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ARCHITECTURE FOR THE ANTHROPOCENE: HOW TO BUILD FOR A BETTER FUTURE?

Matti Kuittinen

ABSTRACT
We have entered the Anthropocene in which humanity is shaking the delicate balance of the Earth. Anthropogenic environmental impacts—especially in the form of climate change—have become an existential crisis for the entire planet.

Half of global raw materials are used for construction, and a third of greenhouse gas emissions are produced by the built environment. Without a radical shift towards a circular economy, our chances for meeting the emission budgets proposed by the UN’s Intergovernmental Panel on Climate Change (IPCC) for scenarios in which global warming is limited by either 1.5 or 2 degrees Celsius are not good. This brings architects and architecture to the forefront of mitigating the overconsumption of planetary resources and environmental pollution.

As a response to the environmental, social, and economic turbulence of the Anthropocene, three practical suggestions are made for the design of buildings: 1) decoupling of functional quality and environmental impacts, 2) simplification of buildings, and 3) strengthening the cultural resilience through architecture.

In this article, the background and drivers for the environmental and social changes associated with the Anthropocene are presented. Then, possible mitigation and adaptation strategies are discussed using the building norms and architectural policies of the Nordic countries as an example. Finally, architecture for the Anthropocene will be presented, along with argumentation for why the three suggestions are essential for future architecture.

KEYWORDS
Anthropocene, climate change, architecture, resilience
INTRODUCTION: HUMANITY AS A PLANETARY FORCE

Anthropocene: Our Biggest Achievement

We are living in the Anthropocene—a geological epoch during which humanity has become capable of altering Earth’s geological, chemical, and biological composition.¹ We have left markers in the form of radioactive material, heavy metals, and plastic fallout that deposit into sedimentary records. We are moving more soils and minerals across the globe than the forces of nature could do.² Each year, we consume raw materials faster than the planet can reproduce. Simultaneously, we are leaving behind us more waste than the planet is able to neutralize through its mechanisms.³ Furthermore, we have triggered the sixth mass extinction of species.⁴ As summarized by professors Simon L. Lewis and Mark A. Maslin, ‘the future of the only place in the universe where life is known to exist is increasingly being determined by human actions’.⁵

This new era is also affecting us. Although the planetary tolerance has been high, the consequences are becoming visible. A well-known concept for describing these changes is ‘planetary boundaries’, introduced by Johan Rockström in 2009.⁶ According to the revision of the concept in 2015,⁷ the most alarming overshoots to planetary balance have been taken in the fields of genetic diversity, biogeochemical flows, land-system change, and global warming. These overshoots will not only harm nature and ecosystems, but they will have a deep impact on our social and economic well-being.

The time to mitigate many of the negative global changes is getting short if we wish to prevent the irreversible consequences of climate change or mass extinction. As an adaption, many of the processes and functions of our societies may have to change radically. This also applies to the construction sector and architecture.

Climate Change Requires Immediate and Unprecedented Action

The 2018 Special Report by United Nations’ Intergovernmental Panel on Climate Change (IPCC)⁸ on global warming by 1.5 degrees Celsius has left us with very little uncertainty about the magnitude of the required actions and the hurry to implement them. According to the report, we only have up to twelve years to reduce the greenhouse gas (GHG) emissions to prevent the globe from warming beyond 1.5 degrees. Those simulated pathways that would indicate that warming would most likely stay below 1.5 degrees would require ‘rapid and far-reaching’ changes in energy, land use, transportation,
and buildings. These mitigation measures would be ‘unprecedented’ in their scale and speed. In addition, several authors argue that we may need a new economic system that would be more suited to changing the current crash course towards a climate catastrophe.9

Rockström and his colleagues have pointed out that there are ‘alarming inconsistencies between science-based targets and national commitments’.10 To set the course right, they suggest a ‘rapid decarbonization’ roadmap, in which the global GHG emissions should be halved every decade and carbon neutrality reached no later than by 2050. Richard J. Millar and his team state that limiting the warming to 1.5 degrees would ‘require a significant strengthening of the nationally determined contributions . . . in 2020’.11 This way we could avoid enough of the costs and turmoil of global warming.

