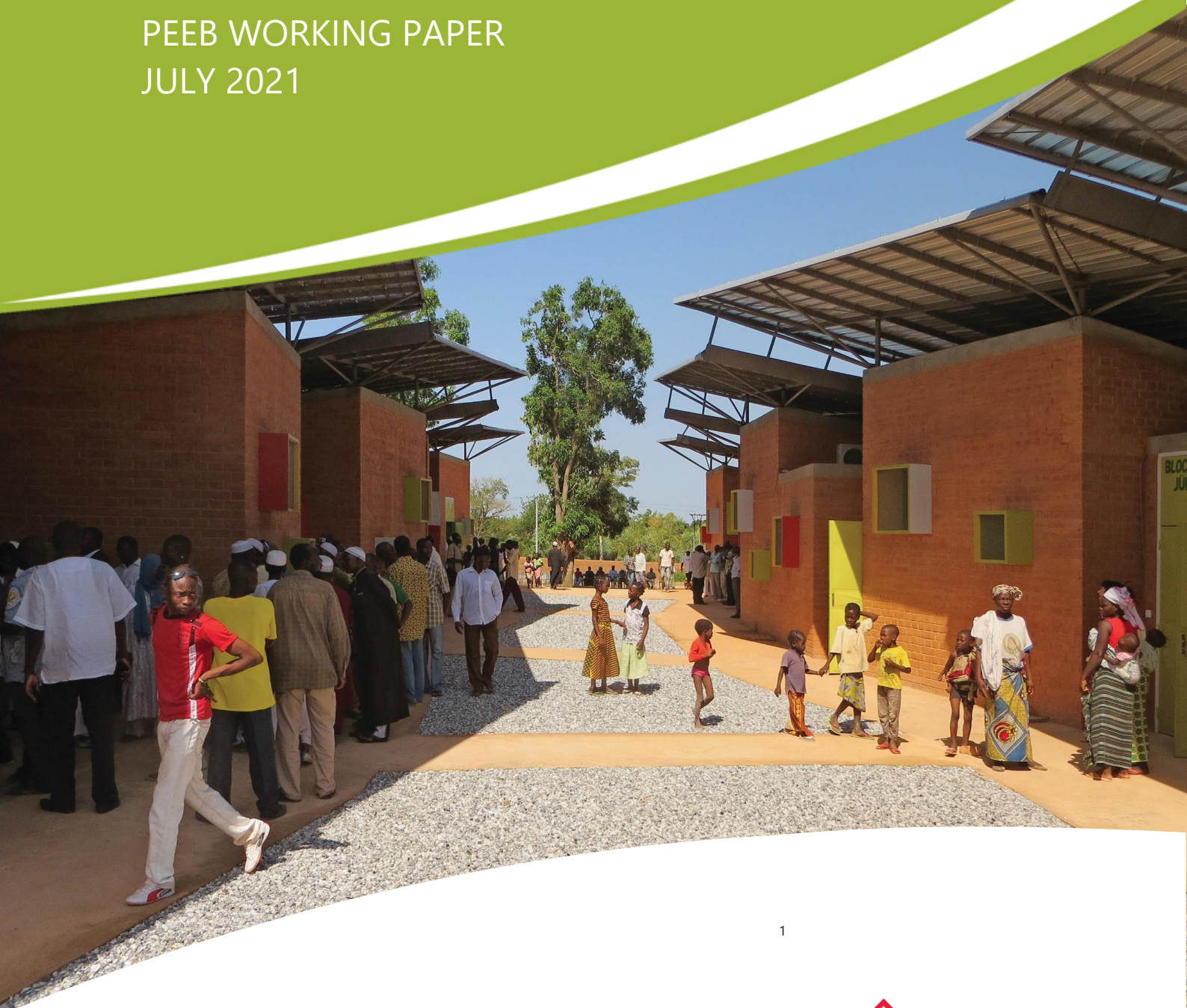


HEALTH AND GREEN BUILDINGS

RESILIENCE AND EFFICIENCY THROUGH BETTER BUILDINGS IN THE HEALTH SECTOR IN AFRICA

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1. HUMAN HEALTH AND THE CLIMATE: THE IMPORTANCE OF BUILDING ENERGY EFFICIENCY IN THE HEALTH SECTOR¹

Being comfortable in a building is essential for human health. A healthy environment requires sufficient fresh and clean air and light, and comfortable in-door temperatures. In the health sector, green buildings² can make a substantial contribution to the well-being of patients and medical staff. They have a positive effect on patients' health, as well as staff motivation. Achieving comfortable conditions without mechanical cooling is also extremely relevant for off-grid health centres. With rising temperatures, there is an urgent need for resilient green buildings as part of adaptation strategies. Buildings that keep cool naturally present an important strategy to adapt to rising temperatures and protect from overheating.

