

Promoting the widespread use of ecological and resilient infrastructures

In the face of climate and environmental challenges, a paradigm shift needs to take place through the systemic promotion of eco-construction in Belgium's cooperation programmes

Towards net zero by 2050

Positioning

Over the last few years, Enabel has built up a wealth of experience in eco-construction. This approach to reducing the climate and environmental footprint is fully in line with the DGD's 2023 Federal Climate Strategy and the approaches promoted by Enabel to tackle climate challenges. **This note clarifies Enabel's ambitions in the area of infrastructure building, based on its experience of the last twenty years. Time of experiment is over. It is time to convince partners of the need to apply the principles of ecological construction across the board.** The note echoes a more elaborate concept note that targets industry professionals and sets out the details of the approach.

Impact of the built environment on ecosystems and the climate

As climate urgency and the pressure on biodiversity are ever-increasing, action is required in the whole of human activities. The most damaging effects are being felt particularly in Africa while the continent is experiencing rapid demographic and economic growth and is thirsting for new energy and development. Against that background, buildings have a profound influence on the environment. Worldwide, their construction is responsible for 40-50% of the extraction of raw materials (Dsilva et al., 2023). Their energy demand represents 36% of global consumption (UNEP, 2020). Cement production alone accounts for 5 to 8% of global CO₂

emissions (Cheng et al., 2023). The sector also generates 40% of greenhouse gases (Climate Group, 2024) and around 30% of solid waste (BBC, 2021). Soil mineralisation, arable land grabbing and the fragmentation of natural ecosystems are further harmful consequences of the industry. Alternatively, urban densification, the development of land that has already been built on and the rehabilitation of existing structures are possible responses.

Beside the necessary adaptation measures to the unavoidable impacts of climate changes, reducing the environmental impact and decarbonising the entire industry are essential if Africa is also to achieve the agreed global sustainability, circularity and decarbonisation targets by 2050. This means reducing the use of the most polluting materials, such as cement. To minimise the impact of transportation and at the same time ensure the economic development of Africa, it is essential that alternative materials can be produced locally.

Enabel and eco-construction

Learning from experiences

For some years Enabel has been promoting the principles of eco-construction. Five flagship projects are presented below.

From pilot projects to a comprehensive green building framework, the case of Palestine

The bioclimatic approach was launched in Palestine in 2009 as part of a major school construction programme. Various appropriate passive technologies were tested, such as solar chimneys and Canadian wells. After a necessary pilot phase to convince the authorities, Enabel is now developing a more ambitious approach in supporting the authorities in developing a favourable institutional ecosystem, in particular by co-developing the regulatory framework. This includes the production of certification of green buildings guideline, energy efficiency code, the use of energy performance tools in building permit applications, etc. Finally, a mechanism for monitoring the reduced environmental impact of new or renovated buildings has been established.

A decade of eco-construction in Uganda

Enabel has been promoting eco-construction design in Uganda as part of its education programmes for the last



10 years. The result is a bioclimatic architecture that is largely open to its surroundings, allowing optimum natural ventilation, well-protected from direct sunlight and making extensive use of local materials. The approach adopted was awarded the Architizer prize in 2022 (Architizer Projects, 2022). In order to reduce operating costs, local electricity production was favoured with photovoltaic installations as well as biomass. The programme also provided a framework for reflection, communication, exchange and training involving professionals, students and authorities. It resulted in the organisation of an International Forum, the publication of a Manifesto (Clegg & Sandeman, 2019) and the creation of a regional network of sustainable construction professionals.

Cost-effective and sustainable building solution in Burundi

Since 2018, Enabel deploys the 'modern' semi-industrial bricks construction technique, using the Row Lock Bond (RLB) fitting system in Burundi. These standardised, perforated RLB bricks are made from clay and are perfectly suited to local conditions. They significantly reduce the use of materials, especially cement, while maintaining structural strength. They offer significant economic, technical and environmental benefits. This approach has been adopted in some fifteen projects in the vocational training, health and agriculture sectors. Infrastructure built in this way is less expensive than that constructed in concrete, while at the same time the thermal and acoustic comfort of buildings is improved. At the same time, a maintenance model was developed by the health programme, covering both infrastructure and health equipment.

Enhanced urban resilience in Rwanda

The urbanisation project in Rwanda supported the development of three value chains: earth, stone and bamboo. Support materialised in assistance to 75 companies promoting the circular economy. The project facilitated access to finance and technology and supported the development of standards for the use of local materials. At the same time, curricula were revised to incorporate the use of local materials and workflow training was introduced. These initiatives are part of a wider programme that targeted three secondary towns (Musanze, Rubavu and Rwamagana) to develop resilient and sustainable economic infrastructure.

