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Urban pop-up housing environments and their potential as local innovation systems

Description of three elements

Deliverable D1

April 2019

(slightly adapted in October 2021)

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PREFACE

As part of the interdisciplinary research project "Urban pop-up housing environments and their potential as local innovation systems", six deliverables (D1 – D6) were generated in accordance with the project proposal, which reflect in detail the working process and outputs of the diverse tasks in the working packages. An overview of all deliverables and their key messages is provided in the Executive Summary (Deliverable D0). The individual deliverables were developed chronologically according to the project schedule and progress, and thus, completed at different time points in the project, reflecting the state of knowledge at the respective project status at that time.

Different SCI publications were also generated within the work-packages and based on the deliverables, whereby some contents were deepened and further developed. In some cases, terms and terminology have also been adapted. The contents of the deliverables therefore partly represent “work in progress” at the respective times of completion of the working packages and writing of the deliverables. The contents of the published SCI-papers and the key statements in the executive summary (D0) are to be understood as the most recent and solid outcomes and conclusions.

In the present Deliverable D1, which was already finished as outcome of working package WP1 in April 2019, this concerns, for example, the classification table of the temporary housing types, that was further developed and adapted in a corresponding SCI-paper published in 2020.

CONTENT

1 AIM OF WORKING PACKAGE 1

This project aims to address the subject of urban temporary housing in an inter- and transdisciplinary way. Urban temporary accommodation can be looked at from the point of view of various disciplines but as the project's goal is to propose solutions that are socially and ecologically sustainable, single-disciplinary approaches are not sufficient. "Interdisciplinary study is the integration of insights from two or more disciplines for a broader understanding of a complex problem than can be attained by a single discipline" (Arvidson 2014, 171). To be able to exchange ideas and knowledge in between disciplines, a common ground among them is needed: "Interdisciplinary integration is the cognitive process of critically evaluating disciplinary insights and creating common ground among them to construct a more comprehensive understanding" (Repko 2012 in Arvidson 2014, 190). Gestalt theory is an appropriate approach to address this process as it says that the whole is something different than the sum of its parts. (cf. Kriz 2008, 40)

Gurwitsch relates the Gestaltist with the phenomenological approach. According to him the entire Field of Consciousness is composed of theme (focus), thematic field (context), and margin. Whereas in a single-discipline approach the focus and the thematic fields are varied in each discipline, in interdisciplinary research in one thematic field (=common ground) can be various themes among which can be switched. This context is new and different from the discipline specific one and not available within one discipline. (cf. Arvidson 2014, 187)

2 SCREENING AND DESCRIPTION OF TEMPORARY HOUSING ENVIRONMENTS

In order to address Task 1.1 “Screening and description of temporary housing environments (international case studies, necessity, requirements, dimension)” and build an empirical basis for the project, it was decided during the official kick-off meeting on April 26th and 27th, 2018, that the junior team would design “factsheets” for the collection of relevant data on temporary housing cases. These cases could range from conceptual works to prototypes and examples with real-life implementation. The aim was to achieve a high diversity of different temporary housing solutions, with emphasis being placed on not excluding any cases during this phase but representing a broad spectrum. The only exclusion factor determined at this stage of the process was the lack of any kind of visualization of the case example, seeing as photos or sketches were deemed essential to gaining sufficient understanding of the housing concept.

2.1 INFORMATION SHEETS AND CASE DOCUMENTATION

During the kick-off meeting a short list was developed with characteristics which should be collected of each case. During the junior meetings this list was expanded, resulting in an structured ducumentation sheet covering the following information:

- **basic information** such as the particularities of the case or status of implementation
- **user information** such as social mix and social cohesion or gender-sensitive aspects
- **location and unit features**, such as coordinates, sea level, construction, and foundation type, used materials, number of storeys, building type, connection to neighbouring buildings or houses, number of residential units, number of persons per unit, area of plot, square meters per person, equipment and facilities and the integration of recreational or productive opportunities in design
- **information on water, sanitation and energy and solid waste management**
- **information on the implementation and life cycle** of the case, including information on the funding structures, the contracting authorities, cost of construction, related patents, the use of recycled materials in construction, the reversibility, the expected total lifetime, and adaptability

Pictures had to be provided for every example, and an ID-number was assigned to every case.

The list of characteristics was determined during the first week of May 2018. All junior scientists were invited to make suggestions for characteristics relevant to their respective disciplinary background. After this consultation phase, the list of characteristics was implemented in the data pool in BOKUlearn (Academic Moodle Cooperation, database tool). Although this initial list was quite comprehensive, during the collection phase of the cases, at times additional criteria were added gradually to the factsheets when deemed appropriate for our research questions or transparency / traceability (examples: “How did you initially find out about the example”, “Is the PUE mainly embedded in a formal or informal setting?”, “Implementation of innovation”, “Social mix and cohesion”, “gender-sensitive aspects”, “number of storeys (floors

in a building)", "user experience", "weather resistance of PUE", "site type", "repurpose, reuse, new development of site / building").

In mid-July 2018, there was an additional, very simplified database on temporary housing environments created on BOKUlearn, covering only basic information on user groups, (social) innovation, location and unit features, water, sanitation, energy, solid waste management and implementation and life cycle. During the initial collection phase of pop-up housing examples, it became evident, that certain types of examples were easier to find and better documented than others (especially those originating from tiny house movement, or to some extent originating from refugee accommodation). As the process of investigating and thoroughly adding new pop-up housing examples into the database turned out to be quite time-consuming, it was decided that there was not much value added, if the database would be filled up with very similar examples (e.g., various container homes used for refugee accommodation or container tiny homes). To not lose those additional examples, that were detected after a very similar example had been added to the main database, the additional database was created. Another reason why examples would only be added to the add-on database was limited data quality. Some examples that were brought up during research were considered highly interesting, however, reliable information was not available in all relevant categories for the main database. (e.g., example of temporary Olympic village in Lillehammer 1994 – where not much information on the details was found online).

2.1.1 Collecting the case studies

Five members of the junior team conducted desktop research independently, in order to collect a large number of case examples of temporary housing. The main collection phase spanned from the beginning of May to the beginning of July 2018, with 53 different international cases having been documented as of 06.07.2018.

The following sources were used during the collection process:

- peer-reviewed literature
- grey literature
- websites dedicated to the case (architects, NGOs, companies…)
- articles on webpages dedicated to fields such as architecture or sustainability research
- -personal recollection
- newsletter articles or TV reports
- on-site visits

Peer-reviewed literature ended up only representing a very marginal source for the collection of our case studies, having proved very difficult for achieving the level of detail we required for our factsheet, especially concerning all the different aspects of the housing project. This is since most papers will focus on one aspect of the case study, and not provide any information on the other dimensions. The most reliable sources for complete and comprehensive information could be found on websites dedicated to specific housing projects, most often presented by their architects, or in the case of broad implementation and funding campaigns,

by NGOs. Typically, more sources were required for each case in order to collect sufficient data.

If necessary, GoogleEarth, Open Street Map and other applications were used to retrieve location specific information (e.g., about the surroundings, orientation), and at times to manually count the individual units on a PUE. The GoogleEarth feature “Historical satellite Imagery” was sometimes useful to retrace beginning and end points of PUEs as well as changes and adaptions during their lifespans. YouTube videos and Facebook profiles/groups provided additional insight that was not available on formal websites (e.g., a video of the constructing process gives information on the foundation and a Facebook group of the residents gives insights on their everyday life).

As mentioned above, the idea was to keep the search as broad as possible during this stage, and not exclude any examples, except for cases not providing visual depictions. On the 24.05.2018 the junior team conducted a project meeting with Gerda Schneider to discuss our next steps going forward and the details of the method behind creating classification tables. During these meetings the cases we had collected up to this point were arranged according to similarities and differences and were labelled according to the phenological method. At this point we reflected on the variety represented by our cases, observing that while we had a lot of entries in “free standing individual unit houses” (see Figure 1), other options, such as for instance housing located on water, was represented only once. Our search became more targeted from this point forward, with a stronger focus being placed on finding underrepresented examples in the interest of achieving high variety of solutions.

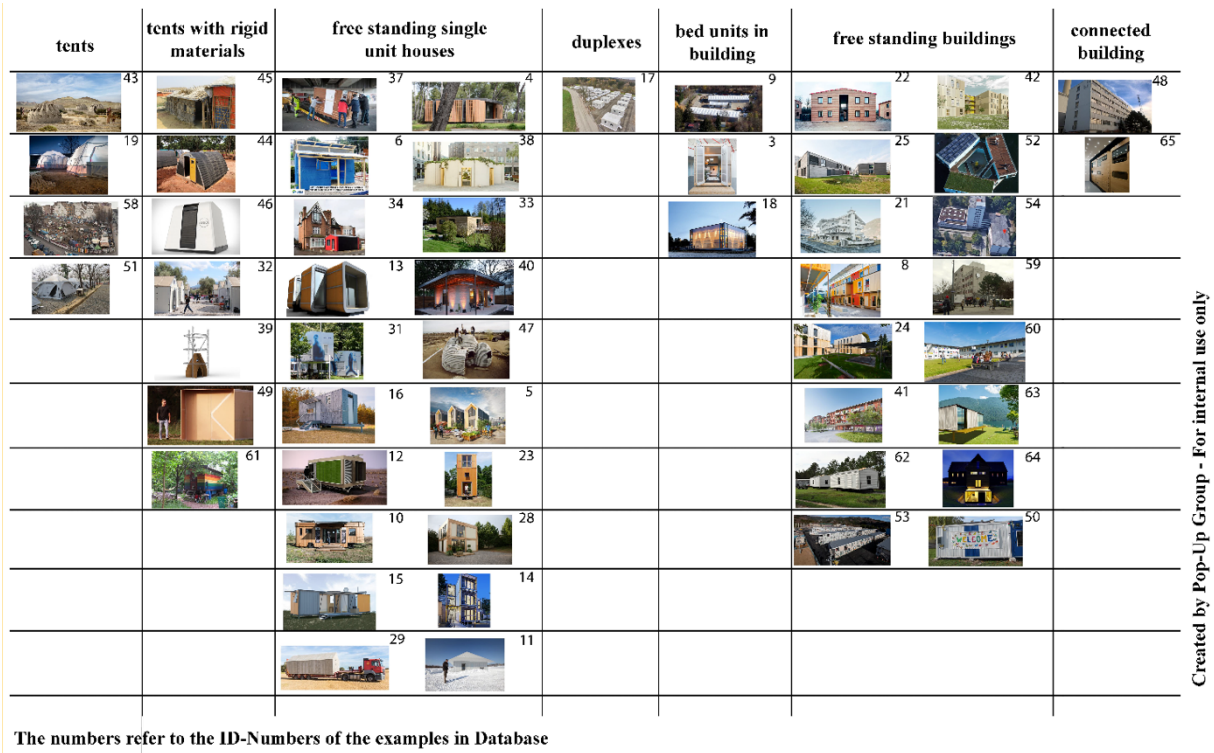


Figure 1: Table of Temporary Housing Examples according to Phenological Method (Source: Database; Status Quo September 2018)

2.2 ORGANIZED COMPARISON

Hypothesis: Temporary living spaces can provide one potential solution to rapidly increasing urban population by adapting unused urban land.