Figure 1. Cumulative greenhouse gas emissions from the production of key construction materials until 2100 and the required emission reductions. Data: Material Economics, 2018.
If we truly listen to these statements, and if we increase the political ambition and quicken the implementation of regulatory measures, then there will be significant implications for construction as well. The global construction sector consumes approximately half of all planetary raw materials, and over 40 per cent of the available primary energy is accountable for a third of all GHG emissions and generates over 30 per cent of all waste. Furthermore, the construction sector is the main end user of many of the products of our heavy industries.

According to a recent report by Material Economics, the consumption trends of cement, steel, aluminium, and plastics are a serious threat to us meeting our climate goals. The consumption of materials for construction may increase two- or four-fold during this century. The GHG emissions from the production of these four materials—which are mostly used for construction—are estimated to reach 920 Gt CO\textsubscript{2} emissions during this century. This is almost twice the amount of the remaining global carbon budget (550 Gt) found in the IPCC report ‘Global Warming of 1.5 °C’. In other words, if we continue to build using the current practices and amounts, then we will seriously overshoot the GHG emissions budget, possibly trigger ‘dangerous’ climate change, and permanently alter the living conditions of this planet.

**Population Growth and Urbanism Increase Vulnerability**

Growing populations and rapid urbanization add to the environmental challenge. The global population is growing by 1.1 percent annually. It will likely reach 9.8 billion by 2050 and 11.2 billion by 2100. This growth will mainly take place in urban areas and in developing countries. Most of the required new urban areas are not yet built.

As another collateral feature of the Anthropocene, the changing climate has become a key driver for humanitarian crises and forced migration. Growing populations in dense, urban settlements increase the likelihood of climate-related disasters. This is the case especially in developing countries, in which the institutional capacity for preparing or responding to weather-related disasters is lower than in developed countries. In 2017, approximately 68.5 million people had to leave their homes because of conflicts, violence, or human rights violations, a fact that in many cases can be associated with climate change.

The environmental impacts per capita in urban areas differ considerably. There is no single factor in urban lifestyles that can explain these variations
or define whether urban lifestyles reduce or increase GHG emissions and environmental impacts. Some studies suggest that densification and public transport are keys to more environmentally sustainable results. Others indicate that urban lifestyles, especially in developed countries, may induce more consumption of services, and this in turn can have a negative impact on the environment. Some findings suggest that aspects such as the impact of urban density, regional grid electricity, or water management may be more significant than in residential urban areas.

Evidence suggests that climate change mitigation correlates with several of the socio-economic sustainable development goals of Agenda 2030. However, as pointed out by Ernst Ulrich von Weizsäcker and Anders Wijkman, fulfilling many of the socio-economic indicators of Agenda 2030 may bring much needed well-being to the world, but it could also cause collateral damage by increasing the stress on the environment and by accelerating the consumption of raw materials and land-use change.

The increasing numbers of our populations heighten the demand for our limited natural resources. If we would divide the planetary resources evenly, this would lead to a fundamental reconsideration of many of the aspects of Western society that we currently take for granted. Affordable energy, clean water, and safe housing conditions belong in this category.

How Should Architecture Respond?
As described earlier, the construction sector is responsible for most of the raw material consumption and for a significant share of GHG emissions. Therefore, we can position it among the key drivers of the Anthropocene. Although architects have not designed most of the built environment around us, the role of architecture has the potential for building a better future. In the value chain of construction, someone has to take the lead in suggesting how much energy we can use in buildings. In addition, we have to put limits on raw material consumption in the building, maintaining, and repairing of our building stock. We also need a vision for defining what sort of consumption patterns the cities and buildings we design promote. Furthermore, we should be cautious not to slide into a narrow-minded eco-technological strategy for the built environment in which resource-efficiency and architectural design would end up on a collision course.
It is perhaps a suitable time for discussing what sort of role architecture and architects should take in the global effort of restoring our planet back to a healthy state. According to the architect Kenneth Frampton, living needs ‘demand to be met but surely not in such a way as to ruin the world for generations yet unborn’.  