Holistic and climate-resilient infrastructure in Senegal

The Agropole centre project, part of the Plan for an Emerging Senegal, adopted a holistic approach to infrastructure design (Enabel's programme, 2019-2024). Climate-resilient infrastructure principles were studied and implemented not just to the buildings but throughout the site, which is to host agro-industrial and aquaculture processing infrastructures. The shell has been optimised to reduce the amount of concrete required by 25%, while masonry is made of compressed earth brick or adobe and the roofs are thatched with cattail Typha, an abundantly available local material that is rot-proof and insulating.

Lessons learned

Key Principles for Sustainable and Inclusive Infrastructures Development: Step-by-Step Approach

A series of common basics emerge from these various experiences. First, there is the need to take a critical look at national norms and standards, which are still too rarely open to the matter and the required innovative approaches. It is therefore often necessary to proceed in stages, starting with a pilot demonstration phase. Second, the various stakeholders are in need of competence development and awareness raising programmes as the principles to be applied are not always known by the authorities and the design offices and even less so by the contractors and the local communities.

When it comes to the actual design, a number of factors need to be taken into account, starting with respect for and enhancement of the site's characteristics and taking into account the community's wishes through a participatory approach at every stage of the project. Then, it is important to learn from what already exists and draw inspiration from it by reinterpreting not only tradition but also nature. The use of cutting-edge innovative technologies must be considered. Particular attention will also be paid to the management and maintenance of the infrastructure, to ensure its longevity and therefore its sustainability. Other aspects to consider include inclusion, gender mainstreaming and respect for decent work principles, including compliance with safety standards.

Bioclimatic architectural solutions: Enhancing Energy Efficiency and Reducing Environmental Impact

The architectural solutions adopted must improve the energy performance of the buildings, contributing simultaneously to reducing energy requirements and increasing user comfort by paying particular attention to orientation, reducing external energy input, natural ventilation, thermal inertia of the shell, promotion of low-carbon renewable energies, etc. It is also important to ensure that the GHGs inherent in construction materials are reduced and that the consumption of non-renewable resources is reduced, in particular by using local bio-sourced or recycled materials, allowing to reduce the need for cement. Special attention will be paid to managing the water cycle. Applying these principles usually leads to a relative increase in the overall budget - around 15% on average.

Recommendations

While these various pilot projects have demonstrated the value of the approach, it is now important to move beyond the experimental phase and start scaling up to meet the challenges of climate change.

1. Developing a favourable environment

Creating a favourable environment includes a series of measures such as:

- Raising the awareness of the general public, building professionals and political decision-makers as done in Palestine,
- Providing specialised professional training at technical colleges and universities, following the example of Uganda and Senegal,
- Introducing regulations and building standards that encourage ecological practices, as practised in Palestine,
- Investing in all local building materials production chains, as demonstrated in Rwanda,
- Elaborating construction standards for schools and hospitals, as done in Uganda,
- Promoting collaboration between local authorities, construction professionals, non-governmental organisations and civil society, along the lines of what is done in Rwanda and Uganda.

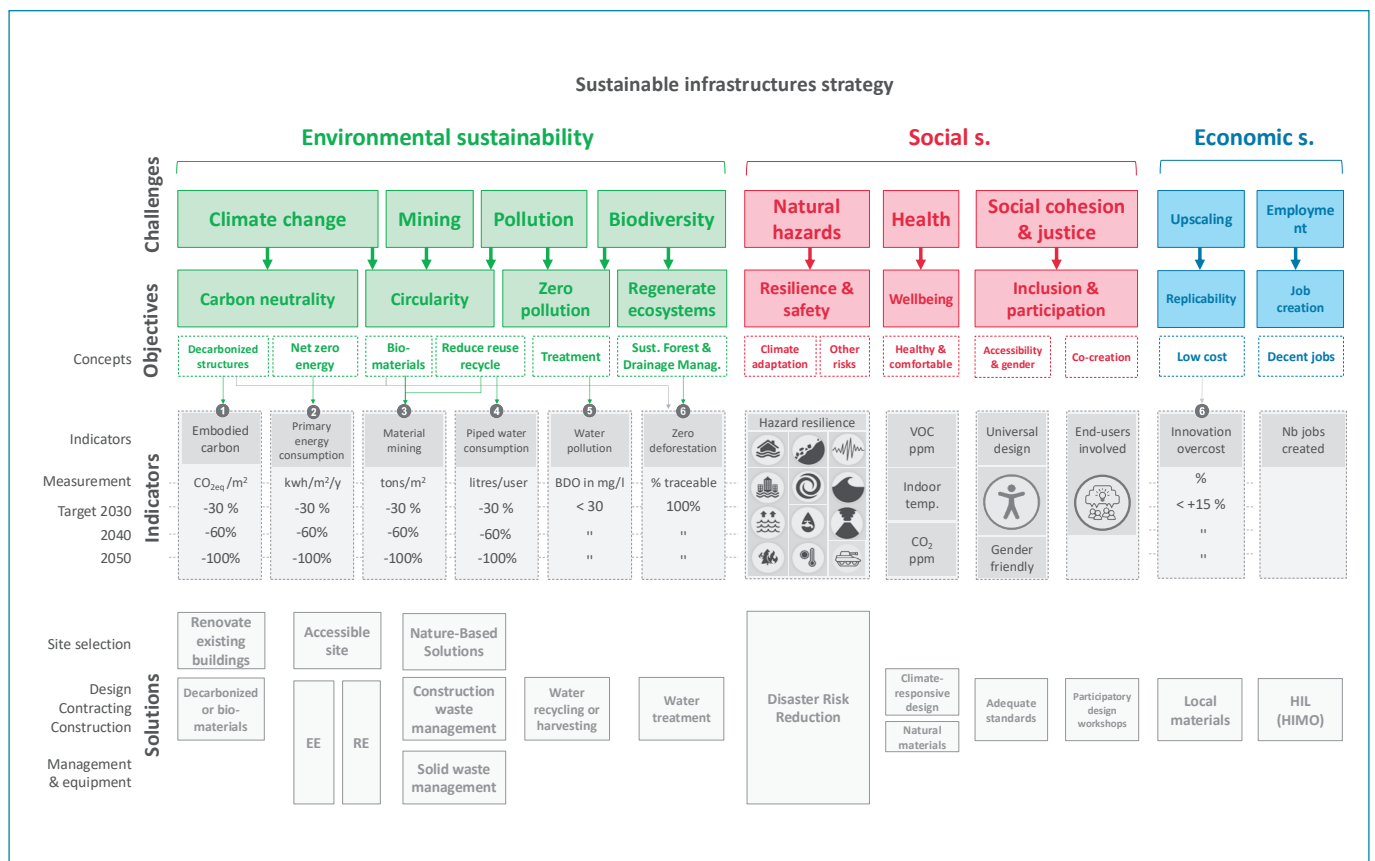
2. Certification versus performance targets