Energy efficiency can massively reduce the energy consumption and associated cost of medical facilities, which often have a high energy consumption. Investments in energy efficiency have high returns on investment, with short payback times³. Cost savings through energy efficiency can be reinvested to reinforce capacities of the health sector, into equipment, personnel or drugs. For example, the health sector in Tunisia features a current building stock of more than 5,000 buildings (from large university hospitals to local health posts, private clinics and laboratories) with a surface of almost 800,000 m² and a capacity of 5,600 hospital beds. They not only deliver health services to the Tunisian population, but also represent 5% of total energy consumption in the buildings sector⁴.

¹ A first version of this paper was developed by PEEB for the "Energy Talks" of the Africa-EU Energy Partnership (AEEP) (<http://www.peeb.build/news-events/energy-talks-of-the-africa-eu-energy-partnership>)

² "Green buildings" is used throughout this text to refer to buildings that are energy-efficient and resilient, but also include further sustainability and urban planning criteria. Cf. https://www.peeb.build/imglib/downloads/PEEB_criteria_june%202019.pdf, accessed on 15 February 2021

³ SmartMarket Report, 2018, World Green Building Trends 2018, <https://www.worldgbc.org/sites/default/files/World%20Green%20Building%20Trends%202018%20SMR%20FINAL%2010-11.pdf>

⁴ Mapping of the Tunisian Building Sector, National Energy Management Agency (ANME), in collaboration with PEEB, UNESCWA and KfW, cf. <http://www.peeb.build/news-events/hospitals-in-tunisia>

The issue of energy efficiency in buildings goes beyond the benefits of the individual hospital or health centre. The 21st century is characterised by massive growth in construction. Globally, it is expected that the building floor area will double by 2060. On the African continent, growth rates are even higher (see figure 1 below).

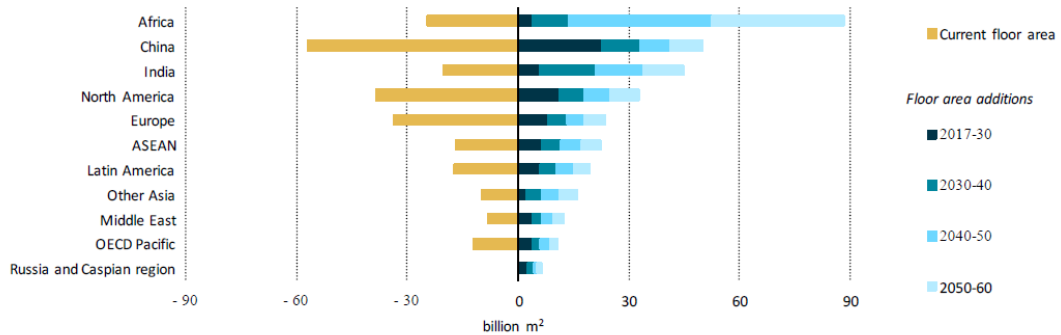


Figure 1: Floor area additions to 2060 by key regions (Source: Global Status Report (GABC) 2017) ⁵

Energy use from buildings is rising rapidly. In Africa, the building sector accounted for 61% of the energy consumption and 32% of process-related CO₂ emission in 2018 (see figure 2).⁶

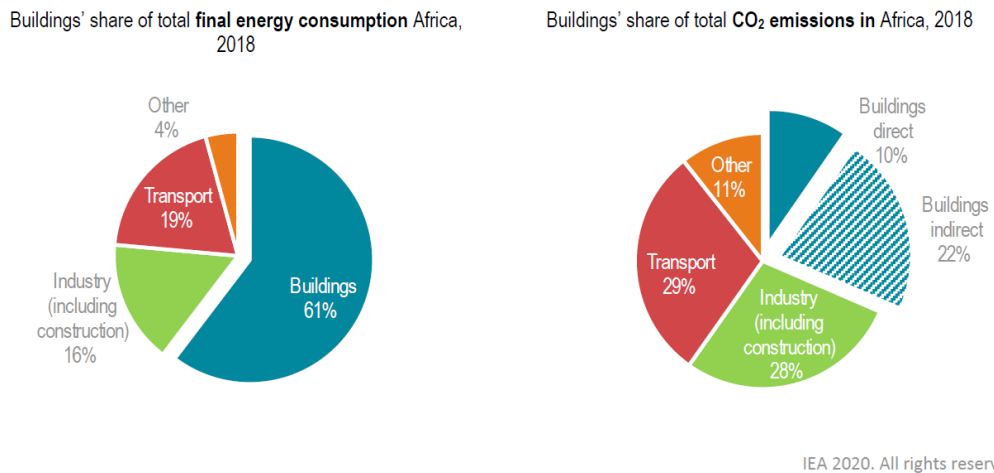


Figure 2: Share of buildings' final energy and emissions in Africa, 2018 (Source: IEA/GlobalABC: Regional Roadmap for Buildings and Construction in Africa)⁷