**ADAPTATION AND MITIGATION PATHWAYS IN THE NORDIC COUNTRIES**

The narrative of the Nordic welfare states is often told from the viewpoints of democracy, social sustainability, and clean nature. Indeed, Denmark, Finland, Iceland, Norway, and Sweden are among the global leaders when it comes to environmental accountability. Still, their average per capita carbon footprint of 7.64 is almost double that of the world average of 4.97 t CO$_2$e (and not even comparable to the average of 0.8 t CO$_2$e of Sub-Saharan Africa). Is the high Nordic level of accountability enough to compensate for the environmental impacts related to lifestyles and industries? How are the planetary boundaries included in Nordic building regulations?

**The Nordic Climate Ambition**

If we look at the three most important aspects—biodiversity loss, nitrogen cycle, and global warming—the heaviest normative weight has been on global warming.

Denmark is pursuing seventy percent GHG emissions reductions by 2030 compared to the figures of 1990. As a part of this process, strong initiatives are planned for the transport sector, but emissions from the built environment will also be addressed.

Finland is pursuing carbon negativity (national GHG removals larger than emissions) during the 2040s. However, despite the detailed national energy and climate strategy, there is no exact practical method defined for how these goals should be implemented in the construction sector.

Iceland is aiming for carbon neutrality by 2040. The existing general carbon tax will be gradually increased to support this goal.

Norway is aiming for climate neutrality by 2030. In the Norwegian approach, this requires that the emissions reductions ‘abroad’ should be equal to the national emissions of Norway. By 2050, Norway aims to become a ‘low emissions society’.
Sweden is pursuing carbon neutrality by 2045. As part of a wide stakeholder discussion, the Swedish construction industry has also jointly presented their practical proposal for reaching carbon neutrality.

The environmental policies in the Nordic countries are strongly focused on climate change. Given its timely importance and the wide societal support for its mitigation, this can be well understood. The same applies to joint voluntary policies in the construction sector.

**Nordic Construction and Architectural Policies**

The Nordic countries have jointly expressed ambitious goals for improving the sustainability of the built environment and addressing climate change. Altogether, 124 companies, municipalities, and public bodies signed the Nordic Built Charter, an initiative of Nordic Innovation, which coordinates cross-border innovation and development in the Nordic countries. This charter consists of ten principles that are aimed at transforming the building sector. Especially the fourth principle, in which the built environment ‘achieves zero emissions over its lifecycle’, can be considered highly ambitious. This principle would be met ‘by integrating smart technologies for resource optimisation and clean energy production in our buildings’. It has not been recorded if any of the pilot projects that implemented the charter actually achieved this. The Charter project has since transformed into the Nordic Built Cities programme (2013–17).

Architectural policies offer an instrument for implementing sustainable development in architecture. These policies are nationally developed strategies consisting of voluntary recommendations, governmental action plans, and normative roadmaps that aim to set the course for architecture. Architectural policies are similar in many countries, and they are being revised regularly to reflect the societal, economic, and environmental changes that have a direct influence on land use and building.

Denmark, Norway, and Sweden place sustainable development as the first priority in their architectural policies, and Iceland places it among the first drivers of its design policy, which also covers architectural design. In Finland, the architectural policy is currently under revision, and the existing policy from 1998 does not directly address sustainable development. However, the pre-study for the revision process of Finland’s architectural policy underlines climate change and resource efficiency as drivers for the new policy.
If we look at the Nordic Built Charter and the Nordic architectural policies from the viewpoint of the Anthropocene, it appears that the urgency for changing the current design and construction practices is well recognized in them. However, recognition alone does not turn the course. Practical action, way beyond the normative minimum, is required.

BUILDING FOR A BETTER FUTURE
In order to adapt architecture to the Anthropocene, three strategies are suggested for practical architectural action. These are not substitutes for the classic Vitruvian principles. Instead, they offer a new set of priorities that help architecture to empower and facilitate the important environmental, economic, societal, and cultural changes that are facing humanity.

Decoupling Functional Quality and Environmental Impacts
Decoupling is a term usually referenced in the context of resource efficiency and circular economy. Typically, it refers to separating the growth of the gross domestic product (GDP) from resource use. Decoupling can be either relative (in which case resource use grows slower than the GDP) or absolute (in which case resource use decreases while the GDP increases). As stated by Weizsäcker and Wijkman, such ‘continued conventional growth leads to massive collisions with natural planetary boundaries’ and thus a ‘massive decoupling of human well-being from the use of fossil fuels, basic materials, and scarce minerals’ is required.

