

Managing GHG emissions of buildings with a lifecycle-based "Climate Action Roadmap"

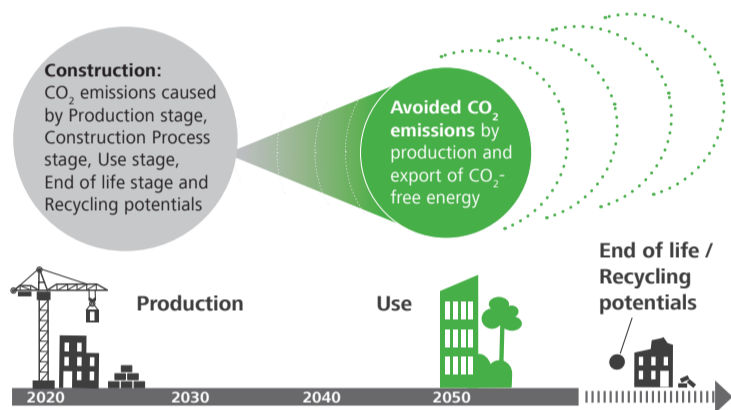
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► Background and objectives

The Paris Agreement was passed in 2015 in order to curb the consequences of climate change as effectively as possible. In relation to the current building stock, this means: All construction activities necessary must be carried out with significantly lower CO₂ intensity than previously and be operated carbon neutrally by 2050 at the very latest. This requires a systematic approach in order to implement the necessary activities economically and according to targets.

The GHG emissions of the build environment are at current dominated by the operational emissions, generated through the use of energy for hot water, heating, cooling, ventilation and lighting. Climate action measures, aiming at reducing the energy demand and on generating energy supply, require the comprehensive examination and the complete energy balance to identify the most eco-efficient investments. In Germany, around 7 % of all national GHG emissions are generated during the production of building materials, the transportation and the installation on construction sites (BBSR, 2020).

Figure 1: Carbon neutral building throughout the entire life cycle



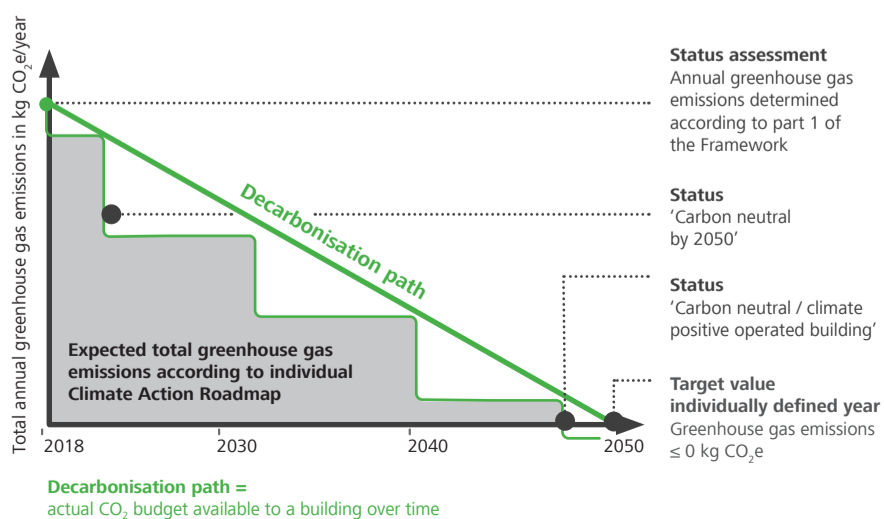
► Methods and scope

To implement the reduction targets the DGNB has developed a tool at the building level: A Climate Action Roadmap is a tangible plan of measures determined for a specific building. It aims at accounting for all operational emissions and all additional lifecycle-related emissions from improvement measures (the often called "embodied emissions").

The target value in connection with the decarbonisation path is derived from the remaining CO₂ budget in connection with the key demand of the Paris agreement for a balanced greenhouse gas account by the middle of this century. For the accounting scope "operation" this instrument defines the maximum allowable amount of GHG emissions per building, the remaining "carbon budget" as the integral of a linear function from today's emissions until 2050 latest. Including all improvement measures in the accounting scope "operation and construction" the remaining "carbon budget" is determined by the cumulated avoided emissions.

Figure 2 graphically represents the basic principle of the effect of a Climate Action Roadmap with an individual decarbonisation path. This path sets the annual limit value for the maximum greenhouse gas emissions individually for a building. This must be permanently below the decarbonisation path in order for a building to lie within its CO₂ budget (in the annual average). Building or site specific measures to reduce greenhouse gas emissions are to be identified, determined and set up in the form of a plan of measures on the basis of this individual decarbonisation path.