Much time was invested for the junior researchers to develop a mutual understanding of the criteria and terms to ensure that the entered data in the factsheets is comparable. The group meetings were used to systematically go through the factsheets and discuss the existing associations of the terms used. In addition, as a measure of quality control, the two project members who were responsible for the data input of most of the cases took the time to examine the cases contributed by the other team-members to ensure uniformity. The team members were in close and frequent contact during this phase in an iterative process of sense-making.

With the help of the screening and description of the case examples and the following classification, the following questions that should be answered:

- What forms of temporary housing environments are there?
- Which features do they have?
- How can the examples be structured in a reasonable way?
- Which similarities and differences are there?

2.2.1 Theory and method of tabulation

The applied table method derives from a method of phytosociology that has been (co-)developed by Josias Braun-Blanquet (1884-1980) (cf. Haber 1981, 3). The table is a descriptive, comparative and synthetic method to compare vegetation in order to demonstrate plant communities. (cf. Willig; cf. Tüxen 1970, 141) Braun-Blanquet's method requires the creation of inventories of the flora (Vegetationsaufnahme) at a specific area. The inventories contain the number of individuals and their habitus of the species as well as (at the table head) the environmental conditions of the area (date and place of inventory; soil, slope, usage, dimensions of the assessed area; vegetation cover, etc.) (Gehlken 2008, 32f). The method of phytosociology tables acc. Braun-Blanquet and Tüxen was first used in landscape planning by Renee Claisses and Jean-Marie Gehu to analyze and compare urban and rural spaces in France (1978). (Harenburg und Wannags 1991, 17) To make a useful comparison with the help of a table, Reinhold Tüxen points out that the samplings must be sufficient in number (amount) and equal in quality. (cf. Tüxen 1970, 145) He emphasizes the importance of high-quality data, cautioning that it is risky to use data that has not been surveyed by the scientist himself/herself on site. (Tüxen 1972; Tüxen und International Association for Vegetation Science 1972, 172) In our work the inventories equal the precise and holistic description of pop-up examples.

2.2.2 Creation of table

The case examples described in the database get arranged in the table. The table contains a header including the name and ID number of the example. Columns contain examples and rows contain criteria. The characteristics described in the profiles lead to criteria. Table creating begins by describing a case example by including all the characteristics it shows.

When the second example is entered (and whenever a new example enters the table), all existing criteria have to be assessed and marked as requested. The first order of the examples is given by the hypothesis of the phenological method but can/will change within the process. This table is referred to as a raw table (Rohtabelle).

The criteria then get sorted by the number of fulfilled boxes they evince in the upper part the criteria that occur most frequently are placed, sorted in a descending order. This table is called constancy table (Stetigkeitstabelle). Then the columns and rows are compared with each other and sorted according to their similarities and differences.

The table can be compared with other research outcomes of published work to check if criteria has been forgotten. This work, including the referencing with other tables, forms part of a process of hermeneutic thinking.

2.2.3 Towards a classification

Once an order has been established, the appearing structures get detected and designated. The designated structures can be brought in a systematic overview that is aligned with the systematic of phytosociology. The basic unit is the type (association, Typ). A type is represented by one or various case examples in the table that have many similarities within each other and differ from other types by means of presence or absence of criteria. An alliance (Verband) is made up of one or more types. An order is made up of one or more alliances, orders form classes. Literature can be consulted to help determine which criteria define the levels within the systematic overview.

The method of creating a table is never the goal but the basis to work on given research questions. (cf. Tüxen 1970, 149) Once the table and the overview are established, the content can be interpreted and put into context: Interpretations are led by the appearance/absence and the co-occurrence of various criteria. The results are to put in context with related topics: sustainability, urban environment, resident's quality of life, energy consumption, waste management, conservation of resources among others.

The here mentioned process is also discussed in the article of Stocker et al. (2020) in the Journal of Housing and the Built Environment that is currently in press.

2.2.4 Systematic overview

Essentially the assessed case examples of temporary housing environments can be divided in three classes: Housing environments of planned temporary presence, housing environments in permanent residential buildings and housing environments in permanent non-residential repurposed buildings.

Housing environments of planned temporary presence embrace accommodations that are built for the purpose of a temporary presence on a particular site. The actual time remaining at a specific area and the total life span of this class is variable, but the planned duration of presence is always temporary. This means that infrastructure that is not supplied by the housing environment has to be offered by the surrounding area. The examples are generally

newly built and made from lightweight prefabricated elements or modules. The accommodations can be transported as a whole or in modules/elements.

In Table 1 it is evident that two orders are distinguished: accommodations without foundation and residential buildings with reversible foundation. The first order concerns accommodations that are erected without a stable foundation that connects the accommodation with the ground and conducts weight towards the earth. They are quickly assembled, or the entire unit put into place. Having that in common there is broad variety of alliances in this order as described below.

The second order residential buildings with reversible foundation are accommodations out of lightweight rigid material including load bearing walls and roof that are (newly) built with the purpose of residential use for a limited time. The buildings have a foundation that is reversible. Bathroom and kitchen are mostly included in the building that means that all living functions are in one building (or even unit). The units are lockable and usually connected to the power grid as well as to a centralized water supply and the sewage system. Thermal insulation and heating is common.

Housing environments in permanent residential buildings refer to permanent multi-storey residential buildings that are (constructed and) used for temporary accommodation. The buildings have an irreversible foundation and are built out of heavy weight material, mostly constructed on-site and therefore not transportable. The material and construction make them weather resistant. Room distribution and amenities are suitable for living.

Housing environments in permanent non-residential repurposed buildings refer to permanent buildings that are used for the purpose of temporary housing but were constructed for a use other than residential beforehand. Just as the previous class the buildings have irreversible foundations and are constructed on site out of heavyweight material. Given that they were not built for residential use, they may have room distributions and amenities (sanitation, cooking facility, etc.) that are inappropriate or insufficient and may need adaption. This class is divided into two orders: commercial buildings and educational institutions. The original use of the non-residential buildings determines present room distribution and amenities as well as access, open spaces and former land use.

Table 1: Section of systematic Overview on classes and orders of temporary housing environments

Class	**housing environments of planned temporary presence**		**housing environments in permanent residential buildings**	**housing environments in permanent non-residential repurposed buildings**	
Order	accommodation without foundation	residential buildings with reversible foundation	residential buildings with irreversible foundations	commercial (industrial) buildings	educational institutions

Figure 2 shows the complete systematic overview on temporary housing environments that resulted from the comparison of over 60 case examples. Below the characteristics of the alliances and types are described.

Comment: Considering the richness of different solutions for temporary accommodation it was a challenge to find the right terms for the built structures. Scientific literature (Johnson 2007; Félix et al. 2015; Quarantelli 1995) offers a variety of terms that is not defined homogeneous. Since strict definitions may have a limiting impact on the topic, it was tried to describe the existing structures as precise as possible. The term 'environments' is used to emphasise that the entirety of temporary housing consisting of sheltering structure, open spaces, users, infrastructure, organizational matters, neighbourhood, surroundings, etc. is addressed. It should be noted that the term "building" is used for structures that have foundations underlining the difference to those who don't. "Accommodations" refer to all structures that shelter people for residential purposes.

Class *(Klasse)*	housing environments of planned temporary presence									
Order *(Ordnung)*	accommodations without foundation						residential buildings with reversible foundation			
Alliance *(Verband)*	tents (A)		hard shell accommodations (B)		mobile accommodations (C)		individual unit buidlings (D)			multi-unit buildings (E)
Type *(Typ)*	individual unit tents (A1)	multi units tent (A2)*	rigid individual units without foundation (B1)*	mass shelter in lightweight halls (B2)*	individual unit on wheels (C1)*	floating multi-unit buildings (C2)*	free standing individual unit buildings (D1)	individual unit buildings sharing one wall (D2)*	individual unit buildings sharing side walls (D3)	reversible multi-unit buildings (freestanding) (E1)
Example	Consec № 1-4	Consec № 5	Consec № 6-9	Consec № 10-11	Consec № 12-16	Consec № 17-18	Consec № 19-39	Consec № 40	Consec № 41	Consec № 42-52

Class *(Klasse)*	housing environments in permanent residential buildings				housing environments in permanent non-residential repurposed buildings			
Order *(Ordnung)*	residential buildings with irreversible foundations				commercial (industrial) buildings			educational institutions
Alliance *(Verband)*	irreversible residential multi-unit buildings (F)		reused social facility buildings (G)	reused hotels (H)	repurposed commercial buildings (I)		repurposed industrial buildings (J)	repurposed educational institutions (K)
Type *(Typ)*	irreversible residential multi-unit buildings (freestanding) (F1)	irreversible residential multi-unit buildings (sharing side walls) (F2)	reused social facility building (G1)*	reused hotels (H1)*	repurposed office buildings (I1)*	repurposed shops (I2)*	repurposed halls (J1)*	repurposed school gyms (K1)*
Example	Consec № 53-54	Consec № 55-56	Consec № 57-60	Consec № 61-62	Consec № 63-64	Consec № 65-66	Consec № 67	Consec № 68-69

* These associations are formulated as hypotheses as there are not yet enough examples.

Figure 2: Systematic overview on temporary housing (working daft of classification table)

The here shown systematic overview is the preliminary result of our work in April 2019. The typology has further processed and is published is Stocker et al. (2020) in the Journal of Housing and the Built Environment.

