, we conclude with perspectives on new sustainable practices.

2. Methodology

This paper is based on analysis of architecture's potential contributions to social and environmental sustainability and builds on the authors' previous body of work concerning the relation between architecture and the UN Sustainable Development Goals (SDGs)[3]. This work applies an understanding of Goals as potential change catalysts, creating a language that can be employed strategically by stakeholders within the fields of architecture and the built environment to drive transformational achieve development[4]. The approach focusses on the "goal-setting" as strategy, as a key supplement to legislation as a driver for change.

In this paper, the authors' apply this approach to the "Copenhagen Lessons – 10 Principles to Build On[5]". First; The 10 Principles are described, linked to a framework of sustainable development needs and human rights. Second; selected local communities and their core challenges are presented, while realized locally-anchored architectural interventions are analyzed and discussed, with the purpose of illustrating, if only in part, how the 10 Principles can manifest themselves locally through the built environment.

3. Copenhagen Lessons - 10 Principles to Build On

The "Copenhagen Lessons – 10 Principles to Build On" address architecture's contribution to the UN Sustainable Development Goals (SDGs) and outline targets for the new practice needed to meet the goals. Each of the principles would require new localized architectural practices spanning social and environmental sustainability.

[3] Natalie Mossin helped found and served as co-chair of the UIA Commission on the UN Sustainable Development Goals and has co-developed and authored (together with Ingeborg Hau et al) the publications 'An Architecture Guide to the UN 17 Sustainable Development Goals volume 1 and 2', since published in translations to French, Japanese, Traditional Chinese, simplified Chinese and Portuguese. The publications can be downloaded here: https://royaldanishacademy.com/en/publications

[4] Stilling S, Bøjstrup TC, Mossin N. Goal-setting as a strategy to drive transformational development in the building industry. *Architectural Research Quarterly*. 2023;27(2):88-93. doi:10.1017/S1359135523000180

[5] Introduced by Natalie Mossin at the conclusion of the UIA World Congress of Architects 2023: https://www.archdaily.com/1003865/10-copenhagen-lessons-from-the-uia-world-congress-of-architects-2023

The 10 principles are:

1. Dignity and agency for all people is fundamental in architecture, there is no beauty in exclusion.
2. People at risk of being left behind must be accommodated first when we construct, plan, and develop the built environment.
3. Existing built structures must always be reused first.
4. No new development must erase green fields.
5. Natural ecosystems and food production must be sustained regardless of the built context.
6. No virgin mineral material must be used in construction, when reuse is possible.
7. No waste must be produced or left behind in construction.
8. When sourcing materials for construction, local renewable materials come first.
9. In everything we build, carbon capture must exceed carbon footprint.
10. When developing, planning, and constructing the built environment, every activity must have a positive impact on water ecosystems and clean water supply.

In the following sub-chapters, each principle is described and linked to a framework of sustainable development needs and human rights.

3.1 Dignity and Agency for All People is Fundamental in Architecture, there is No Beauty in Exclusion

The Universal Declaration of Human Rights[6] is a foundational starting point for all we build, plan and construct. Architecture is a profession of service to human dignity and to the needs of people. We build to shelter from outside climatic conditions and dangers, to form community, express identity and presence and support the carrying out of the many and diverse activities that humans conduct. However, how we build can also exacerbate inequalities and block access to community. As architects and stakeholders in the built environments, we must insist on an architecture better than that. There is no beauty in exclusion. This starting point requires an open and serious approach to how a space can contribute to dignity and agency for not only those who can be defined as users, but also for those who engage with the project in other ways, for those who were maybe already present at the site, before the project, and for those who could need a space, where they are to be met as equals.

3.2 People at Risk of Being Left Behind Must be Accommodated First When We Construct, Plan, and Develop the Built Environment

When the SDGs were adopted by the United Nations in 2015, a pledge to "Leave No One Behind" was adopted as an overarching value framing the SDGs together with the strategy to "Reach the Furthest Behind First" [7]. Six factors we must think about, when we consider who are at risk of being left behind are poverty, gender, age, ethnicity, religion, and ability. Often when we build, we consider how to do better on inclusivity, how to reach further, and while this is well intended and has real beneficial effects – the UN strategy of "Reach the Furthest Behind First" challenges us to turn this approach around and take as a starting point the accommodation of those at risk of being left the furthest behind. This means that the first user to be thought of when designing the main entry hall to a school is not the majority user, but those at risk of being excluded: the student in a wheelchair, the staff member with PTSD, the non-binary parent. The loss to society is great when portions of the population are excluded from contributing in full: are excluded from obtaining an education, holding

[6] The Declaration was proclaimed by the United Nations General Assembly in Paris on 10 December 1948 (General Assembly resolution 217 A). Available: https://www.un.org/en/about-us/universal-declaration-of-human-rights

[7] With the adaptation of the UN Sustainable Development Goals in 2015, the UN pledged to Leave No One Behind and Reach the Furthest Behind first. Available: https://www.un.org/sustainabledevelopment/ and https://www.undp.org/publications/what-does-it-mean-leave-no-one-behind

a job or raising a family. But the loss for the individual is even greater. Architecture can, through careful design of the building blocks of society we construct, plan and develop, contribute greatly to the accommodation of users at risk of being left behind.

3.3 Existing Built Structures Must Always be Reused First

At a global level, we have built extensively and at accelerated volume and speed following industrialization. Today, we are at a point where ecosystems are threatened with collapse, and looming material scarcity. The pressure on ecosystems require that we move decisively in architecture and planning to use what we already have and employ resources that are already extracted. This means that existing built structures must always be reused first. Looking at the calculated lifespan of residential buildings, we are likely to demolish buildings after little more than half of that time [figure 1]. Adding to the severity, is the knowledge that calculated lifespan is a technical definition of lifespan, not the full actual lifespan of a building well cared for, which can be significantly longer. That is not the way to go forward. We must, when we build, construct, and solve problems in the built environment, start by examining what we already have and put it into use. To add to the daunting statistic of early demolition, the materials used today also have a shorter lifespan compared to previous times. We are tearing down before the technical end of life of a building, but we are also building it with the materials that are expected to last shorter. We must turn that around. This means that stakeholders in the built environment must engage with existing structures in a local context when planning to build or develop new facilities, analyze the state of structures and components, and build the projects on renovations, transformation, or reuse.

Fig. 1. Lifespan of residential buildings. Source: Østergaard et. all (2018)

3.4 No New Development Must Erase Green Fields

The need to use all that we have already claimed and build, also extend to land-use[8]. We have built on so much of this planet, and we have preciously little untouched nature and robust nature-networks left. We should therefore prioritize to build and rebuild on lands already occupied and use them better. If we must develop on green fields, we should do it with the care and consideration of the lifeforms present and their continued survival, at a level no less than what was on site before. No new development must erase green fields, nature-networks and ecosystems present must be protected and prioritized. This attention to the human footprint also relates to space demands, and when accessing the space demand of different income levels [figure 2] a correlation between wealth pr. capita and space demand is evident. This puts a special responsibility on both wealthy nations and persons with higher income levels to reduce space demand so more can be accommodated on sites already occupied, and on stakeholders in the built environment to assist this reckoning. Conversely, growing populations or displacement can create a hard demand to develop on a green field. This should be avoided, when at all possible, but when it must happen, to deliver on basic human rights, the dignity of people and sustainable living conditions, then existing ecosystems must be protected and cohabitation with existing lifeforms made a priority.