⁵ UN Environment, 2017, Global Status Report, p.8, https://www.worldgabc.org/sites/default/files/UNEP%20188_GABC_en%20%28web%29.pdf

⁶ GlobalABC, 2020, GlobalABC Regional Roadmap for Buildings and Construction in Africa, p 9, https://globalabc.org/sites/default/files/inline-files/GlobalABC_Roadmap_for_Buildings_and_Construction_in_Africa_FINAL2_0.pdf

⁷ ibid., p22

Additionally, the healthcare sector needs access to cooling for safe medical clinics and the secure transport and storage of vaccines and medical products.⁸ Green buildings, equipped with efficient and affordable appliances, can make a substantial contribution to achieve “Cooling for All”.

Cooling is the fastest-growing end use in buildings.⁹ Africa is predicted to have a very strong increase in ownership of cooling devices considering the currently very low levels of ownership of cooling devices, a growing population, economic growth and rising average temperatures due to climate change.¹⁰ As a result, the energy consumption from buildings, including the health sector, is expected to grow rapidly, putting extra pressure on electricity systems already under strain to fulfil demand.

Adaptation to a warming climate is another key challenge for the health sector. Buildings that keep cool naturally present an important strategy to adapt to rising temperatures and protect from overheating. The negative effects of climate change on Africa are expected to be severe, through high temperatures and increases in extreme weather events. This will impact health, as extreme high air temperatures contribute directly to deaths from cardiovascular and respiratory disease, while increasingly extreme weather events and floods may destroy homes, medical facilities and other essential services.¹¹ This underlines the need for resilient green buildings as part of adaptation strategies.

⁸ SEforALL, Cooling for All, <https://www.seforall.org/cooling-for-all>, accessed on 10 February 2021

⁹ GlobalABC, 2020, GlobalABC Regional Roadmap for Buildings and Construction in Africa, p 86, [https://globalabc.org/sites/default/files/inline-files/GlobalABC Roadmap for Buildings and Construction in Africa FINAL2_0.pdf](https://globalabc.org/sites/default/files/inline-files/GlobalABC_Roadmap_for_Buildings_and_Construction_in_Africa_FINAL2_0.pdf)

¹⁰ IEA, 2019, Africa Energy Outlook 2019, <https://www.iea.org/reports/africa-energy-outlook-2019>, accessed on 10 February 2021

¹¹ WHO, 2018, Climate change and health, <https://www.who.int/news-room/fact-sheets/detail/climate-change-and-health>, accessed on 15 February 2021; WHO Housing and health guidelines, 2018, <https://www.who.int/publications/i/item/9789241550376>

In addition, investing in buildings efficiency has the highest job potential compared to intervention in other sectors. For every million dollars invested into retrofits or efficiency measures in new buildings 9-30 jobs in manufacturing and construction would be created¹².