Class 1: Housing environments of planned temporary presence

Order: Accommodation without foundation

The above-described order consists of the alliances tents, hard shell accommodations and mobile accommodations.

Alliance: Tents (A)

Tents are accommodations of one single storey made out of a frame construction (poles) with not load-bearing walls and doors made out of lightweight textile materials. Tents do not have heat insulation. They have a limited weather resistance (due to structure and material) but are nevertheless inhabited year-round. The units are not connected to a water supply system but can be supplied with energy (either connected to power grid or via individual solutions). Water is carried by jerry cans to the tents. The residents rely on external sanitation facilities to cover their needs. These facilities have on-site sanitation (no sewage system). Residents usually do not own the tents (nor the land). On a land there are usually more than one tent (camp). Units are mostly situated on not parcelled ground and accessed by footpaths. Former land use of the area is green land. The tents get transported folded up and are fast and easy to assemble. The user groups can be various but are homogeneous within one camp. The units are not lockable. Through the direct entrance the residents dispose of a connection to open space that sometimes get appropriated for private use.

Type: Individual unit tents (A1)

These tents are free standing accommodations that consist of one room only. One unit is occupied by one family. The tents are designed for reuse. Besides relying on external sanitary facilities, the residents also rely on a cooking facility for preparations of meals or on external supply. Waste disposal relies on municipal waste collection.

Type: Multi-unit tents (A2)

These tents include more than one unit per accommodation. The units are attached to each other and share walls and roof. One family resides in one room that also works as kitchen (cooking on the floor). The units are accessed directly from outside, the tents are accessed by footpath or street. These tents are not planned to be recycled. It is expected that the materials will be worn down in the first life cycle. There is no appropriate waste disposal solution. The direct access to open space gives residents the possibility to appropriate the immediate surroundings.

Alliance: Hard shell accommodations (B)

Hard shell accommodations are single storey, freestanding and are made out of lightweight, rigid prefabricated elements that are transported in a flat pack and are fast assembled. Sanitary facilities are mostly not included in the accommodation but in another dwelling and collectively used with residents of other units. The cooking/dining facility is mostly hosted in another dwelling as well. The residents are not owners of the accommodation or land but have other tenure agreements. The accommodations are reached via a footpath (not directly from the street). Former land use of the areas is green land. The accommodations are put in form of a

formal setting. The direct access to open space gives residents the possibility to appropriate the immediate surroundings.

Type: Rigid individual units without foundation (B1)

This type includes accommodations without foundations that host one unit per accommodation. One person or family lives in one unit. The units itself are not connected to water and sewage system and have no heating. The designs of this type are very variable. Some have power supply. The lack of cooking and sanitary facilities may reduce the residents' freedom of action.

Type: Mass shelter in lightweight halls (B2)

This type refers to accommodations in a lightweight hall where many bed units are in one big hall and can therefore be called 'mass shelter'. The accommodation is not heat insulated and heating is provided by a mobile heater. The accommodation is connected to the power grid. There are (paved) open spaces surrounding the buildings are collectively used. Former land use of this area green land. The residents are forced to stay by external factors. The maximum on-site duration of the accommodation is five years.

Since the bed bunks and organisation of housing are given (and can't be adapted) John F. C. Turner's principles of self-government, the appropriate technologies the principle of planning for housing through limits are not fulfilled.

Alliance: Mobile accommodations (C)

This alliance includes accommodations that are moveable without lifting on a truck or other vehicle; but generally, a towing vehicle or tug boat is needed. They consist out of entire modules. The units of this alliance are one bed units and lockable. They often include to a private toilet/bathroom and kitchen and have a heating system. The water and sanitary system vary (individual solutions or connection to municipal system); as well as the power supply. Former land use of the areas is green land or other not constructed area.

Type: Individual unit on wheels (C1)

These accommodations are free standing individual units out of rigid material. They have wheels and can be moved on its own, with the help of a towing vehicle or peoplepower. The accommodations are mostly owned by the residents. This type appears in formal and informal settings and is not always served by municipal waste collection. The possibly given private cooking and sanitation facilities and the possibility of moving the accommodation to another place can enhance the residents' freedom of action.

Type: Floating multi-unit buildings (C2)

This type is a freestanding multi-storey building with individual units that floats on water nearby the waterfront. It is connected to the land via a bridge. The units include a private bathroom and sometimes kitchen facilities, if not residents rely on a centralized dining facility. Water and energy related infrastructure may include innovative resource-friendly solutions. The residents are renters or have other tenure agreements. The accommodation can include collectively used open spaces.

Alliance: Individual unit buildings (D)

This alliance includes individual units that are mostly of one floor and individually accessed from a footpath on the plot. The units are mostly transported on-site in one piece or in modules. Usually the unit is located on a private plot and includes private open space; if not the residents appropriate the collectively used open space around the unit. The units are situated in residential area on former vacant building land. The planned duration on-site is often less than one year. The case examples of this alliance have also direct access to open space on the ground level which eases the appropriation of the surrounding space or corresponding plot.

Type: Freestanding individual unit buildings (D1)

This type corresponds the accompanying alliance with the particularity of being a free-standing building.

Type: Individual unit buildings sharing one wall (D2)

This type corresponds the accompanying alliance with the particularity of being a semi-detached building sharing one wall with the neighbour house. This type is formulated as hypotheses as there are not yet enough examples. It is expected to find also examples that contain sanitary and cooking facilities in the same building.

Type: Individual unit buildings sharing side walls (D3)

The particularity of this individual unit building is that they adjoin on at least two sides with neighbouring buildings. The assessed example contains cooking and sanitary facilities in the unit.

Alliance: Multi unit-buildings (E)

Multi-unit buildings are newly built buildings that include more than 2 units per floor. The building commonly is accessed by a footpath and not directly by the street. The access to the units is organised by a central building entrance and corridors or outdoor aisles and staircases.

Type: Free standing multi-unit buildings (freestanding) (E1)

The buildings are free standing and mostly have more than one storey. The buildings are made from prefabricated elements or modules (mostly containers) that are most commonly transportable as entire unit. The foundation of the building is in general reversible. The units are often designed to be reused. The setting in which the accommodation is set is always formal; the buildings dispose of energy supply, either via connection to power grid or an independent system, water, sewage connection and waste collection. The plots are in residential areas or areas with no residential purpose but special (temporary) building permits. Some accommodations can host more than 100 units; it occurs that the units are organized in flat-sharing communities sharing cooking and sanitary facilities and sometimes further spaces like recreational facilities. Some accommodations include private balconies to the units. Collectively used open space is mostly included and outdoor recreational facilities occur. Residents never own but rent or have other resident agreements. Within examples of this type social mix occurs; often students and migrants are included. Since the open space must be

shared, no private appropriation takes place. The immediate space outside of the unit door may be privately appropriated, used as extension of the inner rooms.

Class: Housing environments in permanent residential buildings

Order: Residential buildings with irreversible foundations

As described above, the examples of this order have an irreversible foundation and are planned to stay longer than ten years on site but the residents use the building for shorter periods: from some days up to several months or years.

Alliance: Irreversible residential multi-unit buildings (F)

These buildings mostly contain small complete apartments or are organized that some rooms share cooking facilities, sanitary facilities are mostly private. The users are mostly individual persons.

Type: Irreversible residential multi-unit buildings (freestanding) (F1)

The buildings of this type are detached buildings. The building type (open design) can affect the quality and distribution of entrances and open spaces.

Type: Irreversible residential multi-unit buildings (sharing side walls) (F2)

The examples of this type are sharing side walls with the neighbouring buildings. The examples of this type are generally accessed directly from the street.

Alliance: Reused social facility buildings (G)

This alliance refers to pre-existing buildings that were built with the purpose of hosting a social facility. The buildings have various storeys and are connected to the centralized power grid, water, sewage and waste collection system; with heating they are year-around habitable.

Type: Reused social facility buildings (G1)

Repurposed retirement homes are multi-storey buildings that can be freestanding or attached to other buildings. They contain units that are connected to centralized water supply and therefore have a private bathroom; the upper units can have balconies. Generally, there is only one major kitchen for the whole building. On the ground level there is a planned open space for all residents with equipment and seating. Appropriation of this open space is very low.

Alliance: Reused hotels (H)

Case examples of this alliance include buildings that were built for commercial accommodation (hotel) and get used for a temporary period of time in a specific manor that differs from ordinary hotels.

Type: Reused hotels (H1)

The building is a multi-storey building that is freestanding or in a closed coverage type and accessed directly from the street or via some steps. The units are the former hotel rooms or are independent modules that are set in large rooms and lockable. The latter are not connected to the water system, but the residents have access to shared sanitary facilities. If the units are the former hotel rooms, they have a private bathroom. There may be collectively used open

space on the ground floor but due to the short stay, the amount of residents and the distance to the open space, private appropriation is generally very low.

Class: Housing environments in permanent non-residential repurposed buildings

Order: Commercial (industrial) buildings

Alliance: Repurposed commercial buildings (I)

This alliance refers to buildings that have been used commercially and are used for temporary housing. The buildings are generally connected to the water, sewage and power grid. The buildings are generally freestanding and have open space around. In some cases, it can be used and appropriated by the residents.

Type: Repurposed office buildings (I1)

This type refers to office buildings that are used for temporary housing. They have various storeys and have heating and thermal insulation which makes them year-around habitable. They are equipped with basic technical infrastructure networks, water and sewage connection may not be supplied for each room/unit. The former offices are used as rooms or filled with independent modules. Facilities may be organized like flat-sharing community. Sanitary facilities are shared, kitchen sometimes too, if not the residents rely on an industrial kitchen. In- and outdoor recreational facilities may be present.

Type: Repurposed retail store (I2)

Characteristic for this type are free standing buildings that they have few storeys and consist of big and high rooms/halls where additional walls were installed in order to create separate rooms/bunks. The buildings are surrounded by and accessed via a parking area. Users generally share rooms or bunk units with a small group of others, sanitation and cooking facilities are shared with more individuals. The examples of this type are organized accommodations where employees (and volunteers) support the residents. Small clinics/health care centres can be on site. This The former land and building use is commercial/retail.

Alliance: Repurposed industrial buildings (J)

This alliance refers to repurposed industrial buildings.