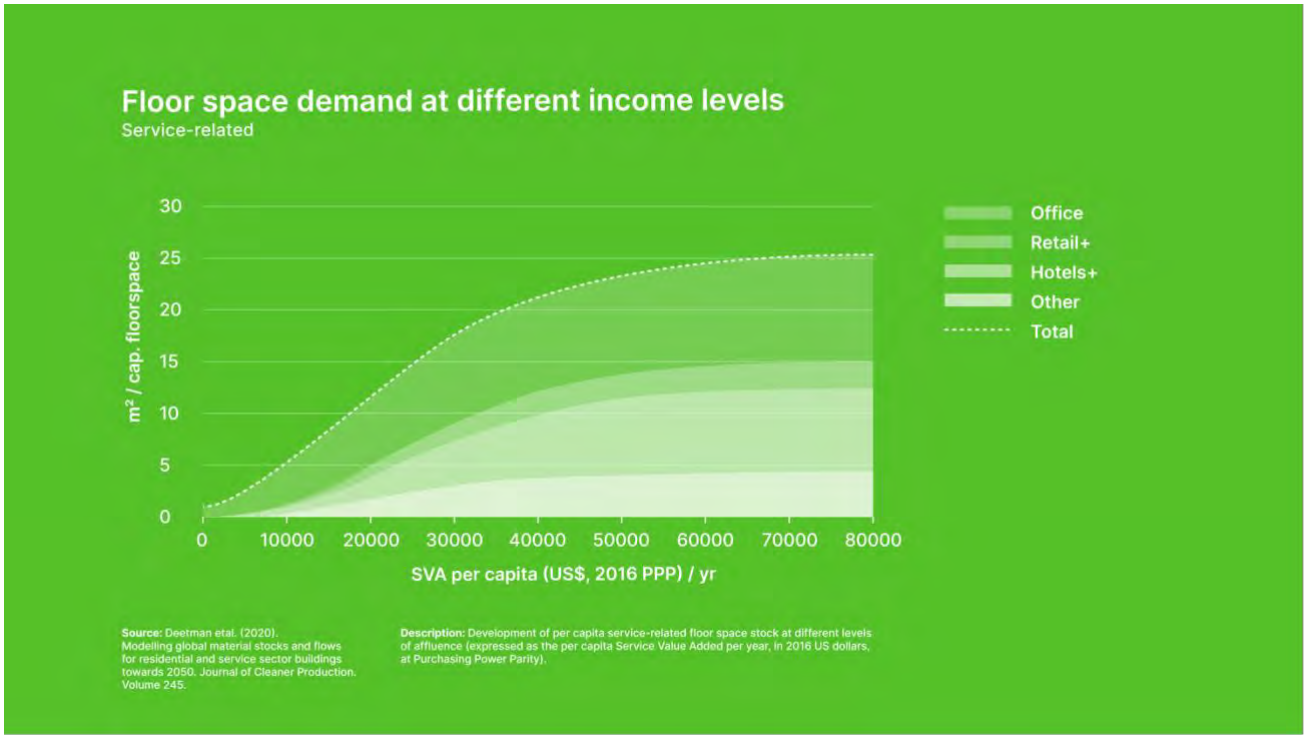

Fig. 2. Floor space demand at different income levels. Source: Deetman et. all (2020)

3.5 Natural Ecosystems and Food Production Must be Sustained Regardless of the Build Context

Creating build environments where cohabitation with other lifeforms, ecosystems and nature networks are a priority, is something we must do everywhere. Natural ecosystems and food production must be sustained or reestablished regardless of the built context. Biodiversity loss and ecosystem collapse is one of the biggest risks to the planet today [figure 3]. This must be reversed. And when this is assessed together with the fact that roughly 2.3 billion people have experienced moderately or severe

[8] UNESCO MAB: https://www.unesco.org/en/mab

food insecurity[9], we must implement and protect natural nature network and food production opportunities in all contexts, also in dense urban environments. Parks, urban wetlands, fields and green roofs can be designed to function as nature network nodes in urban environments, while elements of almost any scale can connect the nodes: trees along a street, insect hotels on a façade, a wildlife corridor under or over infrastructure as well as private gardens or balconies. As for food production, small scale interventions connected to personal agency can have an enormous impact. On the larger scale, disused industrial spaces can be repurposed for farming activities like mushroom production and parks can be organized with community gardening as a key feature.

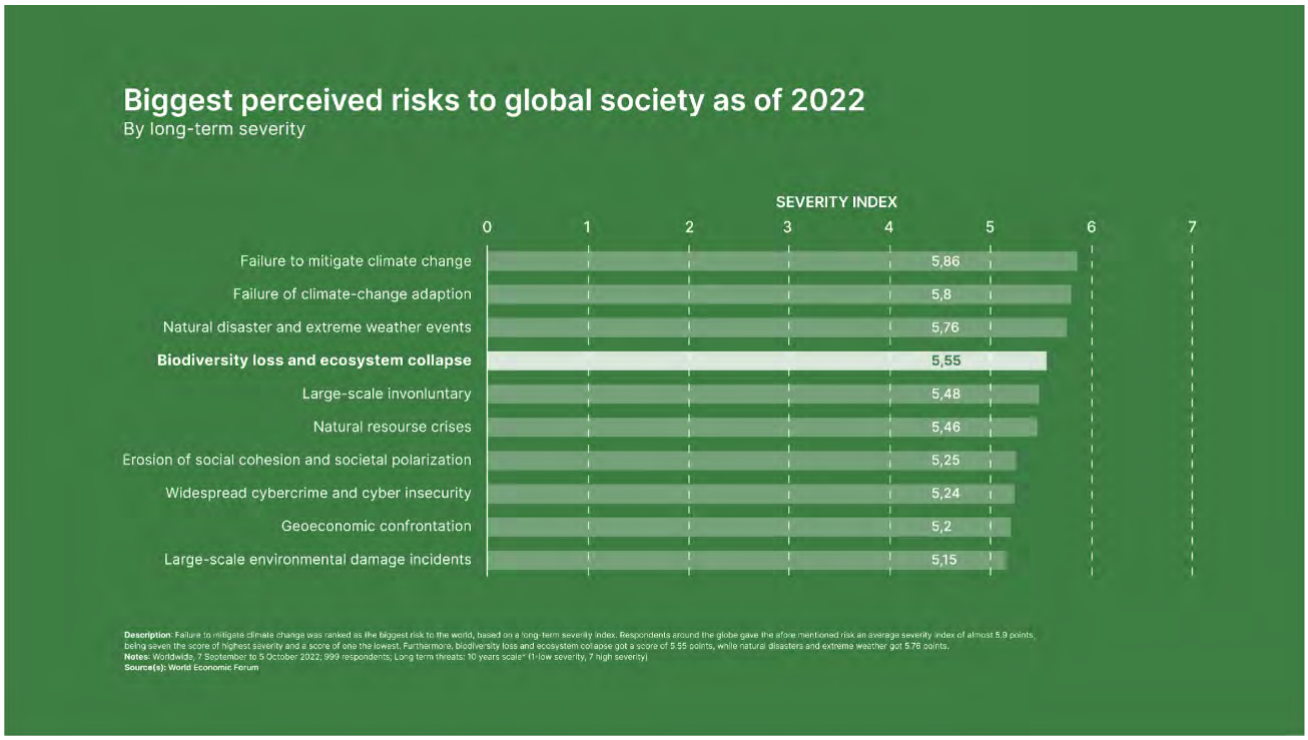

Fig. 3. Biggest perceived risks to global society as of 2022. Source: World Economic Forum

3.6 No Virgin Mineral Material Must be Used in Construction, When Reuse is Possible

The planet is running out of many mineral materials[10]. For example, the demand for sand is skyrocketing, and supplies are running out [figure 4]. And it is not only sand, but also many other finite mineral resources. In building and construction, we have used too much for too long with no real strategy for the future as industrialization made materials and their global distribution cheap. Now we must reverse course: no virgin material must be used in construction when reuse is possible. As an architectural strategy, the first question will be whether the full structure or larger parts of it can be reused where it stands, as specified in principle #3. If this is not possible, elements such as windows or doors must be salvaged and repurposed, and materials such as metals, glass and plastics recast. Finally, strategies and lifecycles must be developed for materials that are currently difficult to repurpose or recast. This requires new knowledge and new methods to access quality and potential toxicity of pre-used elements as well of new businesses creating an infrastructure of routes from demolition to renewed application. Materials for reuse may come from the built environment itself, but can also come from other industries or sources, such as the everyday consumption of single-use

[9] FAO; IFAD; UNICEF; WFP; WHO (2022): The State of Food Security in the World (SOFI). Around 2,3 billion people or nearly 30% of the global population were moderately or severely food insecure in 2021.
[10] IPCC report on mitigation 2023: www.ipcc.ch/report/ar6/syr/downloads/report/IPCC_AR6_SYR_SPM.pdf

plastics currently prevalent in much of the world. Vernacular architecture offers a wealth of inspirations for continual material use and reuse, which can inspire a new approach to the materials we have already extracted and harvested.