In architecture, however, such decoupling is, in this article, defined as the ratio of functional quality of the building to its environmental harms. Architects and engineers have been trained to optimize the functional quality of a building or structure. However, architects and engineers need new skills. According to the previously mentioned Nordic architectural policies, the importance of understanding and prioritizing sustainable development goals for architecture requires more investment into education. In addition, methodologies for quantifying sustainability, such as life cycle assessment or material flow analysis, are becoming relevant skills for architects.

Relative decoupling improves the performance of a product, a service, or a building within its own definitive system boundary in comparison to alternatives on the market. Nevertheless, for changing the big picture, we need a more holistic approach.
Figure 2. The concepts of absolute and relative decoupling in architecture. Source: Matti Kuittinen
In absolute decoupling of functional quality and environmental harms, we should aim at maintaining or improving the functional level of the built environment, while we simultaneously decrease its negative environmental impacts. This may be difficult to achieve by architects alone, without the commitment from the client side and the entire construction value chain. However, we could consider the normative requirements that relate to, for example, mitigation of climate change as the minimum level, not as the goal after which we need not pursue further improvements.

What should be the ambition for architectural design? If we would design according to Rockström’s ‘rapid decarbonization roadmap’,\textsuperscript{47} in a decade we would need to be able to produce buildings that have a 50 per cent smaller carbon footprint than today. In addition, we would need to halve the energy-related emissions every decade. These would not be ‘one-off’ reductions, but we would need to repeat them every decade. We can imagine that with very ambitious design goals and the full support of both clients and authorities, we could achieve this for new energy-efficient buildings. However, the challenge is that this applies to the existing building stock as well, especially if we are seeking cost-effective ways of retrofitting social housing.

Adopting the key principles of a circular economy may help in this quest. A circular economy can be defined as an economy in which ‘the value of products and materials is maintained for as long as possible’ and in which ‘waste and resource use are minimised’.\textsuperscript{48} Without a circular economy, the construction sector’s chances of meeting climate mitigation goals may become unrealistic.\textsuperscript{49} Reusing construction products, recycling materials, and extending the technical service lives of buildings are becoming necessities. Architects should therefore strengthen the dialogue with policymakers and construction companies for solving the normative bottlenecks that hinder the reuse of building products and the recycling of materials.

If we cannot lower the emissions from the construction sector according to the ‘rapid decarbonization roadmap’, then there are two theoretical options left. Another industrial sector may push its emissions well below zero and compensate for the shortcomings of the construction sector. It is, however, unlikely that any other sector could improve its performance to be able to carry the additional loads of the construction sector. The remaining option is, therefore, that the construction sector would launch a massive compensation effort for offsetting those emissions that it could not avoid. This is
theoretically possible with the help of both natural and anthropogenic carbon sinks. In practice, however, natural sinks (such as soils, meadows, forests, and aquatic ecosystems) are under a lot of stress. Natural processes can only deal with approximately half of anthropogenic GHG emissions. The growing global population requires more land for food production and for settlements. On the other hand, carbon dioxide removal technologies, such as carbon capture and storage, are still expensive, risky, and not scaled up to the required volume of GHG removals.

For these reasons, Jannik Giesekam, Danielle Tingley, and Isabel Cotton argue that ‘the full implications of the Paris Agreement for the construction sector are profound, yet poorly understood’ and that the construction sector may never reach carbon neutrality. This is an alarming finding, as it leads us to consider how much we can still build on this planet without pushing climate change beyond the point of no return.

Absolute decoupling is, despite of its challenges, the only way towards a liveable planet. Therefore, building designers should ‘urgently engage with efforts to depict a net zero emission future’. From an architectural viewpoint, this may include radical design solutions, new design methods (such as algorithmic design and multi-objective building optimization of the building design process), and profoundly reconsidering how to utilize the existing built environment in better ways, without the need to invest energy and materials into new construction. This could have considerable socio-economic impact on the construction and real estate sectors in the short term, but enable their adaptation to the new state of the Anthropocene.