Type: Repurposed halls (J1)

Halls are generally buildings of one storey that exceeds usual room heights. The largest part of the floor belongs to one large room/hall. The entrance to the building often is a hall gate or main entrance, additional entrances are possible. Thermal insulation and heating may be not available. To create rooms modular walls can be constructed or mobile modules placed in the hall. The buildings are freestanding and surrounded by open space. Appropriation of the open space has not been observed.

Order: Educational institutions

Alliance and type: Repurposed educational institutions (K)

Gyms of educational institutions are free standing or connected halls that are used to accommodate people for a short period of time (less than one year). The buildings have heating and thermal insulation if needed, are connected to the power grid provide sanitation facilities. The original land and building use is dedicated to educational facility (and its sports fields) and can persist during the period of temporary sheltering (for example shelter only during night-time).

Type: Repurposed school gyms (K1)

For the accommodation in this type cots are provided. All residents sleep in one big room; curtains or light walls may separate the sleeping areas. Existing sanitation facilities are used.

2.3 RESULTS

It can be observed that the table in which the examples of temporary housing environments are arranged according to their similarities and differences shows various gradient (trend). Extracting the principles of the examples, those characteristics can make statements on the elements of the systematic overview. Generally, it can be said that the further to the right the types are in the overview, the more durable they get: The materials range from light fabrics (tarpaulin) to light rigid material (metal, wood) to heavyweight material (concrete, bricks) from left to right. Examples of the types on the left have no foundations, the ones in the centre have reversible foundations, on the right there are irreversible foundations. That influences the reversibility of the accommodations in terms of what they leave behind when the temporary accommodation is not needed anymore: accommodations that are built for staying on site for a limited period of time can be dismantled leaving the temporary occupied area behind (on the impact on the area no conclusions are drawn due to lack of data), accommodations in reused permanent buildings can be returned to the original conditions what means: leaving the pre-existing building behind. The exceptions are buildings of the order irreversible residential multi-unit buildings: they are permanent buildings planned to shelter people for a specific period, reversibility to original conditions is not possible here.

Lockable units are very common in all mobile accommodations and buildings, tents and hard-shell accommodations often lack that feature.

The trend from single unit to multi-unit accommodation can be observed at both orders of housing environments of planned temporary presence. Individual unit buildings have mostly only one floor, multi-unit buildings tend to have various stories (except for halls). Floor Area Ratio (FAR) is generally increasing from left to right.

Private open spaces at ground level only occur at individual unit buildings, balconies occur at reversible and irreversible multi-unit residential buildings. Collectively used open space is found at almost every type but general comments on the qualities of the space can’t be made. Multi-unit buildings often include recreational outdoor facilities and sometimes garden beds for primary production.

Permanent residential buildings are often accessed directly from the street. Reversible buildings are commonly detached from the street and accessed by footpath. Most individual

units (with or without foundation) are accessed via footpath, floating multi-unit buildings via footbridge.

Green land preceded often examples of types with reversible and without foundation, sometimes also partly unbuilt/vacant building land. Residential area is a common zoning for most newly built accommodations, reused non-residential buildings often stand on industrial areas (former land use industrial land), commercial area, mixed areas, or others.

Connection to power grid appears at all types but is especially frequent at multi-unit (reversible and irreversible) and non-residential buildings. The same holds for municipal organized waste collection. Non-residential and multi-unit buildings are almost always connected to a centralized water and sewage system, some individual unit buildings and multi-unit buildings provide access even in the units.

Tents and shelters without foundation rarely have mains connections. Fuel based island solutions and on-site sanitation is found at accommodations without foundations, sustainable island solutions are found individual units on wheels, and residential buildings with reversible foundations (individual and multi-unit buildings). Energy and resource autarky in general is rare and occurs mainly at individual units (on wheels or with reversible foundation).

Provision of a kitchen mainly depend on built structure of the accommodations: tents and individual units without foundation mostly have no kitchen included users rely on kitchens that are in other accommodations/buildings. Individual units on wheels and free-standing individual unit buildings include a private kitchen as well as units in irreversible residential multi-unit buildings. Residents of reversible multi-unit buildings dispose private kitchens or share kitchens with other residents. Residential buildings with irreversible foundations include private kitchens, shared or industrial kitchens (restaurants / canteen). Housing environments in permanent non-residential repurposed buildings mostly rely on industrial kitchens.

Provision of private sanitary facilities is more common than provision of private kitchens and the distribution is similar: private and shared bathrooms occur at all alliances except tents and hard-shell accommodations: there are only shared bathrooms. Sustainable water and energy solutions (plant-based water purification, photovoltaic panels, etc.) has been observed at mobile accommodations and residential buildings with reversible foundations. On-site sanitation only happens at individual units (on all alliances) and never at buildings. Generally, it can be observed that island solutions are more common at individual units than at buildings.

Thermal insulation and different types of heating are common at mobile units and housing environments in permanent residential and non-residential buildings.

Generally, it can be observed that the more equipped the housing environment is, the longer is the planned life span.

Reuse of materials and modules occur on all alliances: many modules and elements are newly built but planned to be reusable, sometimes reused/recycled materials were used to build the accommodations.

Tents, hard shell accommodations and elements of housing environments that are hosted in permanent buildings are transported flat packed and are easy to assemble/dismantle. Mobile

units are mostly transported by itself (with the help of a towing vehicle). (Special) Trucks are needed to transport individual unit buildings and reversible multi-unit buildings, the latter are divided into modules/elements for transportation.

Regarding the funding organization of temporary housing environments, it is evident that state funded, or subsidized projects are mostly in multi-unit buildings with reversible foundations, as well as in housing environments in permanent buildings (residential and non-residential). For private company founding applies the same, additionally it could be observed also at individual unit buildings. Funding by donations and foundations could be observed at all alliances. Private acquisition is common at individual units.

Renting is most common at residential multi-unit buildings (reversible and irreversible), ownership at individual units on wheels and individual unit buildings. The most frequent tenure is a different agreement than the other two: residents are offered/assigned the accommodation for different reasons without economic reward.

Residents belonging to user group A (fled from violence and affected by disasters, see next chapter) occur at all alliances. The same holds for user group B: accommodation for homeless are organized in individual units as well as in multi-unit buildings and non-residential buildings.

User group C that includes students and young professionals among others, appear in all classes as well, more commonly in residential multi-unit buildings (reversible and irreversible) and commercial buildings.

A mix of different user groups in one accommodation is not very common but more frequently at buildings (residential and reused non-residential) and co-occurs often with students and people fled from violence/asylum seekers or at self-organized accommodations (occupied parcels hosting people that voluntarily live there as well as residents that live for economic reasons).

2.4 CONCLUSIONS

The table illustrates the material durability of the housing environments. Therefore, the weather resistance of buildings with foundations is generally higher for accommodations without foundations. The material equipment and composition and the lack/existence of foundations indicate the power and resources needed to build and dismantle the accommodations. Consequently, it is assumed that buildings with reversible foundations need more time and effort to be assembled than accommodations without foundation.

Privacy and security belong to human needs that can be addressed by housing. Therefore, the possibility of locking the unit is an important feature. As it is simple and inexpensive to provide, it is quite common at housing environments, subject to the condition that it includes doors (that does not hold for tents and bed units in mass shelters. Housing environments in mass shelters lack of rooms and doors, the enabling of privacy is thereby reduced.

Freedom of action cannot be assessed by equipment or facilities but by the possibilities to arrange and adapt everyday life according to individual needs: the missing cooking facility present a limitation regarding the residents' freedom of action. It can be assumed that the

provision of food by industrial kitchens cannot take into consideration the residents' individual need and preferences. The liberty of cooking and caring for oneself and others cannot be met. Shared kitchen may provide benefits and potential downsides at the same time: residents have to come to agreements regarding time and manner of use to avoid conflicts. Shared kitchens and other rooms, facilities and open spaces can provide occasions of interaction and integration. The same holds for units that do not include private bathrooms or rooms: everyday life gets impeded and individual ways of life are difficult to perform.

At various alliances a variety of degree of facilities that are included to the unit/accommodations can be observed: the units may include or lack private rooms, cooking and sanitary facilities, washing machine connection, entrance to the building, open space, etc., may have access to shared facilities or may lack of the mentioned features. This leads to the assumption that housing always tends toward completeness: as soon as people reside in an accommodation they have (everyday) life to accomplish. As mentioned above, the tasks of everyday life are more difficult to perform if the built-spatial structure does not enhance that. That confirms the observation that the longer the planned lifetime of the housing environments on site is, the more equipped the accommodations are.

Differences between housing environments in newly built accommodations and pre-existing permanent buildings can be observed: the latter have generally less modularity and less provision of renewable energy facilities, utilization of bio-based and innovative materials. This may be result of the intention of using the existing structure and infrastructure. Using the already existing/produced structures/elements is a resource saving solution when it comes to resource conservation.

It becomes clear that on-site sanitation only appears at individual units (accommodations without foundation an individual unit buildings) because it meets its limitations when it comes to multi-storey buildings. The table results that self-sufficient (autarkic) housing environments mostly occurs at privately owned individual unit accommodations.

Although newly built and pre-existing buildings have differences, similar accommodations share characteristics: the spatial-built environment (as well as the social organization) of halls for example is similar, independent from the foundation type.

The fact that public funded accommodations are more common at multi-unit buildings existing buildings than at individual units, may derive from the fact that state/municipalities target urban density that is achieved through multi-storey buildings. The challenge is to enhance a high quality of life with access to appropriable open space in these buildings.

It can be observed that open spaces are influenced significantly by its surrounding and associated buildings. Before accommodations arrive, potential areas are often unconstructed land (green fields, vacant building land) that functions as dysfunctional (multi-functional) open spaces of the neighbourhood and part of the city. As soon as accommodations and residents arise they change into housing/building related open spaces that may be appropriable for the residents. It has to be considered when planning temporary housing environments that this change of use entails the disappearance/arise of open spaces.

2.5 LIMITATIONS OF METHOD

Within Task 1.1 we have managed to collect extensive data on international case examples and comprehensively classified these examples to discern different types of PUEs. Our methods have provided us with solid results, despite encountering the following limitations:

The biggest limitation was that of available data. The chosen method of using a classification table required all included case studies to be recorded in their entirety concerning the chosen criteria. As the list of criteria was very extensive and covered many different areas, such as water, sanitation, energy and solid waste management or social aspects, multiple sources had to be drawn from for each case to be recorded in completion. Within this research, we had no cases of conflicting information between different sources. The method additionally only allowed for clear “yes” or “no” answers, not permitting for missing entries. While in-depth research did allow for most criteria to be determined definitively, in single cases a decision had to be made to the best of our knowledge without explicitly being stated within a source. In order to be able to differentiate between those entries made based on a direct source, and those based on our assumptions, a second set of symbols indicating “presumably yes” and “presumably no” were introduced. This additional information, while lost within the resulting automated classification table itself, which permits only binary inputs, was preserved in the manually created classification table and serves the goal of transparency, as we were well-aware of this missing data being a critical limitation and potential vulnerability.