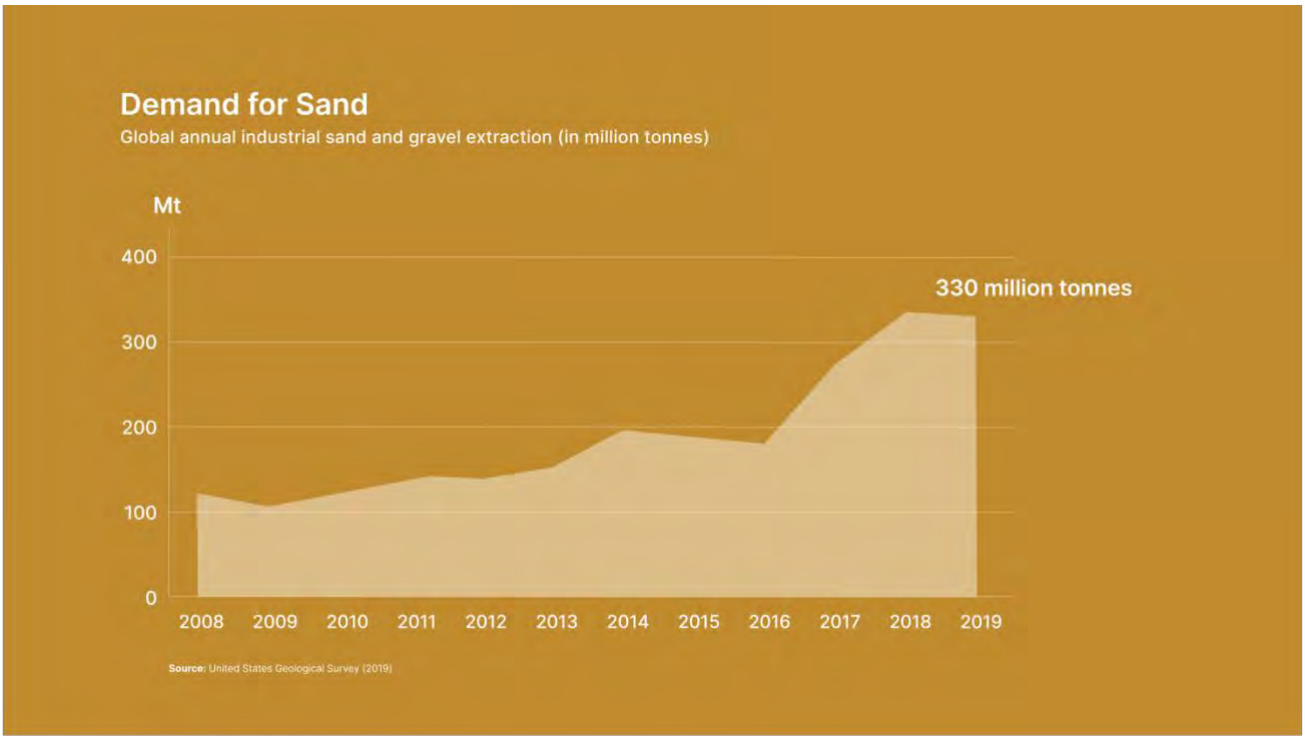

Fig. 4. Demand for Sand. Source: United States Geological Survey (2019)

3.7 No Waste Must be Produced or Left Behind in Construction

The building industry is a huge producer of waste. In the EU the construction industry generates about 37,5 % of all waste [figure 5]. This level of waste production has an enormous impact on resource consumption and planetary health. We can build better than that and must aim for a target of zero waste produced as a byproduct when we build. Currently, we produce to waste in many of the material flows connected to the building industry. As an example, in mainstream industrialized building, only parts of a tree felled at a plantation for flooring will end up on a floor, while much will be discarded or downgraded. First off, smaller branches, leaves and bark are discarded for pulp or secondary use, as is uneven or subpar parts of the trunk. The mainstream industrial modus would then allow only equal length, equal quality boards to reach the building site, often wrapped in single use plastics. On site, boards are cut to fit, and cutoffs discarded with the wrapping. This approach to resource is not sustainable. We must relearn in industry to use the full resource for full value. And we must invest in practices and workflows that make redundant single-use wrappings and other byproducts that go directly to waste, adding no value to the architecture itself.

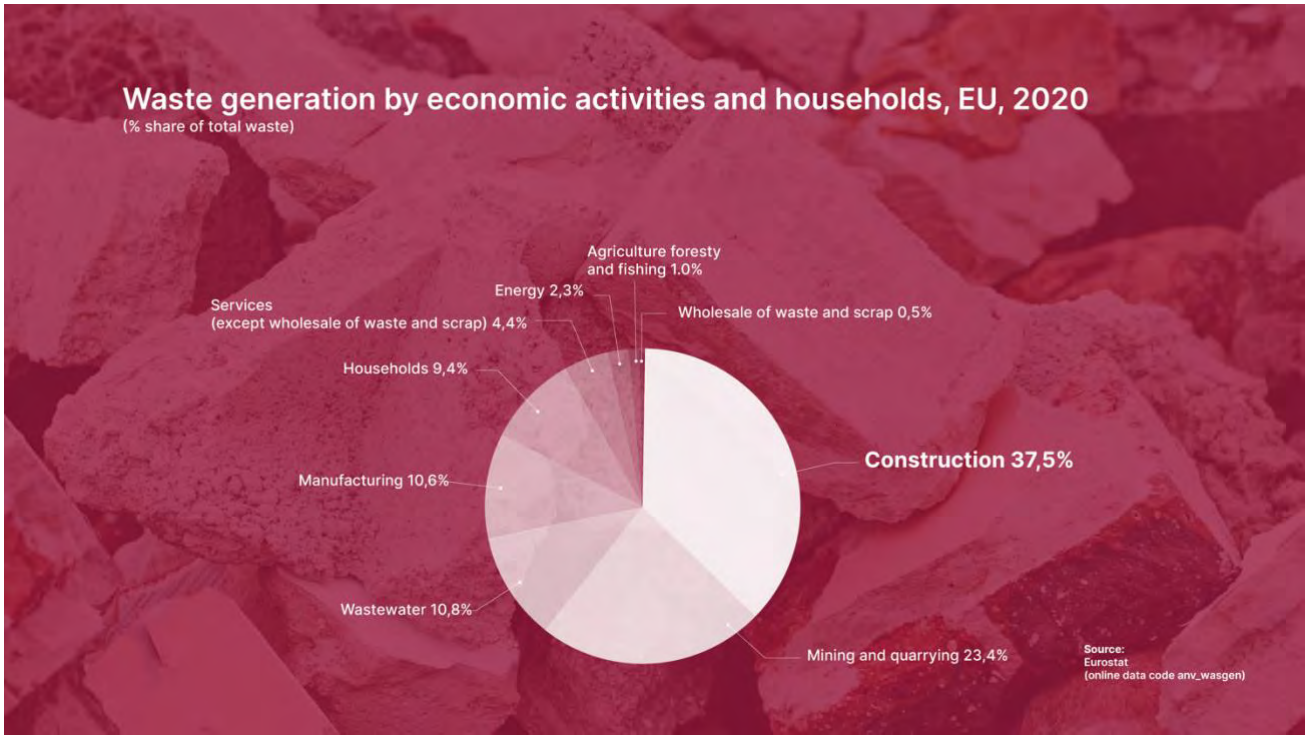

Fig. 5. Waste generation by economic activities and households in the EU (2020). Source: Eurostat

3.8 When Sourcing Materials for Construction, Local Renewable Materials Come First

When sourcing materials for construction, local renewable materials must come first. Global transportation produces large CO^2 emissions, and transporting heavy building materials around the world is adding to that. But even more important is the carbon footprint of building materials themselves. If we replace aluminum with flattened bamboo, the difference in environmental impact is enormous [figure 6]. Across geographies, vernacular architecture has historically employed fast-growing biological resources such as thatch, palm leaves, seaweed and bamboo. These easy to grow, easy to decompose materials require a culture of care and maintenance that to a large degree has been sidelined by industrialization. Today they offer avenues toward a sustainable architecture within the planetary boundaries, and modern applications will require new material practices across the building industry. To accomplish this, when building, developing and renovating, we must prioritize local, renewable materials from the early design phases. The starting point is simply what is locally available, how that material choice might resonate culturally and climatically and how local material productions might help generate local livelihoods and support local skills. This principles' focus on local, renewable materials correlates and supplements principle #6 and #7 towards a cohesive material practice of no waste, reuse, renewable material practices and local relevance across those elements.