**Simplification of Buildings**

As a second approach to building a better tomorrow, buildings should be simplified to such a level of complexity that we could be certain of managing them for many years in changing conditions. We should ensure that structures, elements, technical systems, and their combinations are robust and resilient. We can call this *tectonic simplification*. In addition, we should apply simplicity as a design principle to buildings in order to support usage patterns that are less dependent on material resources or energy. This can be understood as *simplicity as a design agenda*.
**Tectonic Simplification**

Tectonic simplification should cover the architectural design and construction of buildings, building products, structural combinations, and building services. The products that we use for construction may come with a variety of raw materials. As resource consumption grows along with the population growth and consequent construction needs, the availability of certain raw materials (such as oil-based products, certain minerals, or ores) may become considerably limited. Thus, if the products that we assign to a building are not dependent on scarce materials when they need to be repaired or replaced, then the technical and economic service life of that building installation is likely to be longer. Complex products and systems may also include materials and additives that make it harder to reuse or recycle them. Even today, it is surprisingly hard to find out exactly which chemicals or additives have been
used in a product. There are thousands of new chemicals entering the markets every year, and we are not sufficiently aware of how all chemicals affect the reuse and recycling potential of building products—let alone their health impacts. Composing the building from a limited array of materials would most likely enable cost-efficiency during its repairs and pave the way for an easier separation of materials for recycling at the end of their first life cycle.

Structures may benefit from simplification as well. One of the distinct features of the Anthropocene is that the weather is changing. This will put additional stress on buildings in many ways. Increased precipitation and moisture content have been noted to change the physical performance of heavily insulated structures, although the mould growth does not always behave according to mathematical growth models. The diffusion of moisture through a structure changes in the interfaces of different layers of materials. Thus, decreasing the number of layers and selecting materials that do not add risk for mould growth may reduce those risks that are associated with changing patterns of rain, wind, and temperature.

Simplification of structures and components may also enable the principles of a circular economy to be fulfilled. The fewer materials and connections there are within a component, the less need there will be for separating layers from each other in such a manner that would keep each material stream intact. For example, contamination of construction steel and additives that are used for many construction plastics are already an important hindrance to their cost-effective recycling. This means that if products were designed and manufactured using fewer materials and additives, their recycling might be more feasible. The same could be applied to deconstruction methods as well, if building parts were disassembled so that they do not become mixed with other demolition waste streams.

The suggestion for simplification is not to say that building designers should develop a romantic escapism away from technology or become dystopically paranoid about the chemical accumulation in our environment. However, as a building should operate for several decades or centuries in an environment that is about to change considerably, then adding an additional level of resilience would hardly hurt.
**Simplification as Design Agenda**

When describing engineering, the well-known French writer and amateur aviator Antoine de Saint-Exupéry stated that ‘perfection is finally attained not when there is no longer anything to add, but when there is no longer anything to take away’.\(^6^1\) We can apply this reductionist view to simplicity as a design approach as well: Milan Nikolić and Dragana Vasilski describe minimalistic architecture as a journey to an ‘irreducible minimum’, in which there is nothing to be removed from the design.\(^6^2\) Depending on the case, we can observe this through the visual or haptic appearance of a building, through its spatial composition, its materiality or its functionality.

We can also consider simplification as an approach for influencing architectural design, production, maintenance, and circulation processes. In this respect, it is very close to minimalism. However, simplicity and minimalism are not synonyms. There is no exact definition for either term in architecture, and they may have similar connotations. We can describe simplicity as producing a non-complex building with ease and little effort. Minimalism may lead into the same, but we can also understand it as a formalistic design goal that may have intrinsic value in architecture. This implies that a simple building may not necessarily look minimalistic and that we cannot necessarily design, build, maintain, or recycle a minimalistic building effortlessly.

