Klima-Bündnis

Neighbourhoods, Neighbourhood Concepts and CO_2 Monitoring on the Neighbourhood Level

Introduction

These recommendations have been developed at the request of Climate Alliance member municipalities. A need was expressed for clearer definition of a "neighbourhood" and the comparability of neighbourhood concepts. Current practices in the development of neighbourhood concepts vary widely, particularly with regard to the relevant components and planning of measures. With these recommendations, Climate Alliance advocates comparable, sustainable and climate-friendly neighbourhood concepts that are developed and implemented together with local residents. This is the only way to ensure quality –and above all the long-term potential of neighbourhood concepts.

The framework conditions for establishing a neighbourhood concept are specified by the relevant funding bodies. The best-known among these are the Kreditanstalt für Wiederaufbau (KfW) development bank and the German National Climate Initiative (NCI). The KfW's funding programme 432[1] for energy-efficient urban redevelopment subsidises 65 per cent of eligible costs and covers both integrated neighbourhood concepts and the associated implementation management. Municipalities and municipal enterprises are the target group. Funding programme 432 can also be combined with other funding. In contrast, the NCI funding programme entitled "Kurze Wege für den Klimaschutz" ["Shortcuts to combating climate change"][2] concentrates on neighbourhood projects in the field of climate protection. The focus is on implementing climate-friendly everyday activities. Municipalities, clubs, cooperatives, associations and religious communities are eligible for funding.

The term "neighbourhood" is only defined in part. While the NCI does not define it in greater detail, the KfW sets the condition that to be eligible, "at least two privately and/or publicly owned buildings, including the public infrastructure, must be available".[1] In order to achieve broad consensus and by way of orientation, these recommendations outline the features of neighbourhoods that are relevant to climate protection.

[1] www.kfw.de/inlandsfoerderung/%C3%96ffentliche-Einrichtungen/Energetische-Stadtsanierung/Finanzierungsangebote/Energetische-Stadtsanierung-Zuschuss-Kommunen-%28432%29
[2] www.klimaschutz.de/nachbarschaften

1. Definition of a Neighbourhood

Political and administrative definitions exist for the term “neighbourhood” and it is often described in literature as a differentiated subdivision of large cities, municipalities or rural areas. One of the defining features of a neighbourhood also mentioned in literature is the social interaction and exchange among local residents, which in turn contributes to development of the neighbourhood’s character and identity. A neighbourhood can also be interpreted as a common place to live or a community.

This concept paper primarily refers to the narrower definition of “neighbourhood” for integrated energy-efficient neighbourhood concepts. Climate Alliance recommends considering energy and climate aspects on the one hand and the neighbourhood’s settlement, population and economic structures on the other. For these all contribute decisively to the neighbourhood’s character and influence one another. Neighbourhoods are limited in space and have a spatial context.

2. Neighbourhood Size

Similar to the definition, no fixed rule or administrative recommendation exists to date for the size of a neighbourhood. Hence this can vary between two houses up to several thousand residents.

In order to enhance the comparability of neighbourhood concepts and to clearly distinguish between cities, districts and neighbourhoods without confusing these concepts, a maximum size must be set for a neighbourhood.

A neighbourhood is a clearly demarcated area comprising anything from two buildings up to an area smaller than the municipality’s smallest district. To ensure good manageability of the neighbourhood, we recommend that the threshold of 20,000 residents not be exceeded. Should it be necessary to exceed this figure, we recommend dividing the neighbourhood into several sub-neighbourhoods. Each neighbourhood should be considered individually and the most efficient size for implementing measures considered. It is generally easier to implement a neighbourhood concept in smaller neighbourhoods than in larger ones.

To demarcate the neighbourhood, we recommend a preliminary examination of the area in terms of the neighbourhood’s characteristics as described under point 4. These characteristics serve as a guide and should be as homogeneous as possible within the neighbourhood. According to our understanding of the neighbourhood as a living community, social components such as the interaction and exchange among residents constitute basic elements of the neighbourhood that strongly influence its demarcation.

With reference to both German and international literature,[3] Climate Alliance recommends limiting the size of neighbourhoods to up to 20,000 residents. This is the upper limit for small municipalities set by the Federal Office for Building and Regional Planning (BBR).[4] We do not believe that a neighbourhood should attain the size of a medium-sized town or independent city. However, this recommendation can be adapted as necessary should the neighbourhood require it.