The amount of case studies recorded, and the limited timeframe dedicated to WP1 meant that the entire team had to contribute to the documentation process. We were sensitive to the fact that different people being involved in filling out the table automatically meant that this process was not conducted in an entirely uniform manner between the cases. This problem is further aggravated by the fact, that the disciplinary backgrounds of the team members are fundamentally different, which can greatly affect the interpretation of criteria descriptions. While many benefits were found in this procedure (missing criteria could be identified and added from the viewpoint of different disciplines), this did lead to additional time-consuming efforts to ensure quality control and to maximize uniformity. Group meetings were held for the definition of criteria and exchange on how each criterion is characterized. Two of our team members were designated as having the primary responsibility for the table, working closely together to fill out the bulk of the entries, with the other members being responsible for a handful of cases. The two members most familiar with the table then went through the entries of each case with the respective team member having made the entries, to double-check that the criteria were understood in the same way.

2.6 AUTOMATIZATION OF THE SYSTEMATIZATION

The question was to what extent this classification could be supported by computerized technologies. A method of this kind was developed based on basic techniques for machine learning. One of the challenges was not only to assess data, in the following referred to as properties, of a certain discipline, e.g., architecture, building services, forms of use or social aspects, but to evaluate all aspects equally. Likewise, there is no knowledge of the depth of

the structure contained; in other words, how many subclasses exist. Furthermore, a measure was needed for the later assignment of other Temporary Housing Environments (THE) into one of the found classes or groups. In order to answer the problems described above, a Hierarchic Cluster Deep Search was developed. On the one hand, the number of groups in a class including the membership of the THEs is determined based on the properties. On the other hand, subclasses in the respective groups are also searched for. To describe the respective classes, two measures were developed with regard to the considered properties. The combination of these two measures results in a representative description of the peculiarities of each class. The first measure is an evaluation of how representative a property is in a class. The second measure is an evaluation of how characterizing a property is for a group. The classification and characterization were written in MATLAB code and the implementation was also tested. A more detailed description of the method and the results are currently being summarized and will be published in a paper.

3 IDENTIFICATION AND DEFINITION OF "NEEDS" OF THE PEOPLE, HOUSING AND AREA

3.1 HUMAN NEEDS

To grasp what requirements areas and housing need to fulfil to qualify as providing an adequate and acceptable standard of living, we must first understand what constitutes as a human need. The definition and systematization of human needs has been an endeavour with a history spanning over multiple decades. For our project, which places a focus on temporary housing, the discussions taking place within the field of development policy and practice and social services are of particular interest.

In context of emergency shelters the notion of distinguishing between "fundamental" or "basic" human needs, tied directly to functions required for survival, and what can perhaps be deemed as "higher" needs (addressing dimensions such as self-fulfilment) may initially feel intuitive and apparent too many. Upon closer reflexion, however, human needs quickly prove to be much more multi-facetted and complex, showing many interrelations. Current research challenges the hierarchical division of needs, such as proposed by Maslow in the 1940s, to varying degrees. During this chapter brief insight is provided into core literature on attempts to systemize human needs throughout the years, so we may develop an understanding of what temporary housing solutions must provide and what standards to set within the project.

As already addressed, Maslow (1943) defined a hierarchy-based theory in psychology concerning human needs (see Figure 3). Within this hierarchical structure, Basic needs are found at the bottom of the pyramid, consisting of two layers. The first layer is made up of physiological needs for food, water, warmth, and rest, the second layer of safety needs consisting of security and safety. The fundamental idea behind this hierarchy of needs was that "higher" needs can only be fulfilled once the lower needs have been met. By this logic, the psychological needs, defined by Maslow as consisting of belongingness and love needs on one layer, and esteem needs on the next, can only be met once the basic needs have been addressed. Consequently, self-fulfilment needs consisting of self-actualization can only unfold once basic needs and psychological needs are sufficiently met.

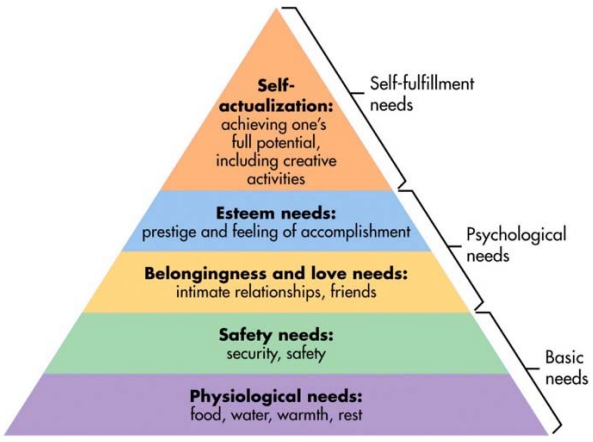


Figure 3: Maslow's Hierarchy of needs (1943) as depicted on https://www.simplypsychology.org/maslow.html

In examining subjective wellbeing (SWB) in the slums of Calcutta, India, Biswas-Diener and Diener (2001) have been able to show that even when basic needs are not met to a satisfactory degree, subjective well-being can be increased by successfully meeting other needs. There can therefore be an effect of compensation:

> *"Together, the multiple measures approach to SWB research produced a picture of Calcutta's poor as a group that, while living in sub-standard conditions, are satisfied with many areas of their lives. Social relationships, in particular, appear to be important in understanding our respondents' well-being. […] to the extent the poor can utilize their strong social relationships, the negative effects of poverty are counterbalanced."* (Biswas-Diener and Diener 2001, 347).

A later study from Biswas-Diener and Diener in 2006 examined the subjective well-being of the homeless in the USA, making an interesting observation with direct relevance to housing:

> *"A study of homeless people who later found housing showed that improved quality of life depended on "what kind of housing was obtained," with people transitioning to independent living situation making much larger gains in satisfaction that those transitioning to dependent living situations (Wolf et al. 2001). To the extent that social and self-actualization needs are fundamentally important to subjective well-being, an examination of specific life domains might help shed light on which aspects of the homeless experience are most beneficial, and which are most detrimental, to the emotional quality of life of people on the streets."* (Biswas-Diener and Diener 2006, 188).

Another interesting quote reads (bold marking added by authors):

> *"Across the three groups the respondents' reported low levels of satisfaction with material resources such as income and housing, where housing referred to sleeping accommodations ranging from tents to makeshift shelters to community shelters.* ***We also found strong correlations between housing satisfaction and general life satisfaction.*** *It is interesting that the three samples in the current study, chosen for their differences, reported similar trends in material satisfaction. This suggests that there are certain experiences common to extreme poverty – such as health problems – that transcend differences in culture."* (Biswas-Diener and Diener 2006, 198).

In summary, Biswas-Diener and Diener afford a much more important role to social factors than Maslow did, their results from India showing that social and psychological health can in fact occur even before physical and material needs are met. Their results were described later by McGregor et al. as follows:

> *"The combination of low satisfaction of basic/physiological needs and high satisfaction with social/psychological, which was observed particularly in Calcutta, supports the argument of this paper that "social needs merit renewed attention, and […] may be as important as physical needs […] Physical, social, and psychological needs might interact in a more 'horizontal' fashion to create overall psychological well-being, and*

> *[…] a success in one can counterbalance a failure in another" (Biswas-Diener and Diener 2006, 201)"* (McGregor, Camfield, and Woodcock 2009, 142)

McGregor et al. (2009) also considered the subjective and socially constructed dimensions of human wellbeing and how to prioritize competing needs claims, as is often necessitated in public policy.

Doyal and Gough (1991) present the idea of merely two basic needs, "health" and "autonomy", which result in harm for individuals if not met (as found in McGregor, Camfield, and Woodcock 2009, 137–38). This so-called D&G theory "[…] accounts for local contexts by recognizing that in different social and environmental contexts these intermediate needs can be met in different ways. Thus, the need for health is met partly through the satisfaction of the need for shelter, the satisfier of which will be different in a northern temperate climate than in a more southerly tropical climate." (McGregor, Camfield, and Woodcock 2009, 138). This theory, again, runs counter to the notion of a hierarchy of needs as proposed by Maslow (1943). (McGregor, Camfield, and Woodcock 2009, 138) also refer to Streeten (1995) and Agarwal (1992), who have spoken up for the inclusion of needs such as participation, good environment, and freedom to choose as well as spiritual dimensions, respectively. The Self Determination Theory from Sen speaks of three psychological needs made up of relatedness, competence, and autonomy, without which individuals experience harm (McGregor, Camfield, and Woodcock 2009, 138). Ian Gough (2003, 2) has also made a plea for the greater incorporation of social and psychological dimensions of need (as found in McGregor, Camfield, and Woodcock 2009, 140).

When speaking of subjective wellbeing, one must address Sen and Nussbaum's Capabilities approach. "The Capabilities Approach can be provisionally defined as an approach to comparative quality-of-life assessment and to theorizing about basic social justice" (Nussbaum 2009, 18). In Nussbaum's approach, the choice or freedom is greatly emphasized; an element which can be expected to play a fundamental role in temporary housing, as many scenarios can be envisioned where individuals do not possess many degrees of freedom.

> *"What are capabilities? They are the answers to the question, "What is this person able to do and to be? […] they are not just abilities residing inside a person but also the freedoms or opportunities created by a combination of personal abilities and the political, social, and economic environment. To make the complexity of capabilities clear, I refer to these "substantial freedoms" as combined capabilities."* (Nussbaum 2009, 20–21)

Nussbaum attempts to answer the question, what a life worthy of human dignity requires, claiming that ten Central Capabilities (as described in Table 2) are required.