As the reductionist approach is one of the distinct features of minimalistic architecture and simplified construction, there is some evidence that it may also apply to environmental impacts of buildings as well. Atsushi Takano has used life cycle assessment calculations to exemplify that the simplification of a wooden exterior wall structure with multifunctional yet simple materials may reduce its overall environmental impacts, and that certain principles of vernacular architecture can be helpful in achieving these goals.\(^6^3\) Antti Ruuska has shown that if a single-family house is made from massive logs instead of a timber frame, there is a reduction not only in components but also in its GHG emissions.\(^6^4\)

Although there are not many studies that discuss the correlation of structural simplicity and environmental impacts, the topic is of special relevance. As buildings have become more energy efficient, their life cycle impacts arise from so-called ‘embodied’ impacts, that is, not from the use of energy and water during the operational use of a building.\(^6^5\) Especially the use of materials has risen in its relative dominance of life cycle impacts.\(^6^6\)
There are limits to simplification as well. A building or system constructed from the fewest possible components is not necessarily resilient. The requirement of resilience has increasing relevance to building design. As weather changes, stronger storms, increased precipitation, flooding, extreme heat waves, and higher wind and snow loads may cause more damage to the built environment and its users. Reducing the number of structural layers in an external wall or roof may lead to fewer components having to provide for the same amount of structural safety and stability. For example, weather protection of the external shell of tall buildings may become risky if it relies only on one weather-protective layer. Therefore, additional protective layers may be required. Although this will increase the amount of materials invested in the structure, the benefit is decreased risks and a potentially longer technical service life for the structure.

Thus, we could aim for simplicity as a design approach. In the ‘irreducible minimum’ the negative impacts of the building would be minimized, its possible positive impacts maximized, and its resilience optimized.

**Cultural Resilience**

*Architecture and Anti-Consumerism*

Cultural resilience refers to how our cultural background may help us to overcome difficulties or adapt to changes. Architecture can be a part of culture that builds such resilience. According to Christian Norberg-Schulz, ‘since remote times architecture has helped man in making his existence meaningful’. This longing for a meaningful life seems to be one of the drivers when people adopt anti-consumerist lifestyles and start redirecting their aspirations towards fewer environmental impacts and away from the distractions of a materialist society. Today, this phenomenon is often referred to as ‘minimalism’ or ‘downshifting’. In the 1930s, such a lifestyle was titled ‘voluntary simplicity’, and in the early twentieth century, ‘simple life’. Throughout written history, similar endeavours have been common for many religious, philosophical, or social movements. Notable figures have inspired masses to pursue a simpler and more meaningful life, such as the Christian monks Benedict of Nursia and Francis of Assisi, the Zen Master Ikkyu, the writers Jean-Jacques Rousseau and Leo Tolstoy, and the political leader Mahatma Gandhi.
Does architecture have latent potential for enhancing cultural resilience for the turbulence expected to come along with the Anthropocene? Could we apply it to finding alternative paths for materialism, consumerism, and the linear economy?

Emerging signals suggest that our living environments can play a role in enabling lifestyles in which individuals have less need for defining their social status through the consumption of material goods. As described by the minimalist writer Joshua Becker, ‘in a minimalist economy, well-designed, multipurpose, quality-crafted items will be desired and purchased’. Furthermore, the reduction of material items may, according to Marta Skowrońska, lead to the ‘selection of the most effective, functional, aesthetically pleasing, space-saving and lightest items’. If these observations hold true and can also be applied to broader society, then fostering a lifestyle that can settle with less material consumption could be aimed at through architecture as well. If a building’s form should follow its function, then the minimalist goal of ‘decluttering’ spaces should be reflected in its design as well. As an example, the architect Ann Thorpe advocates the use of architecture as activism for challenging the paradigm of constant economic growth and as means to alleviate its negative environmental, social, and economic consequences.

**Architecture and Environmental Anxiety**

Cultural resilience could also help in overcoming other emerging impacts of climate change—in particular, those that affect mental health. Several researchers have documented that climate change, its consequences, and its communication in the media are already causing mental stress, anxiety, depression, and are even increasing the risk of suicide.

As a remedy for climate-related anxiety, a few general approaches exist. These include political leadership in both admitting to the severity of the climate problem and in signalling active mitigation and adaptation policies; healthcare and social support systems that recognize the symptoms of climate-related anxiety and offer support; and therapy, discussion groups, and self-help materials. In addition to these, both art and rituals are proposed as valid approaches to dealing with feelings of environmental anxiety and for creating compassion towards oneself.