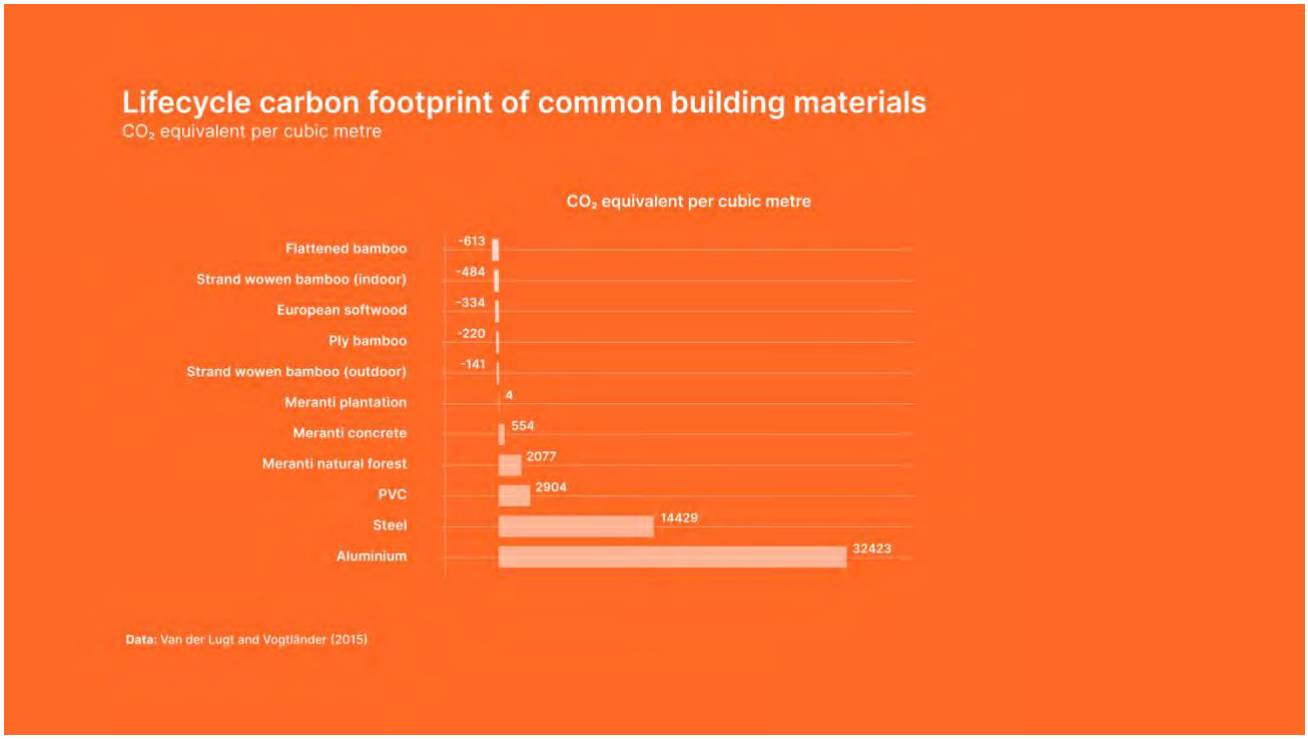

Fig. 6. Lifecycle carbon footprint of common building materials. Source: Van der Lugt and Vogtländer (2015).

3.9 In everything we build, carbon capture must exceed carbon footprint

Global CO_2 emissions are getting higher all the time, and it is breaking the planet [figure 7]. We need to change that, and we need to change that in every project we conduct. The enormous carbon footprint of the construction industry must be dramatically reduced, and to accomplish the needed change in time, the target must be for carbon capture to exceed carbon footprint in everything we build. This is possible with an environmentally conscious choice of materials, as described in principle #6, #7 and #8, by ensuring grown elements in architecture, as described in principle #5, by reusing built structures that are already there, as described in principle #3 and by keeping CO_2 storing green areas intact as described in principle #4. Carbon footprint is also unevenly distributed among nations and in communities, with wealthy, industrialized nations producing a disproportionately large footprint. This places a core responsibility on wealthy nations and communities to lead local innovation processes towards carbon capturing practices.

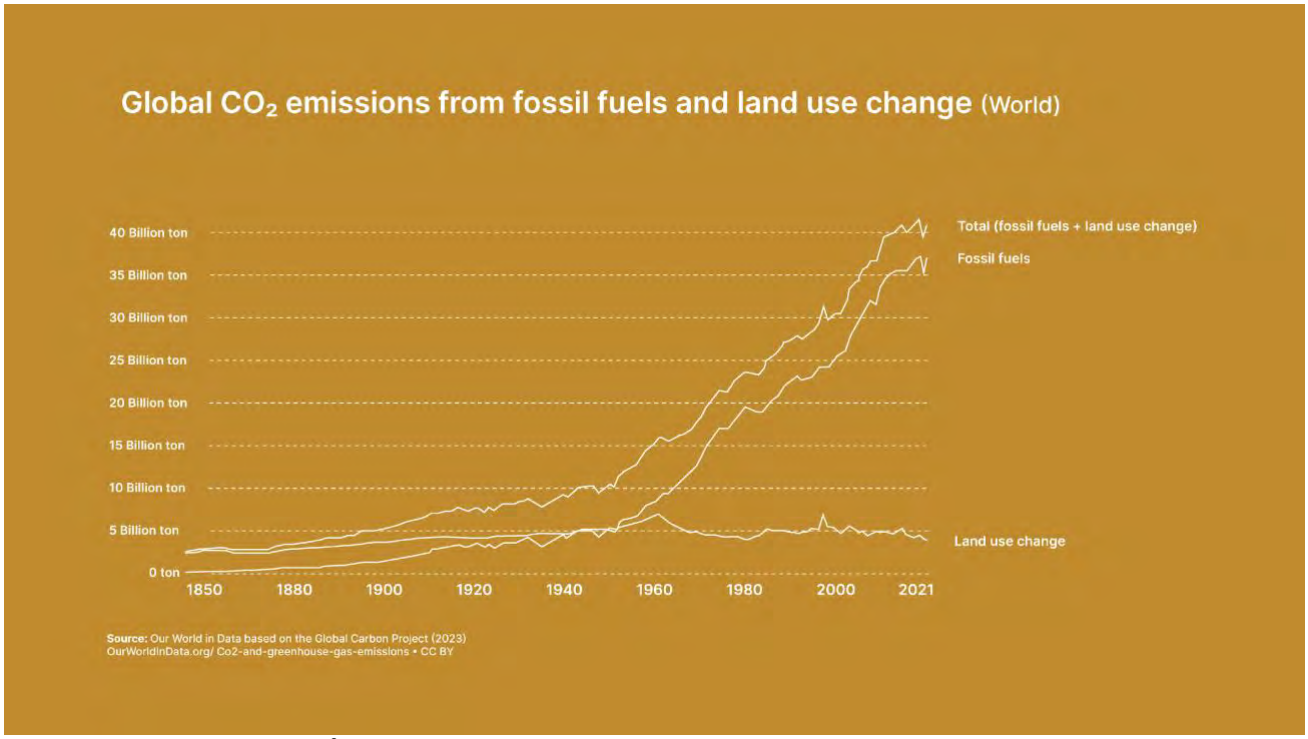

Fig. 7. Global CO^2 emissions from fossil fuels and land use change. Source: Our World in Data based on the Global Carbon Project (2023).

3.10 When Developing, Planning, and Constructing the Built Environment, Every Activity Must Have a Positive Impact on Water Ecosystems and Clean Water Supply

When developing, planning, and constructing the built environment, every activity must have a positive impact on water ecosystems and clean water supply. Only 40% of surface water bodies are standing in a good ecological state and only 35% in a good chemical state[11]. Water is key to the survival of the planet, and we must think about our water ecosystems when we build. Challenges related to water, whether in regard to life under water, water scarcity or flooding, are felt across the planet. We must integrate how we plan and design in relation to water much more in architecture and in the built environment as we go forward. A key component of all lifeform's survival is access to clean water, this access requires adequate infrastructure in cities and communities, and demands vigilant care in regard to how the built environment and its supply chains affect water quality and access to water across the world. Furthermore, we must develop the built environment in response to the ongoing climate change and the resulting droughts, rising water levels, stormwater and extreme rains while protecting the health of water bodies.

The 10 principles presented are relevant across geographies, but implementation must be localized.