3. The Neighbourhood Concept

Neighbourhood concepts primarily comprise measures for the energy-efficient retrofitting of neighbourhoods and buildings. They are based on a review of the final energy consumption, primary energy demand and CO_2 emissions within the neighbourhood.

As an urban planning tool, neighbourhood concepts aim at efficient conceptual development of the neighbourhood and the associated investment costs. Further aspects include improving residents' quality of life and a sustainable, climate-friendly neighbourhood design. The neighbourhood concept is particularly suitable for defining a municipal energy-efficient building retrofitting policy and designing a decentralised demand-oriented energy supply.

Sociospatial and economic aspects are further important components to consider during the preparation of a neighbourhood concept.

4. Elements of the Neighbourhood Concept

The neighbourhood concept includes a CO_2 inventory for the neighbourhood, a traffic analysis based on indicators, an energy supply plan, and a description of the implementation measures.

Other characteristics of the neighbourhood must also be examined for a comprehensive analysis of the neighbourhood. These are detailed below. In order to simplify recording of all these characteristics, Climate Alliance provides a template. This should also enable a comparison of different neighbourhoods.

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[3] Doxiadis, Constantinos. Ekistics. 1968.

[4] www.bbsr.bund.de/BBSR/DE/Raumbeobachtung/Raumabgrenzungen/StadtGemeindetyp/StadtGemeindetyp_node.html

Characteristic Features of a Neighbourhood:

- **Topographical Categorisation**

The neighbourhood's topographical and geographical location plays a decisive role, as it determines the area's spatial and climatic characteristics. Special distinguishing features, such as dips and rises or hills, altitudes, proximity to bodies of water, and other spatial features determine the essential basic characteristics of a settlement area. They are at the same time relevant for the spatial demarcation of a neighbourhood.

Topographical factors:

- Large-scale categorisation of the neighbourhood or settlement
- Terrain: hills, valleys, terracing, dips, hollows, ridges, etc.
- Type of and distance to bodies of water
- Settlement density
- Ventilation corridors
- Ecological factors: proximity to forests, local vegetation, green spaces

- **Climatic and Environmental Conditions**[5]

The climatic conditions in an area are particularly decisive when it comes to energy usage and efficiency. Depending on the temperature, precipitation and wind direction throughout the year, the energy requirements are accordingly high or low – especially when it comes to the heating and cooling of buildings.

We recommend reviewing the climatic conditions on the settlement or neighbourhood level (e.g. spatial climate forecasts), taking the climatic conditions and resulting factors into account. A review of the risks – together with an assessment and description of the according hazards due to climate events – should be included in the neighbourhood concept and the planning of measures (should any exist). Such future-oriented planning is conducive to the successful implementation of measures in the long term. This perspective is an indispensable component of neighbourhood development, particularly with regard to residents' health. If no concrete climate data is available for the neighbourhood, the data used in the municipal adaptation plan can also be used and qualitative conclusions drawn.

[5] Climate forecasts and data are available from the German Weather Service and the ReKIS regional climate information system for Saxony, Saxony-Anhalt and Thuringia: www.deutschesklimaportal.de

- **Air Quality in the Neighbourhood**

The quality of the air in a neighbourhood is causally linked to the climatic conditions as well as to the space usage. Traffic and industry are considered the main emitters of pollutants, such as particulate matter, carbon monoxide, sulphur dioxide, nitrogen oxide and many others harmful substances.

As an optional supplement to the neighbourhood concept, data from air monitoring stations in the settlement area or neighbourhood can be analysed. A comparison with the threshold values and, where available, the air pollution control plan can reveal any potential shortcomings in the neighbourhood. If measuring stations have not yet been installed, mobile measuring stations can be used and the corresponding data collected based on measurement drives.

- **Neighbourhood Origins and Settlement Structure**

The neighbourhood's history is an essential aspect and has a huge impact on the other characteristics.

The distribution of green and open spaces, building density, different usage types, and settlement size are important characteristics that define a neighbourhood. Demarcation of a neighbourhood is often based on these in practice.

Climate Alliance recommends that the upper limit of 20,000 residents (i.e. the size of a small town) is not exceeded.[6] This is important in order to guarantee manageability and a certain amount of detail as well as to achieve a very in-depth analysis and comprehensive planning for the neighbourhood.