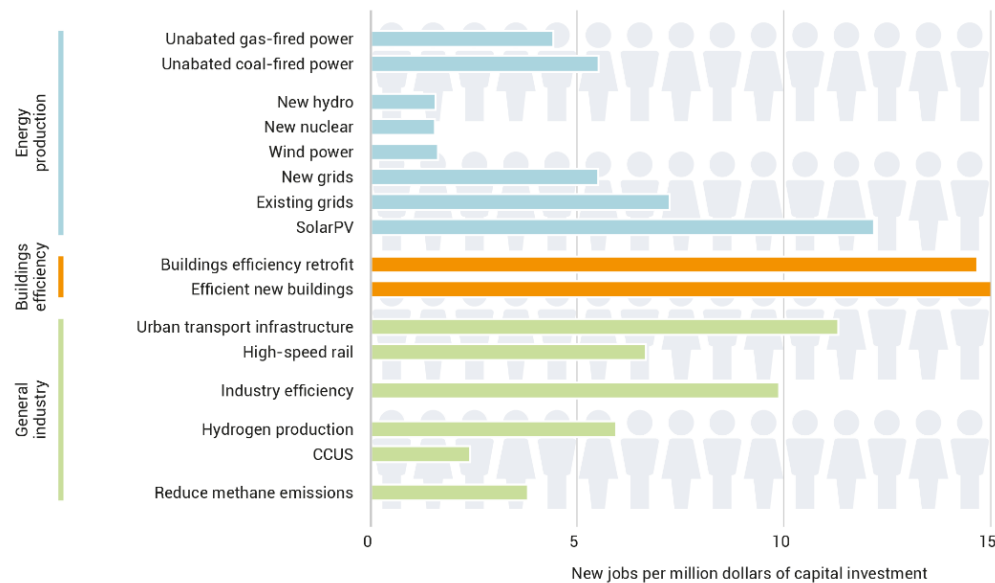


Figure 8: Jobs created per million dollars of capital investment and spending by measure (Source: Global Status Report 2020)

Examples of successful green stimulus programmes from eight countries, including Colombia, France, Kenya and Peru, show the benefits of green buildings in terms of value for money, economic impacts, job creation and climate benefits¹³.

¹² GlobalABC, 2020, 2020 Global Status Report, pp. 26-30, [https://globalabc.org/sites/default/files/inline-files/2020 Buildings GSR FULL REPORT.pdf](https://globalabc.org/sites/default/files/inline-files/2020%20Buildings%20GSR%20FULL%20REPORT.pdf)

¹³ GlobalABC, 2020, Stimulus Programmes For Green Buildings – Best Practice Examples, <https://globalabc.org/resources/publications/stimulus-programmes-green-buildings-best-practice-examples>, accessed on 12 February 2021

2. GREEN BUILDINGS IN THE HEALTH SECTOR

Building green in the health sector is possible and can be done in all building projects. Traditional buildings in hot climates used to achieve comfortable conditions without electricity. Building design has a major impact on the need for mechanical cooling. Long roof overhangs, exterior shading elements, thick walls and green courtyards provide shade to buildings and reduce solar heat gains. During the planning phase, massive improvements to energy consumption and well-being can be made by taking a few simple considerations into account (cf. figure 3).

'Quick wins' for all buildings

- Building orientation aligned from west to east.
- Low window-to-wall ratio, adapted to the climate zone.
- External shading above windows, exterior doors and vents.
- Natural ventilation where possible and adapted to climate zone.
- Vegetation for shade and evaporative cooling.
- Roofs with thermal insulation.
- Light-coloured and reflective coatings on roofs and façades.
- Ceiling fans before considering air conditioners.

Figure 3: 'Quick wins' for all buildings (Source: PEEB, 2020)

Existing projects in the health sector have achieved excellent results. For example, the Surgical Clinic and Health Centre in Burkina Faso, uses a modular system to reduce costs and speed up construction, with large overlapping roofs that protect the raw clay walls during the rainy season as well as shade them from the hot daytime sun.¹⁴

Another example from Frankfurt, Germany, shows how hospitals have also been built to the passive house standard.¹⁵



Figure 4: Surgical Clinic and Health Centre, Burkina Faso (Architects: Kéré Architecture)

¹⁴ Kéré Architecture, Surgical Clinic and Health Centre, <https://www.kerearchitecture.com/work/building/surgical-clinic-and-health-centre>, accessed on 15 February 2021

¹⁵ The Construction Specifier, 2020, World's first Passive House hospital is a step closer to certification, <https://www.constructionspecifier.com/worlds-first-passive-house-hospital-is-a-step-closer-to-certification/>

Tunisia: Guide for energy efficiency in healthcare facilities

Healthcare facilities that are energy efficient are important for patient comfort and can save costs that can be reallocated to patient care. Still this is not a priority for architects or engineers involved in construction and rehabilitation of healthcare facilities. PEEB therefore developed an energy efficiency guide for healthcare facilities in Tunisia¹⁶, together with the Tunisian Ministry of Health and the Tunisian Energy Management Agency (ANME). This guide complements the PEEB financing for two hospitals.

This detailed guide gives concrete recommendations to energy managers and architects working in the health sector. It covers areas such as the orientation of waiting areas and patient rooms, energy efficiency and management of different hospital installations, and the integration of renewable energy sources to provide a safe and secure power supply for its day-to-day functioning. The guide also contains an overview of the current state of public and private sector health buildings in Tunisia. An accompanying quick checklist for integrating energy efficiency in health buildings is under development.

“Cool buildings” work with the climate, not against it. Building designs need to be adapted to the local context, with different strategies for humid or dry climates and different temperatures. By factoring in orientation, insulation, design, and using local and bioclimatic materials, buildings can increase thermal comfort and achieve massive energy savings.