Figure 2: Principle illustration of a Climate Action Roadmap with individual decarbonisation path (accounting scope "operation").



► Results and discussion

The following six principle steps are to be implemented in the creation and implementation of a Climate Action Roadmap:

- Step 1: Determining the initial condition**
- Step 2: Potential analysis for relevant focus areas**
- Step 3: Cost assessment of the measures**
- Step 4: Time planning of the measures and determining the targets**
- Step 5: Documentation and quality assurance of the creation of a Climate Action Roadmap**
- Step 6: Determining responsibilities and planning the first implementation steps**

The establishment of climate action management processes, the implementation of the planned measures and the continual inspection of the CO₂ accounting are tasks which are connected to the creation of the Climate Action Roadmap.

Figure 3: Focus areas for the optimisation of the operation

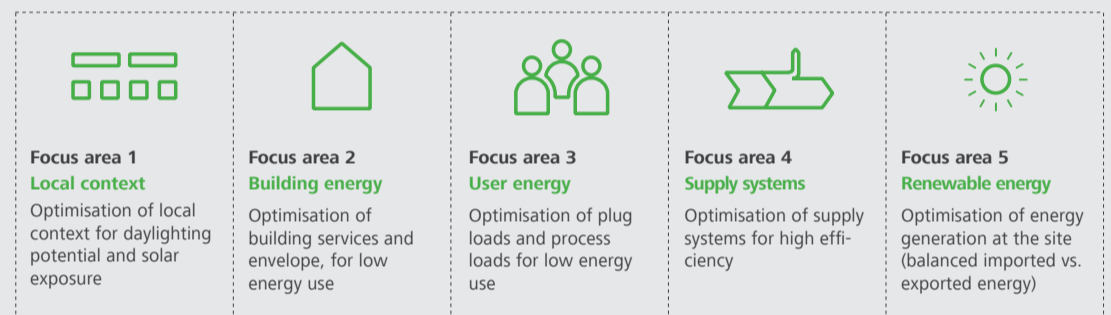
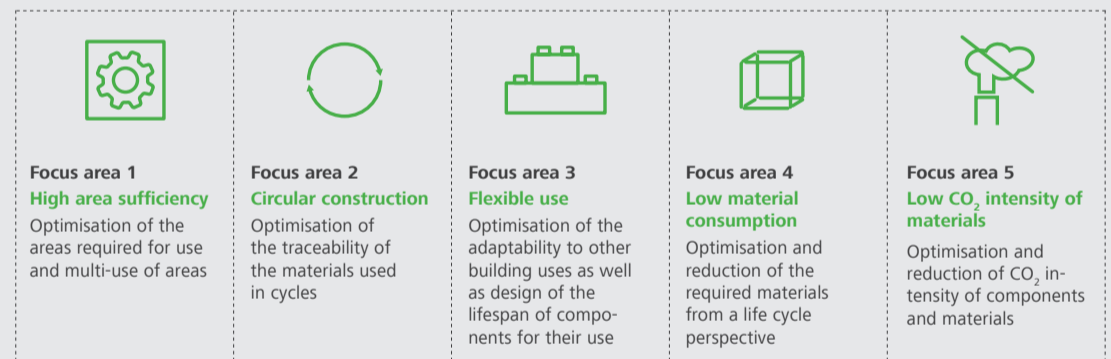


Figure 4: Focus areas for the optimisation of the construction



► Conclusions

1. Climate action and the associated investments must be planned in a focused manner.
2. Only those who define clear objectives for their buildings, sustain these and implement measures in a future-orientated manner can optimally combine climate action and economic viability.
3. It is important here that this is carried out for each building individually.
4. As a proven and practical tool, the developed "Climate Action Roadmap" helps planners to develop a building-specific plan and identify the most effective measures to achieve net zero GHG emissions.

► References

- BBSR 2020: Bundesinstitut für Bau-, Stadt- und Raumforschung (BBSR) im Bundesamt für Bauwesen und Raumordnung (BBR) (Hrsg.): Umweltfußabdruck von Gebäuden in Deutschland. Kurzstudie zu sektorübergreifenden Wirkungen des Handlungsfelds „Errichtung und Nutzung von Hochbauten“ auf Klima und Umwelt. BBSR-Online-Publication 17/2020, Bonn, December 2020.
- DGNB 2020: Framework for carbon-neutral buildings and sites, Stuttgart, March 2020