- **Building Typology**

The German residential building typology[7] and associated online tool[8] enable a review of different building types in the neighbourhood, such as multi-family and single-family houses, year of construction, building height and structure. The first energetic shortcomings can already be determined based on the building typology – the year it was built or the construction method used, for example. In addition to the building typology, other aspects such as the building's current condition and state of retrofitting play an important role within the neighbourhood, particularly in terms of reducing CO_2 emissions and energy requirements.

[6] www.bbsr.bund.de/BBSR/DE/Raumbeobachtung/Raumabgrenzungen/StadtGemeindetyp/StadtGemeindetyp_node.html

7 www.building-typology.eu/downloads/public/docs/brochure/DE_TABULA_TypologyBrochure_IWU.pdf

[8] http://webtool.building-typology.eu/#bm

Further data can also be consulted, such as the data from chimney sweeps, neighbourhood and building energy certificates, or the register of heating systems or other data on the energy supply, in order to learn more about the heating systems and types installed, for example. However, we strongly recommend verifying this data with a comprehensive site inspection or survey of the area, as the data is often imprecise.

- **Social and Economic Structure of the Neighbourhood**

With regard to the social and economic structure of the neighbourhood, above all the age distribution, income structure, level of education, property ownership, origin of inhabitants, their identification and identity that can be consulted as decisive factors. One special aspect is the duration of residence by age group, as this strongly influences residents' identification with the neighbourhood. The selection and success of the planned measures depend on these aspects, as they should be tailored as far as possible to the needs and wishes of the local residents and stakeholders. The communication strategy with affected residents should be carefully attuned to their respective capacities and intrinsic motivation.

The analysis of the neighbourhood according to social and economic factors can be supplemented with statistical data (see the practical examples under point 10).

5. CO_2 Inventory for the Neighbourhood

The aim of preparing a CO_2 inventory for neighbourhoods is to record the final energy consumption of all consumers in the neighbourhood in addition to the primary energy consumption, street and traffic lighting as well as the local infrastructure within the neighbourhood.

Once the neighbourhood's final energy consumption has been determined, the CO_2 emissions can be calculated, broken down by energy source, and the primary energy required for this included in the inventory.

In order to ensure sustainable comparability, calculation of the neighbourhood's CO_2 inventory should be based on the same principles as the BISKO[9] standardised balancing method for local municipalities. The corresponding CO_2 emission factors are also determined for calculation of the final energy consumption for heating and cooling.

[9] See here for details of the BISKO methodology and its application:
www.ifeu.de/wp-content/uploads/Bilanzierungs-Systematik_Kommunal_Kurzfassung.pdf
and
www.klimaschutz-planer.de

The primary energy factors required for the neighbourhood should moreover be acknowledged using the BISKO methodology. Climate Alliance will formulate a recommendation on the appropriate primary energy factors for this calculation.

The calculation for the CO_2 inventory is detailed below:

- Final energy consumption by energy source x CO_2 emission factors of the energy sources = CO_2 emissions of the energy source
- Final energy consumption by energy source x primary energy factor = primary energy consumption of the energy source

The neighbourhood's complete CO_2 inventory is calculated by adding together the entire energy consumption, CO_2 emissions and primary energy needs for the neighbourhood.[10] These should be presented in tables and graphs.

The inventory outcomes can be presented in a graph or map format. Alternatively, if data is available for the entire municipality, this can also contribute to definition of the neighbourhood.

Determination of the Final Energy Consumption

The final energy consumption of all energy sources available in the neighbourhood is calculated and presented for the following categories:

- Energy consumption of buildings by use
- Energy consumption of businesses: trade, retail, services, and industry
- Energy consumption of street and traffic lighting
- Energy consumption of other neighbourhood infrastructure

The generic term "building" includes apartments and houses, municipal and public buildings, as well as commercial buildings. "Street and traffic lighting" refers to the lighting in streets, avenues, parks and green spaces as well as public playgrounds and sports grounds. The "neighbourhood infrastructure" is the necessary supply and disposal infrastructure for a neighbourhood, such as drinking water, waste water, refuse, wells, canals, water pumps and waste disposal sites. The local energy suppliers can use the neighbourhood's energy consumption data for each building subject to certain data protection regulations. The KfW funding also allows the inclusion of industrial estates, thus creating synergies. Some municipalities are already pursuing this approach.

[10] All data collected should be compatible with the BISKO standard and Climate Alliance's Climate Protection Planner.

