04 HOW TO ADAPT BUILDINGS TO THE CLIMATE REALITY

HOW IT IS DONE

Buildings take up a lot of Earth's capacity to support human existence. Approximately 40% of our total energy consumption is related to buildings. However, the negative climate impact of buildings can be reduced while improving indoor climate, if these items are considered:

- Pass building legislation that focuses on sustainable parameters. These can be using healthy materials, reducing noise levels, making fresh air and natural light a priority in buildings.
- A building is an integrated part of a city. To reflect this, strive to include stakeholders from infrastructure, energy, health, environment and include their perspective and tie-in to design, construction and operation to dramatically minimise the environmental impact of buildings while improving the quality and healthiness of our indoor environment.
- Ensure that all aspects of sustainable construction are applied. The best way to do this is to set performance requirements through local building codes.
- Build synergies. It is rarely feasible to initiate energy efficiency measures on existing buildings purely to save money on energy because of economies-of-scale. But in combination with refurbishment needs for other reasons, the investment will be feasible.

Refurbishment improves energy efficiency

Buildings constitute the physical environment in which most of the world's population spend the majority of their time. We work, eat, learn, sleep and play in buildings. Buildings can provide a controlled environment in which we feel more comfortable and can get the services that we need such as heating, cooling, water, power, etc.

The challenge in the industrial world is that through the use of buildings, we consume approximately 40% of our total energy consumption throughout the building life cycle. We consume large amounts of high quality potable water and we cause a number of secondary effects such as reduced biodiversity, increased heat island effects and loss of prime farmland. Furthermore, buildings use a lot of natural resources and energy when being constructed, and they are the source of much waste material during demolition.

There are several ways of successfully adapting buildings to the reality of climate change. First of all, we can design buildings in a way that they consume less energy. This is true for new buildings but especially when it comes to refurbishment of older buildings where improved energy conservation is very feasible. In the last 40 years, a great deal of progress has been made to improve our understanding of how energy consumption can be reduced. This has resulted in modern buildings that only consume a fraction of energy compared to buildings constructed in the last century.

New elements include:

- Advanced design tools
- Improved construction techniques
- Better insulation materials
- Better air tightness
- Triple glazed windows
- Heat recovering ventilation systems
- LED lighting
- Energy efficient appliances and
- Heightened awareness of human behavioural patterns.

The added benefits of energy efficient buildings

Not only is it feasible to design energy efficient buildings to save energy, but the additional benefits of better thermal comfort would be a goal on its own. With energy efficient buildings we avoid cold draft and damp walls. At best, a building would be equipped with high temperature cooling and/or low temperature underfloor heating.

It is rarely feasible to initiate energy efficiency measures on existing buildings purely to save money on energy. Such measures should be taken in combination with refurbishment needs for other reasons.

Green roofs
Another feature of climate adaptive buildings is the option of green roofs. Green roofs help reduce urban heat island effects, which is the reason for increased temperatures in big cities. Large cities in temperate climates are experiencing 3-4 degree C higher temperatures than the surrounding landscape due to higher thermal masses from paved streets and building structures. Green roofs also absorb and retain rain water thus providing relief for the sewer system. Finally, green roofs lead to a greener city overall which has an empirically proven positive influence on the air quality and the improved quality of life of building inhabitants.