For example, high-performance thermal building envelopes (foundations, external walls, roofs and external doors) can reduce the cooling demand by 30% to 50%. Figure 4 shows an example of a building for hot and humid climates without the need for air-conditioning.¹⁷

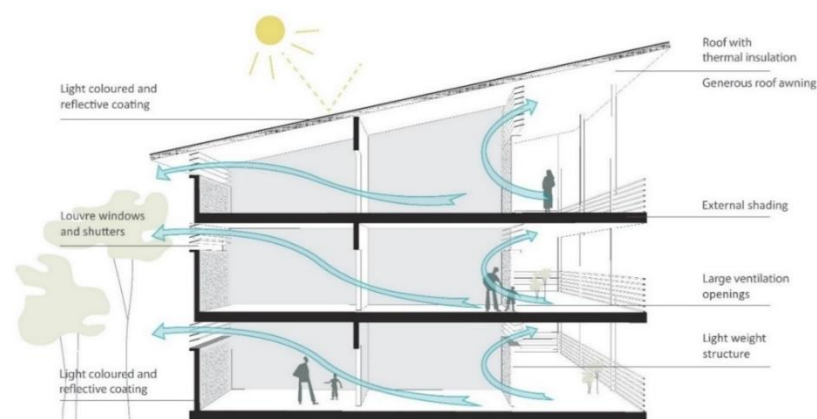


Figure 5 Example of an open building, suitable for hot and humid climate, without air-conditioning (Source: PEEB. 2020)

¹⁶ PEEB, Tunisia: A guide for energy efficiency in healthcare facilities. <http://www.peeb.build/news-events/peeb-tunisia-hospital-guide>

¹⁷ PEEB, 2020, Better Design for Cool Buildings, https://www.peeb.build/imglib/downloads/PEEB_Cool%20Buildings_Working%20Paper_August%202020.pdf

By following a three-step approach, buildings can become energy-efficient:

Avoid-Shift-Improve

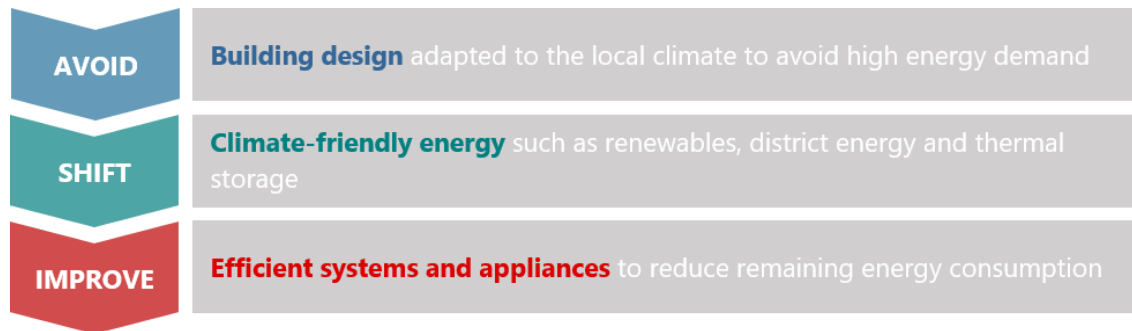


Figure 6: Avoid-Shift-Improve Approach (Source: PEEB. 2020)

Sustainable building materials are an important element of green buildings. They can provide comfortable indoor conditions, while reducing the high reliance on – often imported – materials with a high carbon footprint¹⁸. A local industry for green building materials, including innovative solutions such as green concrete, insulation panels made from sustainable materials¹⁹, or clay bricks, is nascent in Africa and needs to get into the mainstream.

¹⁸ World Green Building Council, 2019, Bringing Embodied Carbon Upfront, <https://www.worldgbc.org/embodied-carbon>, accessed on 12 February 2021

¹⁹ Including invasive plants, e.g. <http://www.tyccao-typha.org/wp-content/uploads/2019/10/TyCCAO-program-flyer-eng-2019-1.pdf>

3. CONCLUSION: MAINSTREAM GREEN BUILDINGS IN HEALTH

Building green in the health sector is possible and can be done in all building projects. The following points should be addressed:

- **Mainstream energy efficiency standards and criteria for green buildings in construction or renovation projects in the health sector** and other sectors, including low-income housing, to ensure ‘cooling for all’ and reduce energy poverty.
- Support the **adoption of ambitious regulation for hospitals and health centres**, including building energy codes for new buildings and renovations.
- Spread **knowledge and build capacity among building sector professionals** around “quick wins” and more ambitious measures for buildings in the health sector.
- **Mainstream energy efficiency and green building criteria** for health buildings in **financing decisions** of international and national financiers.

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