The role of art and rituals brings the discussion to cultural resilience through architecture. Would it be possible to also use the power of the built environ-
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*Figure 4. Drivers, solutions and outcomes. Source: Matti Kuittinen*
ment for alleviating the mental impacts of climate change? Could we design memorial places or meditative surroundings that would offer us spaces to deal with difficult feelings and provide possibilities for building mental resilience? Could we use the built environment for facilitating a societal shift from consumerism to sustainability?

For thousands of years, architects, engineers, and master carpenters have sought to impress and inspire with buildings. We may experience a sense of majesty in the Pantheon of Rome, enjoy the modest cosiness of the turf house of Núpsstaður in Iceland, feel suppressed in front of Albert Speer’s plans for the Nazi Volkshalle in Berlin, or transcend into a meditative state-of-mind in the modern wooden Kamppi Chapel (or Chapel of Silence) in Helsinki. We experience these emotions through architecture. Architecture’s role in behaviourism is utilized commercially as well. Many of today’s shopping malls and restaurants can be interpreted as symbols of consumption that are intentionally designed to make consumption as effective as possible. Thus, architecture—and the entirety of the built environment—has the unique potential to create an atmosphere, influencing our moods and offering a perception of the society that has produced it. Amidst the typical discourse of sustainability in the built environment, this may sound distant or even escapist. However, we need both physical and mental strength to overcome the challenges of global warming (and human nature) so that we can avoid dangerous climate change and build a better future—preferably on Planet Earth.

CONCLUSION

The built environment is a long-lasting asset, and therefore it includes a significant risk for path-dependency. How we design and build our future is an important and strategic decision in which architects should actively engage. We can question how many new buildings we need to build—or how many we can afford to build if the competition for limited resources gets tougher. We can design buildings that are highly efficient in their use of energy and materials over their full life cycle. These actions are reactions to the current state of the Anthropocene. Proactive measures are more difficult, but they may have greater impact. We can use architecture to alleviate the forthcoming turbulence of the Anthropocene. Although the quantification of such proactive benefits is challenging, we should not abandon this aspect.

The three suggestions for architecture include both reactive and proactive responses to the Anthropocene. A decoupling of functional quality from
environmental impacts is a reactive action. When given goals based on the ‘rapid decarbonization roadmap’, it becomes proactive as well. Simplification of building technology is both reactive and proactive, as it responds to the need to cut resource use while preparing the built environment for the changes in weather, usage, and availability of resources for maintenance. Simplification as a design agenda, however, offers possibilities for using architecture for facilitating much-needed changes in lifestyles. The potential of cultural resilience is part of architecture’s proactive response to the psychological impacts of the Anthropocene. This is a specific value-added feature of architecture that neither construction technology, nor ecological optimization, nor the social sciences alone is able to produce.

Finding a remedy to the Anthropocene is perhaps the biggest joint effort of the whole of humankind. To be successful, we need to engage all sectors of our society. Now, perhaps more than ever, architecture requires redefinition.
NOTES


7 Steffen et al., ‘Planetary Boundaries’.


11 Richard J. Millar et al., ‘Emission Budgets and Pathways Consistent with Limiting Warming to 1.5°C’, *Nature Geoscience* 10 (October 2017), pp. 741–47.


15 IPCC, ‘Global Warming of 1.5 °C’.


23 For some of the findings, this is merely a question of different system boundaries and allocation methods. However, these factors do not explain all of the differences in the findings. See Seto et al., ‘Human Settlement, Infrastructure and Spatial Planning’, p. 90.


30 Weizsäcker and Wijkman, Come On!.


46 Weizsäcker and Wijkman, Come On!, pp. viii–ix.

47 Rockström et al., ‘A roadmap for rapid decarbonization’.


53 Hansen et al., ‘Assessing “Dangerous Climate Change”’.
54 Giesekam et al., ‘Aligning Carbon Targets’, p. 115.
63 Atsushi Takano, Wood in Sustainable Construction: A Material Perspective (Espoo: Aalto University, Department of Forest Products Technology, 2015).


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