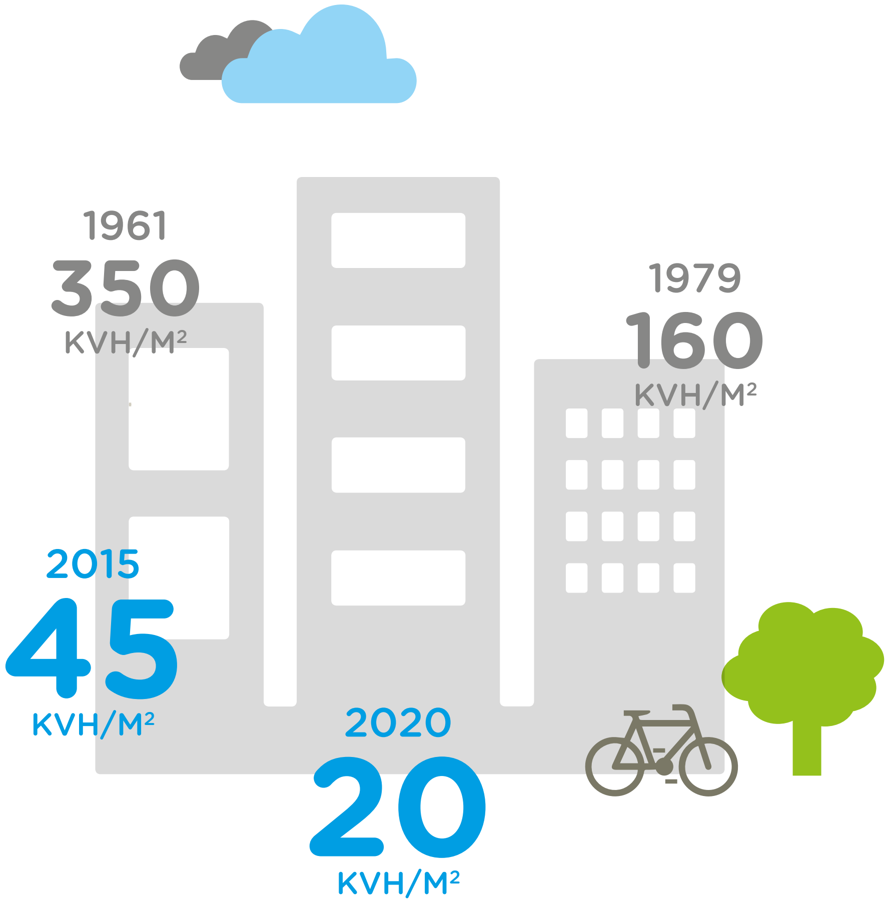
Always have lifespan and durability in mind
The use of materials in construction constitutes a major part of any building's environmental impact. To minimise the impact construction materials should be sourced locally when possible and materials should be chosen with lifespan and durability in mind. Whether a project involves building a brand-new facility or refurbishing an existing one, a key consideration is to determine how to use more recycled building materials to save resources.

Perform a life cycle analysis
Performing a life cycle analysis of the building project and its functions is the best way to determine this. When doing so, it is possible to get a full picture of a building's performance. This includes taking into account what will happen when the building will be either refurbished or deconstructed. Recycling building materials requires that the various components can be easily disassembled. From a socioeconomic standpoint, recycling all materials can be a costly affair, especially in cases involving chemicals or other non-recyclable components like the PCB embedded in cement-based products. Analysing the lifetime expectancy of the specific project helps us choose the materials best-suited for each function.

The best way to ensure that all aspects of sustainable construction have been applied is to set performance requirements through local building codes. Such requirements would be along the lines of the existing voluntary certification schemes such as LEED, BREEAM or DGNB.

Reaping the benefits of building smarter
It is possible and feasible through better legislation, planning, design, construction and operation to dramatically minimise the environmental impact of buildings while at the same time improving the quality and healthiness of our indoor environment. For all stakeholders, such a development represents a learning curve that every local building sector has to go through. But the sooner this is started, the sooner it is possible to reap the benefits of building smarter.

THE HISTORIC DEVELOPMENT IN THE LEVELS OF ALLOWABLE ENERGY CONSUMPTION OF BUILDING



From 1961 until today, the levels have fallen from 350 KVH/m2 to 45 KVH/m2, and the global ambitions are to bring these to less than half of this within the next five years.

THE IDEA BROUGHT TO LIFE

Nordhavn

A good example of sustainable urban development is the Nordhavn project, located in Copenhagen. In collaboration with COBE architects and SLETH and Polyform, Ramboll experts have developed a concept that drastically rethinks how different ways of living can be combined with sustainable energy, environment, traffic and cityscape solutions.

At Nordhavn it will be easier to walk, cycle and use the metro than to use your car. And one very good answer to the energy and climate challenge is exactly this kind of approach, as one of the greatest advantages of a dense city is that the need for transportation gets smaller.

Tate Modern II

Tate Modern is located on the site of the UK's first oil-fired power station on the south bank of the River Thames in London. Tate Modern II, an extension, located on a site with a complex history of potentially-contaminative industrial activities, including asbestos, gas, engineering, chemical and printing works.

Our work as project environmental consultants has included the detailed assessment of soil gas regimes and groundwater regimes, a review of historical and existing data, ground investigations, chemical testing and monitoring.

A Conceptual Site Model has been developed, highlighting potential pollutant linkages. Following this, a strategy for management of these during demolition and construction phases was developed. Additional risk assessment for infiltration systems as well as input into BREEAM assessment work has also been completed.

60% – PROPORTION OF URBAN AREAS EXPECTED TO BE DEVELOPED BY 2030 THAT HAVE NOT YET BEEN BUILT

Source: Secretariat of the Convention on Biological Diversity