5.1. Traffic

In light of the complexity of recording and calculating the energy consumption and CO_2 emissions within a neighbourhood generated by the traffic, so far only very few neighbourhood concepts include this aspect. The lack of reliable data for recording energy consumption and CO_2 emissions from road traffic makes calculation of the CO_2 inventory for traffic extremely complicated and difficult to compare.

Given the lack of reliable figures and negligible significance of such calculations,[11] calculation of the CO_2 inventory for traffic is not recommended at the current time.[12]

Despite these difficulties, traffic should be considered because of its high importance.[13] Climate Alliance therefore does not recommend a numerical survey of traffic at this point, but rather a qualitative survey based on indicators. This should enable a preliminary comparison with other neighbourhoods and a continuous assessment of the neighbourhood's development in this field. Such indicators allow the traffic developments within the neighbourhood to be interpreted and can also form the basis for defining potential measures.

Climate Alliance proposes the following indicators:

- **Number of vehicles registered in the neighbourhood:** the number of registered vehicles provides information on the use of private cars and lorries in the neighbourhood. A decrease in the number of registered vehicles would indicate the increased use of other means of transport, such as public transport or bicycles.
- **Traffic calming measures:** e.g. number and length of 30 km/h zones, play streets and pedestrianised zones
- **Number, distribution and distance between public transport stops and frequency of use within the neighbourhood**
- **Number, distribution and length of cycle paths:** particularly along major traffic axes and their quality
- **Number of parking spaces for motorised vehicles compared to the number of bicycle storage spaces**
- **Number of charging stations for electric vehicles per inhabitant or street (public/private)**
- **Description of the cycling infrastructure**

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[11] It is possible to calculate a CO_2 inventory for public transport in the neighbourhood, however this calculation is fairly meaningless without precise figures for road traffic.

[12] New recording systems for traffic could mean that this changes in the future.

[13] Since CO_2 emissions from traffic account for at least one quarter of the neighbourhood's emissions, this field must definitely be addressed. The transport sector also has a major impact on other harmful emissions through particulate matter or NO_x.

- **Number of parking garages, multi-storey car parks, parking spaces and areas**

Many of these indicators influence and depend on one another. Recording these indicators in tables and graphs (spider diagram) can serve as the basis for planning measures and the strategic decoupling of mobility and motorised traffic. Climate Alliance recommends that these indicators be recorded per resident.

For many municipalities, recording these indicators can be arduous due to the lack of information and data. In such cases, we recommend a more general description of the traffic within the neighbourhood as the basis for an analysis.

5.2. Energy Supply Plan

The more efficient use of energy, a significant reduction in primary energy requirements and a decrease in CO_2 emissions make the preparation of a neighbourhood energy supply concept necessary. A more efficient energy supply with low primary energy consumption is only possible with energy production within the neighbourhood so that the transport of energy and associated losses can be avoided.

Important components of a neighbourhood energy supply concept are:

- Planning the use of renewable energies within the neighbourhood, such as CHP units, photovoltaics, solar thermal energy, environmental heat and other renewable energy sources, where available.
- Planning of a decentralised energy generation concept on the neighbourhood level should at the same time be linked to building retrofitting measures. The renovation and retrofitting of buildings should go hand in hand with the planning and use of renewable energies in buildings, according to the motto of “No renovation without energy production”. This is the only way to really reduce the primary energy consumption.

Other aspects of energy supply concepts include:

- Planning of heating and cooling networks[14]
- Planning of heat storage tanks as buffer tanks
- Use of industrial waste heat and possible energy cascades[15] (not yet relevant for municipalities, but potentially in the future)

[14] Despite the fact that the KfW offers funding for the planning and implementation of cooling networks, hardly any cooling networks exist in Germany to date.

Cooling networks are recommended, but currently uncommon. There are hardly any examples in Germany; cooling networks are expected to play a greater role in the future however.

6. Planning Ahead to Adapt to Climate Change

The impact of climate change will lead to more frequent extreme weather events. These will have a major impact on life and energy consumption within the neighbourhood:

- Extreme cold and heatwaves lead to increased energy consumption.
- Storms damage buildings, roads, sewage systems and other infrastructure.
- Extreme weather events also cause damage and costs for the residents and affect their quality of life.

In order to guarantee an efficient energy supply, avoid extreme energy consumption peaks and implement sustainable building retrofitting measures, such weather events must be investigated and adaptation and resilience measures planned with the help of a neighbourhood concept. The planning and design of the neighbourhood's green infrastructure and land use planning according to adaptation and resilience principles should also form part of the neighbourhood concept.