Table 2: Ten Central Capabilities according to (Nussbaum 2009, 33–34)

Life	Being able to live to the end of a human life of normal length; not dying prematurely, or before one's life is so reduced as to be not worth living.
Bodily Health	Being able to have good health, including reproductive health; to be adequately nourished; to have adequate shelter.
Bodily Integrity	Being able to move freely from place to place; to be secure against violent assault, including sexual assault and domestic violence; having opportunities for sexual satisfaction and for choice in matters of reproduction
Senses, Imagination and Thought	Being able to use the senses, to imagine, think, and reason – and to do these things in a "truly human" way, a way informed and cultivated by an adequate education, including, but by no means limited to, literacy and basic mathematical and scientific training. Being able to use imagination and thought in connection with experiencing and producing works and events of one's own choice, religious, literary, musical, and so forth. Being able to use one's mind in ways protected by guarantees of freedom of expression with respect to both political and artistic speech, and freedom of religious exercise. Being able to have pleasurable experiences and to avoid non-beneficial pain.
Emotions	Being able to have attachments to things and people outside ourselves; to love those who love and care for us, to grieve at their absence; in general, to love, to grieve, to experience longing, gratitude, and justified anger. Not having one's emotional development blighted by fear and anxiety. (Supporting this capability means supporting forms of human association that can be shown to be crucial in their development.)
Practical Reason	Being able to form a conception of the good and to engage in critical reflection about the planning of one's life. (This entails protection for the liberty of conscience and religious observance.)
Affiliation	1. Being able to live with and toward others, to recognize and show concern for other humans, to engage in various forms of social interaction; to be able to imagine the situation of another. (Protecting this capability means protecting institutions that constitute and nourish such forms of affiliation, and also protecting the freedom of assembly and political speech.) 2. Having the social bases of self-respect and non-humiliation; being able to be treated as a dignified being whose worth is equal to that of others. This entails provisions of non-discrimination on the basis of race, sex, sexual orientation, ethnicity, caste, religion, national origin and species.
Other Species	Being able to live with concern for and in relation to animals, plants, and the world of nature.
Play	Being able to laugh, to play, to enjoy recreational activities.
Control over one's Environment	1. Political. Being able to participate effectively in political choices that govern one's life, having the right of political participation, protections of free speech and association. 2. Material. Being able to hold property (both land and movable goods) and having property rights on an equal basis with others; having the right to seek employment on an equal basis with others; having the freedom from unwarranted search and seizure. In work, being able to work as a human, exercising practical reason and entering meaningful relationships of mutual recognition with other workers.

Assessing the table, one can see how many of these Capabilities stand in some relation to housing and area, even beyond the areas where this is explicitly stated (such as the demand for adequate shelter to ensure bodily health as seen in Table 1).

We can conclude from the literature that it does not suffice to regard temporary housing to provide the sole purpose of shelter. A much more differentiated approach must be taken. In

the 1990s, Max-Neef et al. (1991) proposed a systemic approach to human needs which may provide a good starting point for this endeavour, stating:

> *"Human needs must be understood as a system: that is, all human needs are interrelated and interactive. With the sole exception of the need of subsistence, that is, to remain alive, no hierarchies exist within the system. On the contrary, simultaneities, complementarities and trade-offs are characteristics of the process of needs satisfaction."* (Max-Neef, Elizalde, and Hopenhayn 1991, 17).

This approach explicitly speaks out to a hierarchical view on human needs, only granting the need for subsistence a special prioritized role. Max-Neef et al. (1991, 18) claim fundamental human needs to be universal, with cultural factors determining not fundamental needs themselves, but rather the satisfiers for those needs, with satisfiers being defined as the methods for the satisfaction of the need. The same human need can be satisfied through different satisfiers, which can differ according to culture, also concerning quantity and quality. Max-Neef et al. defined 9 fundamental human needs, which in turn are defined by qualities, things, actions and settings (see Table 3). This approach takes into consideration many of the additional dimensions we have discussed above, while providing clear indicators what requirements for housing and areas are consequently entailed.

Table 3: Needs as defined by Max-Neef (Max-Neef, Elizalde, and Hopenhayn 1991, 32–33)

Fundamental human needs	Being (qualities)	Having (things)	Doing (actions)	Interacting (settings)
Subsistence	Physical and mental health	Food, shelter, work	Feed, clothe, rest, work	Living environment, social setting
Protection	Care, adaptability, autonomy	Social security, health systems, work	Cooperate, plan, take care of, help	Social environment, dwelling
Affection	Respect, sense of humour, generosity, sensuality	Friendships, family, relationships with nature	Share, take care of, make love, express emotions	Privacy, intimate spaces of togetherness
Understanding	Critical capacity, curiosity, intuition	Literature, teachers, educational policies	Analyse, study, meditate, investigate	Schools, families, universities, communities
Participation	Receptiveness, dedication, sense of humour	Responsibilities, duties, work, rights	Cooperate, dissent, express opinions	Associations, parties, churches, neighbourhoods
Leisure	Imagination, tranquillity, spontaneity	Games, parties, peace of mind	Daydream, remember, relax, have fun	Landscapes, intimate spaces, places to be alone
Creation	Imagination, boldness, inventiveness, curiosity	Abilities, skills, work, techniques,	Invent, build, design, work, compose, interpret	Spaces for expression, workshops, audiences

Identity	Sense of belonging, self-esteem, consistency	Language, religions, work, customs, values, norms	Get to know oneself, grow, commit oneself	Places one belongs to, everyday setting
Freedom	Autonomy, passion, self-esteem, open-mindedness	Equal rights	Dissent, choose, run risks, develop awareness	Anywhere

From the project perspective of temporary housing, this systematization of needs from Max-Neef et al. (1991) serves as a good starting point for identifying the interrelations between human needs, and housing and area requirements, when regarded in combination with Sen and Nussbaum's Capabilities approach. These concepts also served as a basis for our construction of "User profiles", detailed below.

3.2 USER GROUPS & SUB-GROUPS

To build a systematization of users for the temporary housing context, which could then serve to provide information on the resulting demands on housing and area, the project team began by starting a broad collection of user groups with a temporary demand for housing. Our definition of user groups was intentionally kept broad within the project proposal, being defined as: "in general, people with urgent housing demand, in a phase of transition or disaffiliation (disruption in biography due to diverse reasons)". The collection includes user groups specified within the international case studies on temporary housing we had already documented within factsheets. This collected was expanded to include further examples resulting from desktop searches as well as personal and professional experiences of the project team. The user groups identified within this process are very varied, but simultaneously show many overlaps. Individuals can be party to multiple user groups at the same time. In addition, several sub-groups were identified, which can occur in practically every user group and have certain demands of their environment which must be considered during planning.

User groups identified within the international literature and temporary housing case studies were as follows:

- People affected by disasters
- People fleeing without refugee status
- Asylum-seekers
- People with refugee status or subsidiary protection
- People in training or education (e.g., students)
- People affected by homelessness

The expanded list included the following user groups:

- Migrants
- Residents of women's shelters
- People recently discharged from institutions (e.g., ex-convicts)
- Families with hospitalized children
- Divorcees or people coming out of partnerships

- Short-term expatriates
- People with temporary working contracts
- Participants, employees and visitors of festivals, sporting events, etc.
- People living and residing without documentation (e.g., mobile Roma communities)
- Tourists

Sub-groups are as follows:

- Children and minors
- Unaccompanied children and minors
- Seniors
- People affected by physical disabilities

Basic information was collected on the user groups where available, comprised of a short abstract, description of the user group, statistical data and future development, particular vulnerabilities of the user group, sub-sets of the user group, particular needs and requirements, the user group in a temporary housing context, the expected duration in a temporary setting and an identification of related topics or user groups. This served as a basis for understanding the key characteristics and possible vulnerabilities of each group.

It is again to be emphasized that the user groups we have defined are not mutually exclusive, and show many overlaps, some can even be considered subsets of each other (for example, migrants can be considered to cover the category of people in training or education and people with refugee status or subsidiary protection, and residents of women's shelters can often belong to the group of people affected by homelessness). It is also evident, that not all of these user groups are ultimately relevant for our project (e.g., tourists). Reading through this list of user groups, several problems become visible. There are no uniform group criteria, resulting in a wide range of "levels", jumping from groups defined by an occupation or an action they partake in for a few days (e.g., employees of a festival) to groups affected by potentially life-altering events (e.g. ex-convicts or people affected by disasters). The groups are also strongly biography-based, and the risk is high of certain terms used to describe the user groups calling forth certain associations or even prejudices. There are, however, certain areas where it is sensible to work with the unit of user groups, such as when gathering expertise from practitioners who are used to working with these units, or when examining, for instance, the financing structures of housing projects, which can potentially be tied to certain user groups. For the exercise of identifying interrelations of "needs" for people, housing, and areas, however, a new categorization of users was developed, the "user profiles", on the basis of the collected user groups.

3.3 USER PROFILES

The objective of the user profiles was to develop a small number of profiles which are distinct from each other regarding the requirements of the housing and area. It should be possible to assign each user group to one of the more abstract and general user profiles. The multi-facetted nature of human needs was established in our previous inspection of international

literature on the subject, as was the importance of choices or freedoms. Evidently people in need of temporary housing cannot be categorized according to needs per se, as ultimately human needs are to be considered as universal. When regarding the collected user groups, however, differences between the groups can be found in the degrees of their ability to meet their own needs in a self-organized manner during the phase of their lives where they have a temporary need for housing. This idea served as the basis for the user profile categories. Factors which characterize the user profiles are for instance the access to public transport, urgency from the perspective of the state (e.g. sudden unexpected increase of housing demand) or urgency from the individual perspective, which can be related to social integration and access to familial or professional networks.

3.3.1 User Profile A

User profile A describes individuals with an urgent demand for temporary housing. In this context urgent describes a sudden and unexpected increase of demand with a very limited timeframe for preparation and reaction (within hours or days) (perspective: city), and a pressing lack of instantly available alternative housing solutions (perspective: individual). This consequently entails a need for strong outside organization, as profile A individuals are severely restricted in their options for finding solutions through self-organization. Outside organization may not only entail the organization of swift housing solutions but may include the organization of medical teams or the provision of psychological care. The mobility of individuals in profile A can be limited and the lack of alternatives places this group in the particularly precarious situation of lacking freedom of choice in various dimensions. User Profile A is therefore to be considered vulnerable in the sense of being exposed to relying on outside actors. These individuals are experiencing a disruption of their daily routines and find themselves in a state of emergency.

User Profile A is strongly dependent on outside organization to cover their needs and is in no state for self-organization. When accommodating user profile A, it is likely that most needs must be met on-site.

