



Global and local challenges in buildings and construction

¹Mareike Thiedeitz | ²Chadlia Ounissi | ³Banjo A. Akinyemi | ⁴Elise Berodier

¹TU Munich, Germany | ²Faculty of Sciences of Gabes, Tunisia | ³Landmark University Omuaran, Nigeria | ⁴Ecole Polytechnique Federale de Lausanne, Switzerland



1. Introduction

Fast urbanisation around the globe is challenging the construction sector at both the global and local scale. Today, buildings and constructions account for 32% of the global energy expenditure and are responsible for 19% of the global greenhouse gas emissions. We are all aware that the situation will worsen significantly in the next decades if we carry on current building practices in our efforts to provide sufficient settlement to the burgeoning population. While the danger of urbanisation is a reality, constructions have enormous potentials – largely unrealised by the society – at the local and global level. From our perspective buildings are source of challenge and solution at the same time. Indeed, they impact with so many critical areas which are identified by the United Nations as Sustainable Development Goals (among them Climate Action, Infrastructures, Sustainable cities ...). The history of architecture has shown that construction materials evolve with the society. We have been developing new technologies for thousands of years and we will continue adapting to new resources and to a new digital world. However, we will do it, will determine our progress toward sustainable development.

This paper provides a review about the challenges and potentials that we, but also governments, policies makers, and cities must address urgently. We propose practical solutions at both local and global level. Our common vision is that cooperation and partnership are key. We hope to inspire collective actions for our future.

2. Global and local challenges: status quo

It can be identified that the main obstacles towards sustainable construction fall in three major fields.

Economic challenges

- Corruption in construction industry
- Affordable sustainable construction
- Unequal distribution of natural resources between countries
- Slow implementation of new technologies and innovation in construction industry

Social challenges

- Negative mindset on low-carbon, local construction materials or practices: vernacular building is seen as buildings for 'poor' and new low-cost housing as of poor quality
- Lack of interdisciplinary connections between actors which limits knowledge transfer and development of efficient solutions
- Lack of awareness on corruption and the misuse of available resources at the society level
- Poverty or unemployment and builders with poor and limited skills
- Artisan skills poor or limited
- Recognition of engineers: avoid exclusion of key engineers and other relevant specialists during feasibility studies and issuing of contracts
- Misalignment of curricula with the application on the ground

Environmental challenges

- GHG emissions from construction
- Importation of materials resulting in inefficient application
- Allocation of financial resources
- Lack of exploitation of locally available and sustainable materials
- Modernisation of construction with the use of new technologies
- Inadequate international standard to many local contexts
- Tendency of construction sector to promote mainstream solutions

3. Global and local potentials

With the massively increased rate of urbanisation worldwide, construction can be a driving force with a significant positive impact on sustainable development of the countries. From a global economic angle, the construction industry is a dominant force in any nation's economic growth as a significant contributor to the gross domestic product. On the environmental global aspect, it is estimated that the building sector can contribute to the mitigation of the climate change by reducing more than 50% of the energy consumed for buildings. However, most potentials are at local scale. They can be summarised as follows:

- Sustainable design can increase the blend of traditional and conventional building materials. We have the knowledge and the technologies.
- Natural and local building materials such as hempcrete, cob, earthbags, straw bale construction, construction waste etc. There is a tremendous volume of natural and local materials that are suitable for construction. Why are we limiting ourselves?
- Leapfrogging technology: urbanisation happens in emerging and developing economies where high-carbon and unsustainable construction are not yet dominant, these countries can take a different pathway than Western countries and leapfrog towards sustainable construction methods and materials.

- Formulating national policies and strategies to implement the adoption of green building materials into the construction industry through the use of incentives and waivers for the industry.
- Re-thinking bidding process towards more open and transparent, as well as encouragement of sustainable construction practices
- Stage by stage monitoring of construction works which would serve as a check and balance to curtail sharp practices in the industry
- Give voice to engineers! They are key actors towards solving the challenges of the construction.

4. Possible solutions

With respect to the discussed global challenges and potentials, solutions in different fields have to be found. Generally, the “Think global, act local” attitude is necessary in each action. Following, possible solutions for different areas are presented:

Politics and corruption

A direct approach to politicians is not applicable. In many countries, governments will not apply direct solutions for environmentally friendly and sustainable engineering without gaining tangible advantages for themselves or the economy. Still there is the possibility of influencing the local politics by either influencing the clients or proceeding in “interdisciplinary undercover lobbying”. As in various movements through history, it is possible to mobilise groups of **passionate** people armed with information and resources in order to impact national policy around sustainable development in construction.

Moreover, engineers and more largely all actors in construction, could form lobby groups to impact on politicians, holding them accountable at every stage of development. Indeed, a smart transportation of our knowledge to politicians in good lobby work could transform consumption and building behavior even if we must sell it from purely economic or other publicly relevant market friendly perspectives. Building interdisciplinary bases for policymakers to transport our knowledge will surely have an impact. We have to be clear that we all are the politics of the world. We built our today’s society and each one of us as well is able to change the society, even if it takes more effort in our today’s world than maybe in ancient times.

Standardisation

Standardisations can be a powerful tool for the implementation of environmentally friendly building. Nevertheless, to be efficient, standards should be appropriate to local context (avoiding predominance of international standards against local standards). Standards should request the use of local available materials and not standardised imported materials as today. Engineers should participate in standard committees and promote local standards in their work.

Information to the public

Not only politics has to be informed but public as well. Engineers and engineering should be more present in society. Information about building and constructing have to be more accessible. Keeping information back, will not stop elites in engineering. With showing engineering methods to the public, construction and living standards will change from bottom up.

Education

Appropriate education is the basis that will support the development of the aforementioned solutions. It is the most powerful tool to create a prospective impact.

Possible educational tools were figured out: Basics have to be taught; not standards or rules. Engineering students should know about the basics and be able to apply them for thoughtful building.

Direct teaching about sustainable building solutions, e.g. low cost materials and the use of wastes makes sustainable building not extraordinary but normal and thus can become the new standard.

5. Creating impact

Influencing the people's minds about construction and its influence on the environment, sustainability and culture is the most important impact to be reached. **Starting from the bottom, impact will eventually be reached at the top:** People will consider their behavior and interaction with the built environment, consumption behavior and political actions.

As engineers and other built environment professionals, we all should start to create impact by using easy but strong channels:

- Start social media! We underestimate the influence of social media accounts, short videos and podcasts on the young generation.
- Try to engage policymakers in the public eye.

Make your point clear! Be short! Use easy words! Do not be exclusive, rather be accessible!

6. Conclusions

Do you want to make a change?
Do you want to create impact for more sustainable construction methods?
Can you implement at least one of the direct approaches?
Will you implement this NOW?