The definition of measures serving both mitigation and adaptation purposes are of particular interest in the neighbourhood concept. These include the renewal of sewage channels and systems or the insulation and cooling of buildings along with straightforward adaptation measures. The neighbourhood's green infrastructure for an improved air exchange should also be defined as part of the neighbourhood concept.

In order to describe the adaptation measures, a brief analysis must first be prepared of the most important climate risks and their impacts. The adaptation methodology used for the Covenant of Mayors can be consulted for this. It is structured as follows:

Probability, intensity and frequency of:

- Extreme heat

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[15] The use of energy cascades and waste heat at the required temperature level is highly efficient and conserves resources. An adaptation of the energy supply according to energy quality criteria based on the actual demand enables large primary energy and CO_2 savings: www.bmu.de/fileadmin/Daten_BMU/Pools/Forschungsdatenbank/fkz_3710_16_124_nutzung_exergiestroeme_bf.pdf

- Extreme cold
- Extreme precipitation
- Floods and sea level rises
- Landslides
- Droughts
- Storms
- Bioclimatic impact of the above

With integrated climate protection concepts, it is important to consider protection from atmospheric radiation and the preservation of human health.

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7. Consistency with Other Plans

The neighbourhood plan should be consistent with other relevant city and urban land-use plans as well as plans relating to energy and climate, nature and environment, emissions, waste, and traffic. Only in this way can meaningful action be planned.

8. Definition of Measures in Neighbourhood Concepts

The main aim of the measures is to reduce the neighbourhood's final and primary energy consumption and thus to decrease CO_2 emissions. Long-term sustainable development within the neighbourhood that will help to improve residents' quality of life is also striven for.

To achieve these aims, action should be planned in the following areas:

- Increased **energy efficiency** in buildings, street and traffic lighting, and municipal infrastructure
- Improved **energy supply** with renewable energies
- Planning and development of **heating and cooling networks**
- **Improvement** or redesign of **neighbourhood infrastructures**
- Design of low CO_2 **or low-pollutant and sustainable mobility**
- **Adaptation and resilience measures**
- **Monitoring of measures**

The measures are divided into four categories:

1) Specific measures: relating to a specific property in the neighbourhood (building, energy system, etc.)
2) Linear measures: relating to a section of or entire road
3) General measures: relating to the whole neighbourhood
4) Building block measures

Realistic and practicable monitoring of the measures as a tool for successful implementation should also form part of the neighbourhood concept. The EU General Data Protection Regulation makes it increasingly difficult to implement this however.

9. Participation of Citizens and Stakeholders

Widespread acceptance of the neighbourhood concept is crucial and necessary to ensure the success of the measures to be implemented. We therefore highly recommend a citizen and stakeholder participation process. Numerous examples and models have been developed in recent years that provide orientation for joint neighbourhood planning in cooperation with residents and other local stakeholders.

Due to the diversity of participation processes, cooperation with the city planning offices and coordination of such processes by the municipal authorities are preferable. The diversity of the neighbourhood concepts and the stakeholders involved is great, hence the conditions may sometimes vary.

10. Practical Examples

These recommendations will be complemented with practical information in a supplementary document containing references and information on the following topics:

- Recommendations for collecting data on energy consumption, especially non-grid-bound energy sources
- Information on data protection
- Useful data sources
- References to municipal examples of the state of retrofitting or neighbourhood retrofitting registers
- Use of energy/exergy cascades on the municipal level
  www.bundesbaublatt.de/artikel/bbb_Kaskadenloesung_spart_Energie_3064617.html

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CONTACT

Miguel Morcillo
Climate Alliance
+49 69 7171 39 -17 | **m.morcillo@climatealliance.org**

Cassandra Silk
Climate Alliance
+49 69 7171 39 -38 | **c.silk@climatealliance.org**

ABOUT CLIMATE ALLIANCE

For more than 25 years, Climate Alliance member municipalities have been acting in partnership with indigenous rainforest peoples for the benefit of the global climate. With 1,700 members spread across 26 European countries, Climate Alliance is the largest city network dedicated to climate action and the only one to set tangible targets: each member city, town and neighbourhood has committed to reducing greenhouse gas emissions by ten percent every five years. Since our lifestyle has a direct impact on the world's most vulnerable peoples and places, Climate Alliance pairs local action with global responsibility. **climatealliance.org**