4. Localization in Three Contexts

In the following chapter we discuss localization in three contexts, in Bangladesh, Palestine and Denmark, that illustrate architecture's contribution to the issues inherent in the principles. As stated in the introduction of this paper, the "Copenhagen Lessons – 10 Principles to Build on" are developed through global conversations regarding architecture's contribution to the SDGs. In this chapter, we

[11] European Environment Agency (2023), *Industrial pollutant releases to water in Europe*.

illustrate and discuss how the principles can be implemented. We will do this through the lens of realized architectural projects (with one exception, a written contribution). These are not projects, that have been developed by applying the principles, but inspirational, frontrunning projects that demonstrate the nature of an architecture the principles could help push for. The projects are located in three communities, each in need of sustainable development. By narrowing in on these local contexts, we will attempt to make perceptible the complex challenges, and what localization means as we address global sustainability challenges as they relate to specific conditions.

4.1 Architecture Supporting Dignity, Identity, and Culture in Cox's Bazar, Bangladesh

Cox's Bazar in Bangladesh holds the world's largest refugee camp, home to approximately one million Rohingya, Muslim refugees forced to flee from their homes in Myanmar[12]. For decades, The Rohingya community were deprived basic human rights in their home country[13]. The ethnic and religious minority suffered from various types of abuse, violence and harassment, culminating in 2017 with the beginning of what is by the many international organizations defined as genocide[14]. The situation forced more than 750.000 people to flee in haste with the bare minimum of their possessions. The destination was for the vast majority the neighboring country Bangladesh, where many Rohingya have sought refuge since the persecution began decades ago. The devastating and deprived situation of the displaced community is evident. The conditions at the camp are poor, despite efforts by individuals, NGOs and authorities. The housing is temporary, light weight structures, with lacking sanitation, utilities, and supply infrastructure resulting in increased risks of physical and mental illness, violence, and crime, with little or no hope for residents of returning to their home country or achieve significantly better living conditions[15].

4.1.1. A small intervention with great human potential.

The "Mikro Gardening Kits"[16] is a project executed by the UN Food and Agriculture Organization (FAO), IOM and the Bangladesh Department of Agriculture Extension. When people are forced to leave their home and community, they also leave their livelihood and everyday lives behind. The Rohingya have found refuge in the camps, and the NGOs and institutions on site help them fulfil core needs of shelter, water, and food. But residents are prohibited from leaving the camp, and often the basic supplies are dried food, delivered by NGOs for the large amount of people in need at the camps.

[12] Danish Refugee Council (2024), "Rohingya in Bangladesh; the world largest refugee camp". Available: https://help.drc.ngo/en/how-we-work/life-as-a-refugee/rohingya-in-bangladesh-the-world-s-largest-refugee-camp/
[13] UNHCR (August 2023). Rohingya Refugee Crisis Explained. Available: https://www.unrefugees.org/news/rohingya-refugee-crisis-explained/#RohingyainBangladesh
[14] Human Rights Watch (April 2024). Rohingya. Available: https://www.hrw.org/tag/rohingya
Amnesty International (Feburary 2021). ROHINGYA: THE DEADLY SITUATION IN MYANMAR EXPLAINED. Available: https://www.amnesty.org.uk/rohingya-deadly-situation-and-what-do-about-it
Council on Foreign Relations, Albert, E., Maizland, L., (January 2023). The Rohingya Crisis. Available: https://www.cfr.org/backgrounder/rohingya-crisis
[15] UNHCR (August 2023). Rohingya Refugee Crisis Explained. Available: https://www.unrefugees.org/news/rohingya-refugee-crisis-explained/#RohingyainBangladesh
[16] IOM UN Network on Migration. (April 2018. Micro Gardening Scheme to Help Feed Rohingya Refugees, Bangladeshi Local Communities. Available: https://www.iom.int/news/micro-gardening-scheme-help-feed-rohingya-refugees-bangladeshi-local-communities

This leave people to sustain on very basic food rations[17], and with very few options to work or generate supplements or a sustainable livelihood[18].

This project navigates in the smallest of architecture's scales. By introducing micro gardening kits, the community is offered a very simple, but potentially very efficient, resource to add to their everyday life. The kits in themselves are modest, consisting of a bag of soil and seeds to sow. But the crops offer a nutritious addition to a family's limited diet, and agency in that they can be self-sustained. The plants can be guided to grow on top of the tent structure too, helping shade and cool the interior and expanding the footprint of crops. Furthermore, many Rohingya come from farming villages and can use existing skills related to farming when tending to the micro gardens. As the photos show, the kits can generate a small garden [figure 8], mark the family's home area, and help create a sense of ownership, maybe even a sense of belonging.

Fig. 8. The mikro gardening kits outside a home in Cox's Bazar. Photo: Natalie Mossin

In that way, the architectural contribution is also to offer the community opportunities to create an architecture themselves by offering resources that are also a kind of building blocks.. The project demonstrates how sustaining or reviving food production benefit both land and people and serves as an example of principles #2 *People at risk of being left behind must be accommodated first when we construct, plan, and develop the built environment* and #5 *Natural Ecosystems and Food Production Must be Sustained Regardless of the Build Context.*

[17] World Food Programme (December 2023). WFP to increase food ration from US$8 to US$10 for all Rohingya refugees in Cox's Bazar. Available: https://reliefweb.int/report/bangladesh/wfp-increase-food-ration-us8-us10-all-rohingya-refugees-coxs-bazar

[18] UNHCR (July 2023). Rohingya refugees face hunger and loss of hope after latest ration cuts. Available: https://www.unhcr.org/news/stories/rohingya-refugees-face-hunger-and-loss-hope-after-latest-ration-cuts

4.1.2. A beautiful safe space might have healing powers

The "Rohingya Cultural Memory Center"[19] is designed by architects Khwaja Fatmi, Saad Ben Mostafa and Rizvi Hassan. Where the micro gardening kits navigate in a small scale and offer a self-built architecture without involving architects, the Rohingya Cultural Memory Centre, reflect a different, supplementing strategy for sustainable development.

The project is designed by a team of local architects and supported by the Bangladeshi NGOs BRAC HCMP and ActionAid. The displaced Rohingya community has little hope of returning to their home country and the way of life, they left behind. Instead, they face an uncertain future in the camp in Bangladesh, speedily planned and built on designs that does not originate in Rohingya architectural history and cultural capital[20].

The Rohingya Cultural Memory Center strives to help the community revive its identity. By working with displaced people, craftsmen, experts and artisans, the architects helped the community design the center as their own. As a place of beauty, of crafts of the highest quality – of culture, tradition, and storytelling of the Rohingya – and a place of pride in who they are. The center itself stands as a testament to the rich culture of the people, and also offers a safe space for some of the particularly vulnerable groups in the camp, women and girls.

Fig. 9. Rohingya Cultural Memory Center. In the courtyard, Rohingya women can manufacture, display and sell their handmade crafts to visitors. Source: Aga Khan Trust for Culture. Photo: Asif Salman

[19] Photos and information courtesy of the Aga Khan Foundation

[20] Huang, X., 2019. Understanding Bordieau – Cultural Capital and Habitus. *Review of European Studies*; Vol. 11, No. 3; 2019. P.45-49. https://doi.org/10.5539/res.v11n3p45

In this case, the architecture has multiple positive impacts. The development of the project offers the community a platform to revitalize their crafts and traditions, while at the same time serving as a testimony of the community's strengths for everyone to see. It also helps bridge the Bangladeshi and the Rohingya cultures, by combining the two vernaculars and their methods, materials, and crafts showcasing the aesthetic and constructive power of principle #8 *When sourcing materials for construction, local renewable materials come first*. And in everyday life, the centre serves as a safe space, where the community can meet and share cultural, artistic, creative and crafty activities – activities that shape and revive their identity beyond the identity of being displaced.

In this project, the architects' role is clearly visible the beautiful and coherent result, but it is the humble, respectful, and warm approach to the community that is the project's largest contribution to sustainable development – and what makes it a great example on principle #2 *People at Risk of Being Left Behind Must be Accommodated First When We Construct, Plan, and Develop the Built Environment*

4.2 Rebuilding together with agency and resilience, Palestine

The people of Palestine have been under constant pressure, occupation, and aggression throughout history, and in our time, since the founding of the State of Israel, 75 years ago. Currently, Gaza is under heavy bombarding, forcing more than 1.7 million Palestinians to flee their home and seek refuge in large, self-built tent camps in the city of Rafah, Southern Gaza[21]. The situation in Gaza is a humanitarian disaster, with more than 34.000 killed[22], and with civilians unable to escape and insufficient access to basic amenities such as food, water, and medical supplies.