Examples:

- Individuals affected by natural disasters who are temporarily evacuated from their homes or who have lost their homes to destruction or contamination. This group of individuals can be expected to for a large part be culturally well integrated in the area with existing social networks
- Individuals fleeing from their home countries and either passing through or applying for asylum. An additional characteristic is that they are not yet culturally integrated and do not yet possess local social networks (asylum seekers, refugees, migrants)

3.3.2 User Profile B

User profile B describes individuals with low urgency in terms of there being no sudden unforeseen changes in housing demand (perspective: city), but high urgency in terms of there being lacking or unsecure alternatives (perspective: individual). The individuals of user profile

B often lack a supporting social network and find themselves in a phase of not being well-integrated into society, or in the worst case even socially excluded. User profile B is often characterized by acute poverty, which in turn strongly restricts available housing solutions for this profile group and additional degrees of freedom, such as mobility. There is an existing need for outside assistance, particularly regarding the provision of psychological care and support for the re-integration in society, e.g., through means of education or employment.

User Profile B is dependent on outside organization to cover some needs but can self-organize others (such as the provision of food), provided there is accessibility.

Examples:

- Individuals affected by extreme poverty (e.g., long-time unemployment, divorcees)
- Individuals affected by a bad family environment or domestic abuse
- Individuals after release from prison

3.3.3 User Profile C

User profile C describes individuals with low urgency in terms of there being no sudden unforeseen changes in housing demand (perspective: city) and medium urgency in terms of there being existing alternatives (perspective: individual), albeit not to a satisfactory degree in terms of quantity or affordability. Events such as the last financial crisis of 2008 can increase the demand and urgency of User Profile C. The individuals of this user profile are either already well integrated into the area or possess the opportunity and ability to organize and build social networks independently. They can generally be considered to possess high mobility in terms of owning a car, a bicycle, access to public transport etc. There is no high demand for outside support in the organization of education or employment, or medical and psychological support. The individuals of user profile C possess many degrees of freedom. Their need for temporary housing solutions stems from, for instance, being in education or training or being employed abroad for a foreseeable limited amount of time. This group of individuals can be considered flexible and open for change. Affordable housing options are sought with the temporary nature of stay leading to specific requirements and expectations of this user profile which can be addressed through pop-up housing solutions. Actively contributing to experimenting with pop-up housing may be attractive to this profile group.

Examples:

- Students
- Employees requiring (regular) short-term accommodation (seasonal workers, construction workers, expats ...)

Table 4: Comparison of User Profiles regarding urgency (perspectives city and individual) and ability to self-organize needs

	Profile A	Profile B	Profile C
Urgency (perspective: city)	x	-	-
Urgency (perspective: individual)	x	x	-
Ability to self-organize needs	-	-/x	x
Examples	Individuals affected by natural disasters	Individuals affected by homelessness	Students

Table 4 compares the three user profiles regarding urgency from the perspective of the city, urgency from the perspective of the individual, and the ability of those affected to self-organize their needs. These user profiles differ not in terms of needs but in terms of what they demand from their living environment. While Profile C can be expected to meet many of its needs off-site in a self-organized manner, solutions must be found on-site for Profile A, with implications for the planning and organization of the temporary housing environment.

3.4 HOUSING REQUIREMENTS

Many people in the world don't live in shelters that meet even the basic requirements. According to the new joint report of the World Health Organization (WHO) and UNICEF, "about 2.1 billion people, that is 30% of the world population, do not yet have access to domestic water supply services and drinking water 4.5 billion, or 60%, does not have hygienically managed sanitary facilities" (JMP, 2017). Indeed, for an increasing number of people, available shelter not only fails to protect them but exposes them to health risks that are, for the most part, preventable (Ranson, 1991: 13). It can be said that the requirements of housing are certainly direct consequence of the definition of an adequate and acceptable standard of living but also of the satisfaction of human needs which can be very different depending on the type of user group for which it is intended.

Regarding legislation, European Union (EU) Directives, national legislation and local standards often contradict one another. Eurocodes (EU Directives with the purpose to provide a basis for construction and engineering specifications) have introduced common objectives and topics, but it has proven difficult to adapt national standards to EU regulations and there are still big differences among technical requirements in EU countries. Alessandro Rigolon, in his "European housing standards", found that countries with a centralized political system (e.g., France) have adopted nationalized regulations and standards, while in other countries, especially federal states such as Austria and Italy, defining standards and procedures are the responsibility of local authorities. Examining the European context, Rigolon writes: "The definition of standards and regulations according to local conditions can often be a positive factor, since it makes it possible to respond better to the specific needs of a given region. Nevertheless, excessive fragmentation, which has led each Italian municipality to devise its own building regulations, seems quite ineffectual" (Rigolon, 2009: 2). The comparative

assessment of regulatory systems demonstrates strong differences in cultural attitudes towards standards, as well as the aspects that are subject to regulations and operating procedures.

The Oxford English Dictionary define the term "Housing" to refer to the construction and usage of houses or buildings for the purpose of sheltering people. The social issue revolves around ensuring that members of society have a home in which to live, whether this is a house, or some other kind of dwelling, lodging, or shelter and temporary housing. As defined by the UN-Habitat:

> *"The term 'housing' is used at a number of levels and is a multi-dimensional concept. It refers to the activity, a process of residing, as well as to the objects of dwellings and their environment. The main attributes of housing as a dwelling are its location (determining access to livelihood), tenure arrangements, cost and physical structure. Housing is a physical structure as well as social structure, functioning at different spatial scales (homes, neighbourhoods, cities and other settlements, regions and countries)"* (UN-Habitat Global Housing Strategy Framework Document, 2012: 15).

Housing that is adequate for a person's health and well-being is a human right, as can be read in the Universal Declaration of Human Rights (UN General Assembly, 1948). The right to adequate housing is described as a basic social condition, as it is a basis for personal stability and security and is linked to welfare of people and places (UN Habitat, 2012). Everyone has the right to adequate housing: this right is recognized by the provisions of international law and includes the right to live in security, peace, and dignity, with the right to property, protection from forced eviction and the right to restitution. Adequate housing must provide more than four walls and a roof, but also a safe and healthy environment for its inhabitants (OHCHR, 2018).

The Sphere Association, focusing on the human right to adequate housing, aims to define several conditions that must be met before forms of shelter and settlements (considered as a whole where "shelter" is the household living space and "settlement" is the wider locations where people and community live) can be considered to constitute "adequate housing". For housing to be adequate, it must, at a minimum, meet the following criteria (The Sphere Handbook, 2018:241):

- sufficient space and protection from cold, humidity, heat, rain, wind, or other health threats, including structural hazards and disease vectors.
- the availability of services, facilities, materials, and infrastructure.
- reliability, habitability, accessibility, position, and cultural adequacy.
- sustainable access to natural and common resources; drinking water; energy for cooking; heating and lighting; sanitation and washing facilities; food preservation means; waste disposal; drainage systems; emergency services.
- the appropriate location of settlements and dwellings to ensure safe access to health services, schools, nurseries and other social facilities and livelihood opportunities.
- that the construction materials and policies relating to the construction of housing allow an adequate expression of cultural identity and the diversity of housing.

Many technical, social, planning and policy factors relating to housing may affect physical and mental health and social wellbeing. These factors can be expressed in terms of basic human requirements that can accordingly be incorporated into housing standards, policies, and goals of attainment relevant to an individual country's needs, resources, and priorities. Other factors to be considered for the definition of the housing requirements are extremely variable, so it cannot be possible to satisfy them by a unique type of system. Consider for instance the type of users to whom housing is destined, to realize the differences: single persons, families, students, migrants, etc. All of them have different characteristics and needs that would then result in a multitude of different approaches to the “housing” spaces and functions. Therefore, it may be impossible to find a universal interpretation of “housing requirements” or “housing standards” that is generally applicable to all possible contexts.

On this basis, it’s possible to outline a series of minimum or standard requirements that are necessary to define an adequate life for those who will benefit from it, bearing in mind that basic human needs are universal (with the sole need for subsistence as a special priority role), but they can be satisfied through different satisfiers, which differ according to culture, also in terms of quantity and quality (Max-Neef, 1991: 17-18).

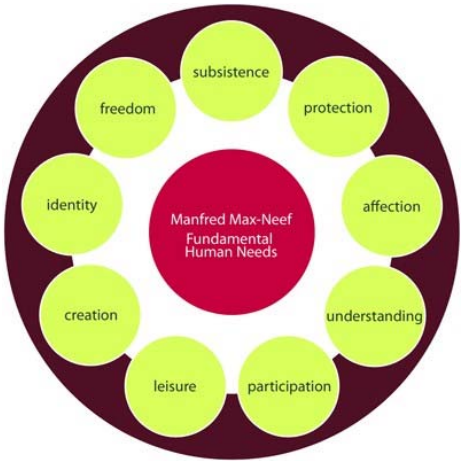


Figure 4: Max-Neef fundamental needs of humans (Source: tihmodels.com)

The minimum standards considered as general housing requirements refer to the satisfaction of human needs, as defined by Max-Neef and listed in Fig. 1. For instance, the human needs of “subsistence" and “protection” are guaranteed by the structural stability of the dwelling and the respect of the hygienic-sanitary requirements; the needs of “affection”, “idleness”, “identity” and “freedom” are guaranteed by the privacy and security requirements, as well as the needs of “participation” and “creation” are ensured by the presence of open spaces next to the dwellings.

Therefore, it is essential to identify the minimum standard requirements that housing must have to ensure at least a generic and minimal satisfaction of human needs, paying attention on the other hand, as mentioned by Turner in his book "Housing as a verb", minimum standards are good but can also be limiting at the same time: “The most common objection to changes in public policy which would increase the user’s control in housing at the expense of central institutions is that standards would be lowered as a result" (Turner & Fichter, 1972:

148). The minimum standards are not a full expression of the right to adequate housing, as defined by international legal instruments. Rather, the minimum standards reflect the fundamental content of the right to adequate housing and contribute to their progressive realization.

3.4.1 Structural stability (safety)

Housing structural stability is the main requirement for any type of dwelling, as this ensures the safety of users dwelling inside it. Without stability, the basic function of refuge and protection for the users would be lost. It is a needed requirement for any type of housing, regardless of the characteristics of user groups (social status, number of residents, temporary or permanent need) and the geographical position and therefore the related regulatory regulation.