An effective environmental and social monitoring and evaluation system is essential to measure the relevance of the

efforts undertaken. One possible solution would be to use a certification scheme for sustainable buildings. While these labelling schemes, such as the British BREEAM, the American LEED and SBSE, the French HQE, and the EDGE scheme developed by IFC, can lead to internationally recognised certification, the process is slow and costly. Like in the work conducted in Palestine, Enabel recommends a specific approach. Six targets for reducing the impact of infrastructure by 2030 are defined for the construction and use stages as illustrated below.

As the environmental impact of infrastructure is not the same everywhere for the various categories of buildings and the various indicators, reduction targets are proposed relating to business-as-usual in each country and type of infrastructure in order to enable a gradual change in practices. A target of a relative reduction of at least 30% is proposed to pave the way for a 100% reduction by 2050, in reference to the base line defined for each country by the EDGE system.

Four criteria relating to social and economic sustainability are also included. They cover resilience to natural hazards, including adaptation to anticipated climatic hazards specific to each country of operation, the promotion of a safe, healthy and comfortable environment for users, consideration of inclusion and gender issues, the level of participation of future users in the co-creation of structures, not forgetting economic sustainability, including management and maintenance. The scheme below presents an overview of these indicators.



Strategic commitment to eco-construction

Given the urgency of the climate and the environmental challenges, now is not the time for experimentation anymore. **On the strength of its experience, Enabel is firmly committed to working with its partner countries to ensure that the principles of eco-construction, with an emphasis on environmental, social and economic sustainability, become widespread, with the aim of contributing to carbon neutrality by 2050.** In its approach, the principles of adaptation and mitigation are part of the same dynamic, with the aim of building societies that are resilient, low-carbon and circular. To achieve this, Enabel's experience underlines the need for a holistic approach involving:

- **The application of a series of key principles**, including the enhancement of the site, community participation, reinterpretation of tradition and of the solutions offered by nature, integrating innovative technological solutions while ensuring inclusiveness and gender.
- **The use of a series of bioclimatic architectural solutions**, including the use of eco-responsible local materials and appropriate technologies, linking energy efficiency, the reduction of greenhouse gases and the use of natural resources.
- **Scaling leads to two complementary approaches:**
 - **Contribute to the establishment of an appropriate ecosystem**, including a society that is aware of the issues through appropriate awareness-raising programmes, duly trained professionals, a robust and restrictive legislative framework that is adapted to local conditions, and economic channels for the production of high-performance local materials.
 - **Develop an effective and appropriate environmental and social monitoring and evaluation system** with 6 indicators together with intermediate targets for reducing the environmental impact of infrastructure and 4 socio-economic sustainability indicators.



Palestine, appropriate technologies



Uganda, local materials

Getting eco-construction off the ground in the partner countries of Belgium therefore requires a multi-dimensional strategy combining normative and exemplary approaches that takes account of local challenges, opportunities and specifics, including cultural ones. By adapting the approaches described in this document to the realities of each country, it will be possible to effectively promote the emergence of climate-resilient infrastructures in our partner countries on the basis of concrete impact objectives integrated into national strategies.

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