While the Palestinians in Gaza are under heavy attack, citizens in the occupied areas of the Westbank are also experiencing an increase in attacks from Israeli settlers, police, and military. People are being evicted from their homes, while Israeli settlers continuously expand their settlements[23]. Even so, the Palestinian people continue to find ways to push back, build community and stay in their homes.

4.2.1. Architecture annunciating a better future

The written contribution "Rebuilding Gaza" by architect Nadi Abusadaa[24] highlights the need for local agency. It is apparent that the rebuilding of Gaza will require every skill and resource, the world of architecture has in its toolbox – both in terms of environmental and social sustainable rebuilding. It is not only the physical structures that are left completely devastated, but also families themselves. Though that conversation might seem to be premature, as the destruction continues, the conversation on how to rebuild is in itself an architectural contribution to rebuilding. Palestinian architect and researcher, Nadi Abusadaa, writes:

[21] BBC Visual Journalism Team (April 2024). Gaza Strip in maps: How life has changed. Available: https://www.bbc.com/news/world-middle-east-20415675

[22] United Nations (April 25th 2024). Gaza: Heatwave brings new misery and disease risk to Rafah. Available: https://news.un.org/en/story/2024/04/1149011?_gl=1*191vbkk*_ga*MTYwMzkyMDc3Ny4xNzE0Mjk1ODU4*_ga_TK9BQL5X7Z*MTcxNDM3NzM3MS4zLjEuMTcxNDM3ODQyNC4wLjAuMA.

[23] Farge, E. (March 9th 2024). Israeli settlements expand by record amount, UN rights chief says. Available: https://www.reuters.com/world/middle-east/israeli-settlements-expand-by-record-amount-un-rights-chief-says-2024-03-08/

[24] Abusadaa, N. 2024. Rebuilding Gaza IN The Repair Issue. *The Architectural Review*, Issue 1508, p. 26-27 https://www.architectural-review.com/essays/rebuilding-gaza

"The lessons from Gaza are, above all else, lessons in human agency, dignity and imagination. What actions can we take to 'end the genocide', as chants around the world have demanded? How do we dismantle the structural forces of settler colonialism and ethnic cleansing that enabled it in the first place? Who should be at the forefront of any effort to imagine and plan Gaza's future? When the bombardment ceases – and it will cease – who will rebuild it? And on whose terms? As glimpses of Gaza's possible reconstruction emerge in international headlines, various players come to the fore: American and Israeli policymakers; British and Italian oil and gas companies; the World Bank; and international organisations and aid agencies. Meanwhile, one group remains conspicuously absent from the discourse – the Palestinians, the people of Gaza."(Abusadaa, 2024)

In his essay, Abusadaa argues, that the rebuilding of Gaza cannot be separated from the decolonization of Palestine. Discussing the task of rebuilding Gaza without acknowledging the Palestinians' right to lead that process, the international society only elongates the infringement of the occupation. And as Abusadaa points out, the Palestinians have through their long, rich and challenging history acquired a unique sense of ownership, resiliency and agency, holding the potential to build a new, free and open environment.

The essay by Nadi Abusadaa is an example of an architectural language beyond that of building physical structures. Abusadaa uses his words to portray a possible future of the spaces and framework of his community, illustrating how architecture, planning and design cannot be separated from those, that live in it. The essay stresses the importance of local agency and serves as an example of principle #1 *Dignity and Agency for All People is Fundamental in Architecture, there is No Beauty in Exclusion*.

4.2.2. Reviving your history and community one building at a time

While Nadi Abusadaa's essay contributes to the rebuilding of Gaza through an intellectual definition of discourse, the family run 'Yalla Project' by Allesandra Gola, Abdalrahman Kittana, Abdel Kittana et al[25]puts its research to use in a very tangible and practical way in the historic town of Nablus. The project brings together architects, urbanists, historians, and many more in an effort to support 'urban regeneration for socio-economic resilience'[26]. The team work collectively in their own community, they rebuild destroyed buildings, renovate cultural heritage, create meeting places, community houses, and cultural and social events [figure 10]. All activities are community anchored and -driven, and carried out in a dynamic process, making the spaces adaptable to the uncertain conditions.

[25] Gola, A., Kittana, A., Kittana, B., et al. (April 2024) The Yalla Project. Available: https://theyallaproject.com/
[26] Gola, A., Kittana, A., Kittana, B., et al. (April 2024) The Yalla Project. Available: https://theyallaproject.com/?page_id=1265

Fig. 10. In a centuries old, historic building, the Yalla Project opened their first, completed project; a café serving local specialities and bringing the community together17. The revenue from the café helped fund the next activities. Source: The Yalla Project (2019)

The old town of Nablus is a world heritage site[27]. Today the historic site is marked by settler or police/military attacks, which has killed and wounded civilians and destroyed built structures in the city. The Yalla Project rebuilds and repairs the affected buildings, restoring them using the skills, materials and crafts of the unique, local vernacular and adapting them to better meet the needs of the current community [figure 11]. To support the revitalized architecture, the project has initiated Yalla Mishwar, a tourism-driven social enterprise that operates refurbished buildings, funds cultural activities, and attracts visitors to the old town[28].

[27] Gola, A., Kittana, A., Kittana, B., et al. (April 2024) The Yalla Project. Available: https://whc.unesco.org/en/tentativelists/5714/
[28] Gola, A., Kittana, A., Kittana, B., et al. (April 2024) The Yalla Project. Available: https://theyallaproject.com/?page_id=567

Fig. 11. The Turquoise Bio Farm is established on the roof top of a historic building, designed and built by the community – and now offering organic greens and a nice, shaded community space to enjoy. Another roof top garden is under development. Source: The Yalla Project.

The project is independent and combines research, field work and experimentation with a strong social and economic strategy, inviting community and neighbors to join and take part in reviving their local built environment. The holistic approach to architecture's potential contribution to sustainable development is inspirational not only for Palestinian stakeholders in the built environment, but regardless of where and how we practice architecture. In this sense, The Yalla Project demonstrates the local agency and resilience, Abusadaa writes about, and while it holds principle #1 *Dignity and agency for all people is fundamental in architecture, there is no beauty in exclusion* at its core, its physical results also demonstrate the potentials of principle #3 *Existing Built Structures Must Always be Reused First*.

4.3 Respecting Planetary Boundaries Through New Tectonics, Denmark

As a nation, Denmark ranks critically high in regard to resource consumption. When looking at *Earth Overshoot Day 2024*[29] Denmark is running out of resources already on March 16th, which means the small nation is spending 4 times her share of the Earth's total resources, a significant overshot in regards to the Planetary boundaries[30]. Therefore, Denmark needs to reduce its carbon emissions and its resource use radically and in solving that challenge, how we develop the built environment can contribute crucially. Strategies for reduction include transforming existing buildings and infrastructure

[29] "A country's overshoot day is the date on which Earth Overshoot Day would fall if all of humanity consumed like the people in that country". https://overshoot.footprintnetwork.org/newsroom/country-overshoot-days/ (Accessed 04.28.24)

[30] The *Planetary boundaries framework* is developed by researchers at the *Stockholm Resilience Centre* in 2009. In 2009, SRC director Johan Rockström led a group of 28 internationally renowned scientists to identify the nine processes that regulate the stability and resilience of the Earth system. The scientists proposed quantitative planetary boundaries within which humanity can continue to develop and thrive for generations to come. Crossing these boundaries increases the risk of generating large-scale abrupt or irreversible environmental changes. Since then, the planetary boundaries framework has generated enormous interest within science, policy, and practice.
https://www.stockholmresilience.org/impact/impact-stories/impact-stories/2018-05-25-the-planetary-boundaries-framework.html

to new use, using local, biogenic materials, that store CO2, and rethinking how we use or structure our built environment.

4.3.1. Using what is already there to create new opportunities

The Danish suburb have many prefabricated concrete buildings, erected in the 60s and 70s with the purpose of creating new, healthy housing for working and middle class families and for the new industries emerging in that time. The Copenhagen area Nordvest (the North-West) has its share of buildings from this period, with many now being renovated and revitalized. Thoravej 29 is a generic industrial building from 1968. The building is a reinforced concrete construction, with horizontal window bands and a mounted yellow brick façade in the small street, Thoravej.

The building was bought by the philanthropic foundation, Bikubenfonden, to create a new socially inclusive community house for people creating art and pursuing social activities. They held a competition and invited teams of young architects paired with more experienced or established engineers and entrepreneurs – searching for truly innovative ideas that were also buildable. The winning proposal by Hoffmann A/S, Pihlmann Architects and ABC Rådgivende Ingeniører presented the dogma, that everything changed or removed in the building should be reused, and as few materials as possible should be added in the transformation. The original building had a low ceiling and part of the spatial transformation focused on opening the space up and creating a larger, central area. This design meant removing some of the old decks and slabs between the levels – a large volume of heavy material, that in turn was given new life as a new central stairway of the building [figure 12].

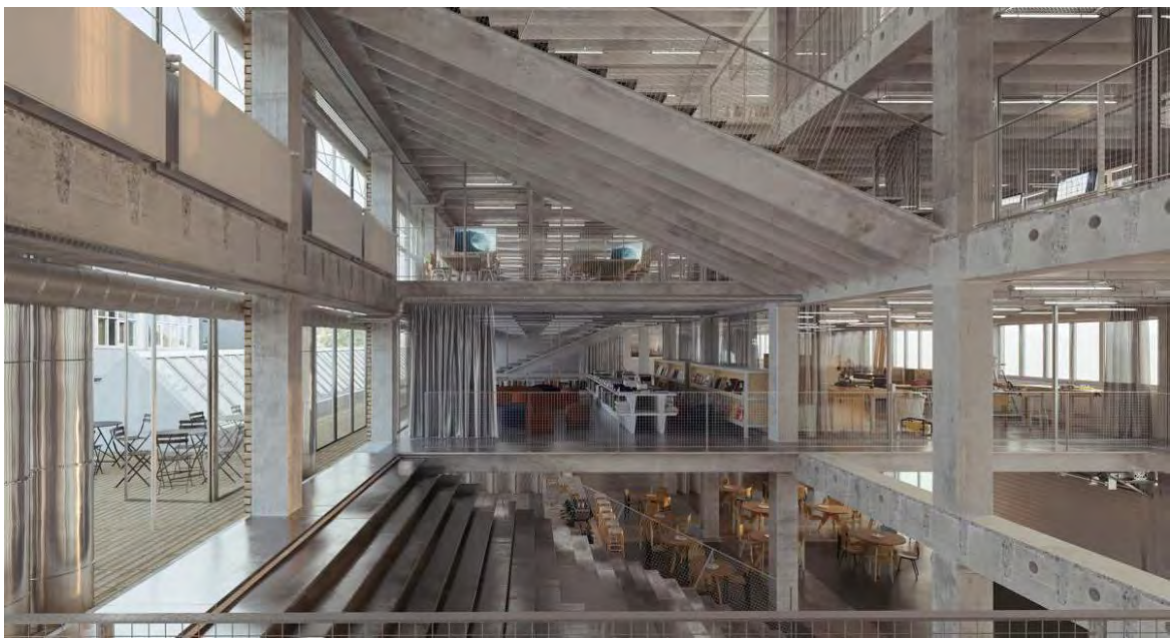

Fig. 12. The open heart of the transport building is designed by removing the decks and reusing them as stairs. Illustration: Pihlmann Architects.

The concept of the transformation is not to make a completely different, spectacular artwork. Instead, the team seek to keep as much as possible including the buildings original expression, upgrading what needs to be fitted to its new use, and allowing the users to shape the house through their social and creative activities [figure 13].

Fig. 13. The façade of Thoravej 29 after renovation. Illustration by Pihlmann Architects.

Working in this way emphasizes the need for close collaboration across professions, and between practice and research in the building industry. In combining different perspectives and innovative ideas with an ambitious client, daring to pave new ways and through that demonstrate the legitimacy of different, sustainable solutions. The project shows how principle #3 *Existing Built Structures Must Always be Reused First, #6 No virgin mineral material must be used in construction, when reuse is possible and #7 No waste must be produced or left behind in construction* can manifest itself in an architectural language and a strategy to implement principle #9 *In everything we build, carbon capture must exceed carbon footprint.*

4.3.2. Building for one planet with local renewable resources and crafts

In the fall of 2022, the two Danish philanthropic foundations *Realdania* and the *Villum Foundation* launched a local initiative directed toward the Danish building industry: *Residential buildings – from 4 to 1 Planet* (Boligbyggeri fra 4 til 1 planet).[31] The purpose was to address the climate crisis in regard of the construction industry, and particularly address the Danish CO_2 footprint [figure 14]. The ambition of the 4to1 Planet initiative has been to:

> *"…inspire and challenge material producers, designers, contractors, and builders to develop homes with a significantly lower emission of CO_2 and other greenhouse gases by joining forces. …The goal is to develop solutions and built examples of healthy and attractive homes that reduce the total climate footprint from cradle to grave from new housing construction in Denmark by 75 percent by 2030."*[32]

[31] https://www.4til1planet.dk/om-os-initiativets-formal (Accessed 04.28.24)
[32] https://www.4til1planet.dk/om-os-initiativets-formal (Accessed 04.28.24)

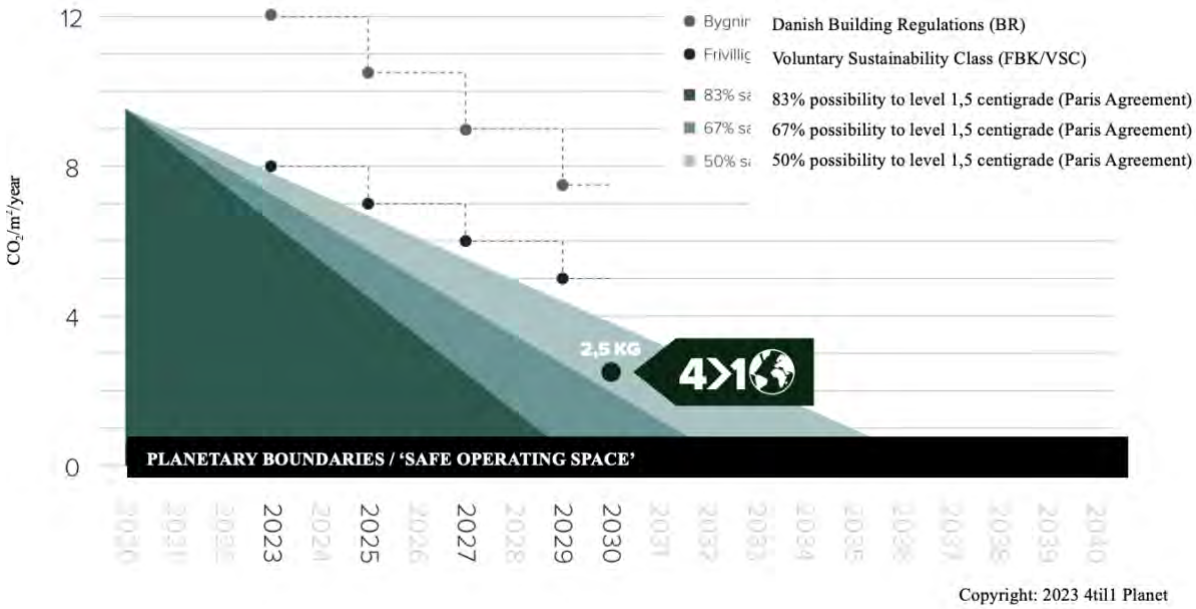

Fig. 14. The necessary reduction in Denmark if the country is to reach its 'safe operating space'. Source: 4til1 Planet 2023

This means a reduction of the CO_2 emissions to 2.5 kg CO_2 equivalent/m²/year to meet the resource consumptions in construction to one Planet. This goal is significantly lower than the reduction goals presented by the Danish authorities that presently aim at a minimum of 5 kg CO_2 equivalent/m²/year in 2029. The initiative *Residential buildings – from 4to1 Planet* also refers to research that applies the concept of 'safe operating space', which serves as the indication of how much reduction in CO2-equiv. emission is needed to keep the Earth on the right side of the planetary boundary of 1,5 degrees temperature rise.[33]

The initiative presented an open call, inviting interdisciplinary radical ideas and projects that would address the role of materials, construction industry and new ways to build when focusing on the climate crisis and the need for reducing the carbon footprint of construction and buildings. There were two calls (competitions) directed towards two different, but related themes: *Next Generation Architecture* and *Sustainable Solutions.*[34] One of six proposals of *Next Generation Architecture* selected to proceed was by the architectural office Rønnow, Leth & Gori together with CINARK - Center for Industrialized Architecture, a research unit at the Royal Danish Academy[35], with the proposal: "Thatched Brick Blocks" exploring climate-responsive construction based on biogenic materials combined with highly efficient industrialized construction built with insulating brick blocks (Porotherm).[36]

Besides a convincing architectural design, the competition brief asked for extensive development and documentation. This included a full LCA analysis of the materials included, a new construction

[33] Petersen, Steffen, Morten W. Ryberg, Morten Birkved, 'The safe operating space for greenhouse gas emission', *Atmospheric and Oceanic Physics*, Cornell University, https://arxiv.org/abs/2209.00118

[34] The case collection from the open call. (2022). Realdania and VILLUM FONDEN https://static1.squarespace.com/static/62a61c9c3ba37e5549b96116/t/63760e7c3293f62127eca846/1668681382407/4til1-publikation_online-opslag.pdf (Accessed 04.29.24)

[35] CINARK is lead by Professor Anne Beim, one of the authors of this paper

[36] Rønnow, Leth & Gori and CINARK, (2022). Project summery of the proposal for the competition *Next Generation Architecture*, https://static1.squarespace.com/static/62a61c9c3ba37e5549b96116/t/644febbd5a323f36eb557fd7/1682959316883/T%C3%A6kkede+Teglblokke.pdf. (Accessed 04.28.24)

typology for multi-story housing, as well as a specific construction design for a pavilion that could serve as a full-scale demonstrator to be exhibited during the 28th UIA World Congress of Architects in July 2023 at Søren Kirkegaards Square in central Copenhagen [figure 15]. In addition, the demonstrator should be easy to build as well as easy to take apart for re-construction and re-use.

Fig. 15. One of the SDG Pavilions for The 28th UIA World Congress of Architects, 'Thatched Brick Blocks'. Source: Anne Beim

The load-bearing wall structure of the thatched pavilion was built of insulating brick blocks and timber for the roof. The exterior was clad with prefabricated thatched boards mounted on wooden battens screwed directly onto the brick blocks. The pavilion was fully clad with the thatched elements both on the facades and on the steep timber roof construction. To answer to the demand of reuse of the materials after the exhibition period the brick masonry was designed and built with dry joints and prestressed with steel rods for ease of disassembly.

The UIA pavilion was a third-generation demonstrator and the outcome of previous research into thatched construction executed by CINARK testing clay as fire impregnation. The first demonstrator was built as a full-scale wall construction of a one-storey house corner with no foundation but showing part of the roof construction. The load-bearing structure of this demonstrator consisted of a prefabricated timber frame system filled with pressed straw for insulation, then clad with wood fibre boards on to which the thatch was directly mounted, without any air gab. The in-situ methods used for the first demonstrator showed that the clay, reed and straw construction was buildable but laborious and would need more research into the craft techniques and logistics of the building processes.[37] The second demonstrator was designed to be transportable and built as a kit-of-parts. For this the

[37] Ejstrup, H., Beim, A. and Arnfred, L. (2024). *Thatch as a façade material,* In: *DETAIL*, March 3, pp. 12-15. https://issuu.com/detail-magazine/docs/bk-det-2024-3_schulen_issn2627-2598

prefabricated timber-straw elements from the first demonstrator could be reused, as they were structurally robust and could easily be disassembled. For the second demonstrator the thatched facade made of prefabricated thatched elements for which reed was mounted in cassettes and treated with clay later. This procedure made the application of the clay easier. The elements were produced by a thatcher in his workshop and were constructed in such a way that they could be assembled by two workers on site.[38]

The UIA pavilion showcases new ideas about how prefabricated thatched facades mounted on a regular loadbearing masonry structure offer simplicity in fabrication procedures, connection details and a characteristic architectural expression that came out of the lessons learned from the earlier full-scale demonstrators. But maybe more importantly, the project's success relied on a respectful dialogue between the craftsmen and architects who worked closely together to develop designs and strategies that were plausible for full-scale construction – and to secure buildability, scalability, and technical solutions linked to the ideas of a new architecture, respecting the planetary boundaries [figure 16]. The experimental project points towards an architectural practice aligning with principles #8 *When sourcing materials for construction, local renewable materials come first* and #9 *In everything we build, carbon capture must exceed carbon footprint.*

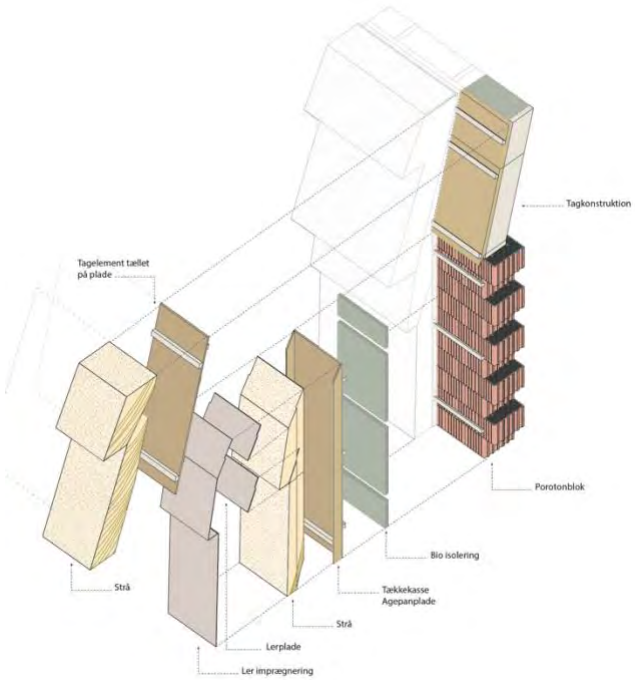

Fig. 16. Exploded construction section.
Illustration: Rønnow, Leth & Gori (2023)

5. Conclusions

This article aims to contribute to a new language and framework of how to understand current architecture as it relates to the SDGs and the challenges encompassed in the goals, both humanely and environmentally. The cases, representing localized action in three contexts, points to the double nature of our need for knowledge-sharing globally and localized action, specific to the need of a place and its

[38] Ejstrup, H. & Beim, A. (2023). *Prototyping thatched facades: Global scaling of local knowledge*. Paper presented at the UIA World Congress of Architects 2023 Copenhagen, København, Danmark. http://papers.uia2023cph.org/P2/3931.pdf

people. The projects points to some of the many new architectural solutions emerging currently, responding to local climate, culture, and challenges. The change needed to address social needs while protecting the planet is mayor, and the collective challenge demands a new way of talking about architecture and, crucially, new ways to design, plan and build as we go forward. A starting point can be to discuss principles of how the built environment can contribute to the SDGs, and localizing what that means.

As the planetary boundaries are under mounting pressure[39] and global conflict on the rise[40] it is clear, that radical change is necessary. This conclusion applies to all sectors and professions, but architecture and the building industry holds both tremendous responsibility and potential in contributing to sustainable development. Architecture is a great consumer of resources, has a massive carbon footprint and significantly impact the planets biodiversity. Architecture impacts all people's daily lives; whether we are divided or unified, has equal or inequal access – are safe or unsafe.

The purpose of the "10 Principles to Build On" is to bridge from the global goals of the SDGs to the necessary action needed in the built environment to reach for social and environmental sustainability. As the selected case studies in this article show, realized projects are already demonstrating, what an architecture working with the principles might mean, if implemented in local communities.

As we move forward, reaching for the SDGs, the "10 Principles to Build On" can be used to push for a shared language among stakeholders in the built environment. In doing that, our hope would be that an understanding of architecture's potential to generate positive societal and environmental change, can help stakeholders in the built environment, when deciding if and what to build, and thus change the scope, reach, and power of architecture today.

Acknowledgements

The Copenhagen Lessons were presented at the conclusion of "Sustainable Futures – Leave No One Behind", the 28th UIA World Congress of Architects, held in Copenhagen in 2023. The Copenhagen Lessons build on the substantive new research and practice developed and brought together in the years up to and during the Congress, exploring architecture's contributions to the UN Sustainable Development Goals. The Copenhagen Lessons were presented with Ramboll and Henning Larsen Architects as knowledge partners. Congress partners were: the Danish Association of Architects, Realdania, Dreyers Fond, Bevica Fonden, the Royal Danish Academy of Fine Arts – Architecture, Design, Conservation, Aarhus School of Architecture and Danish Association of Architectural Firms.

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[39] The Planetary Boundaries. Available: https://www.stockholmresilience.org/research/planetary-boundaries.html

[40] "A New Era of Conflict and Violence". Available: https://www.un.org/en/un75/new-era-conflict-and-violence