Structural stability is defined by the system which transfers loads from the building to the ground through interconnected elements or members. Commonly used structures can be classified into major categories, depending on the type of primary stress that may arise in the members of the structures under major design loads:

Load-bearing wall buildings:

Three-dimensional assembly of walls and floors characterized by a box-like operation that gives the overall stability and strength and all the elements cooperate in resisting the applied loads. The walls bear the weight of the elements above them, resting upon it by conducting its weight to a foundation structure. The materials most often used to construct load-bearing walls in large buildings are concrete blocks, or bricks manufactured from a variety of different materials, like clay to obtain the classic “red brick”. They are made on site and by steps, paying attention particularly to waiting for the completion of the gripping and hardening process of the binding materials (usually mortar or concrete) between the bricks, before to build the next level (Fig. 2). For the building, the load-bearing wall represents a considerable restriction on the free articulation of the architectural plan, affecting the maximum widths of the door and window openings. The genesis of the frame can therefore be traced back to the reduction of the sections of the vertical supporting elements, giving birth to the pillars, and to the increase of the lights of the architraves that are transformed into beams.

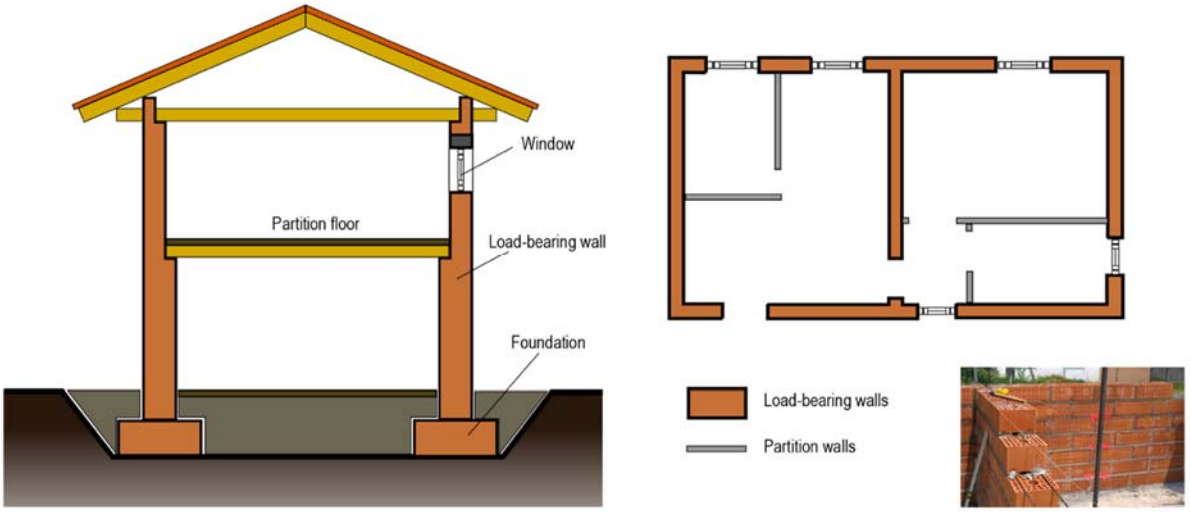


Figure 5: Load-bearing wall buildings scheme (Source: tecnologiaedidattica.com)

Rigid frame buildings:

load-resisting skeleton constructed with straight or curved members interconnected by mostly rigid connections which resist movements induced at the joints of members. Its members can take bending moment, shear, and axial loads. It's made up of foundations, pillars, beams. It consists of a grid of horizontal and vertical elements, beams and pillars: usually on the beams load loads directly, which are inflected under their action; the loads are transferred to the ends and distributed between the pillars, which have the task of unloading them on the foundations and from there to the ground. It's typically made of reinforced concrete (made directly on construction site: dry Portland cement, rocks and water, the mixture forms a fluid slurry that is easily poured and molded into shape and that hardens after 28 days) or a wood/steel beam (Fig. 3).

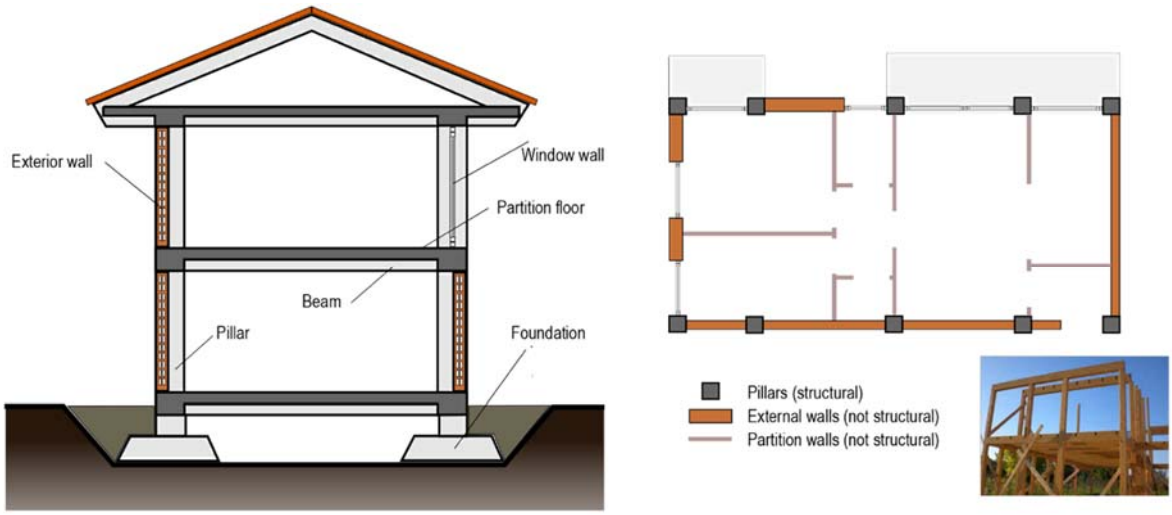


Figure 6: Rigid frame buildings scheme (Source: tecnologiaedidattica.com)

Prefabricated buildings:

This is a building that is manufactured and constructed using prefabrication. It consists of factory-made components or units that are transported and assembled on-site to form the complete building. In this category can be inserted everything that is made in a factory then put in a construction site for the mounting, like containers, tents, or walls that only need to be mounted with bolting or welding, but also large buildings in reinforced concrete or steel made with prefabricated blocks (Fig. 4).

Figure 7: Accommodations made out of prefabricated elements (Source: wikipedia)

In accordance with Eurocodes, (in particular “Eurocode 0” and “Eurocode 1”) the stability of a structure in the design phase is defined by the Limit State Design (CEN, 2001). A limit state is a condition of a structure beyond which it no longer fulfils the relevant design criteria. The condition may refer to a degree of loading or other actions on the structure, while the criteria refer to structural integrity, fitness for use, durability or other design requirements. A structure designed by Limit State Design is proportioned to sustain all actions likely to occur during its design life, and to remain fit for use, with an appropriate level of reliability for each limit state. Building codes based on Limit State Design implicitly define the appropriate levels of reliability by their prescriptions. Limit state design requires the structure to satisfy two principal criteria: Ultimate Limit State and Serviceability Limit State (McCormac, 2008: 50).

Ultimate Limit State are associated with the extreme value of bearing capacity or other forms of structural failure that may endanger people's safety. Some examples of the causes that can lead to the ULS are: a) loss of stability of part or of the whole structure; b) breaking of critical sections of the structure; c) transformation of the structure into a mechanism; d) instability due to excessive deformation; e) deterioration following fatigue; f) deformations of fluents or cracks, which produce a change in geometry that requires the replacement of the structure. The overcoming of a last limit state is irreversible and is defined as collapse.

Serviceability Limit State are states beyond which the prescribed exercise requirements are no longer met. Exceeding it can have reversible or irreversible character: in the first case the damages or deformations are reversible and cease as soon as the cause that led to the surpassing of the limit is eliminated; in the second case, permanent damage or deformation occurs unacceptable and cannot be eliminated by the suppression of the cause that generated them.

Any design process involves a number of assumptions. The loads to which a structure will be subjected must be estimated, sizes of elements to check must be chosen and design criteria must be selected. All engineering design criteria have a common goal: that of ensuring a safe structure and ensuring the functionality of the structure.

3.4.2 Hygienic-sanitary requirements

The hygienic-sanitary requirements are important for the definition of a "healthy" home, that is, equipped with structural and environmental characteristics able to protect the physical and mental health of its inhabitants and promote their social integration. A healthy home is characterized by different parameters that contribute to the general health: natural lighting, indoor air quality, microclimate, acoustic insulation, living space required per person. This means that each dwelling must be equipped with access to potable water (with some exceptions in the case of temporary housing, depending on the user's length of stay), an appropriate indoor microclimate, an electrical system, the provision of facilities and serviced for the safe disposal of human excrements and an adequate ventilation system.

The Joint Monitoring Programme report presents the first global assessment of "safely managed" drinking water and sanitation services. The overriding conclusion is that too many people still lack access, particularly in rural areas. "Safe water, sanitation and hygiene at home should not be a privilege of only those who are rich or live-in urban centres" says Dr. Ghebreyesus, director of the World Health Organization. "These are some of the most basic requirements for human health, and all countries have a responsibility to ensure that everyone can access them". Billions of people have gained access to basic drinking water and sanitation services since 2000, but these services do not necessarily provide safe water and sanitation. Many homes, healthcare facilities and schools also still lack soap and water for handwashing, and this puts the health of all people at risk for diseases. Poor sanitation and contaminated water are also linked to transmission of diseases such as cholera, dysentery, hepatitis A, and typhoid. "Safe water, effective sanitation and hygiene are critical to the health of every child and every community – and thus are essential to building stronger, healthier, and more equitable societies," said UNICEF Executive Director Anthony Lake. "As we improve these services in the most disadvantaged communities and for the most disadvantaged children today, we give them a fairer chance at a better tomorrow" (JMP, 2017).

Natural lighting

The rooms intended for the permanence of people must be illuminated adequately with natural light, and to this end, appropriate openings must be provided which also guarantee the external view. In several European Standards (EN 12464-1:2011; EN 15193-1) involving daylight, the general benefits of daylight are various. The design illuminance levels needed to enable people to perform visual tasks efficiently and accurately shall be obtained by means of daylight, electric light or a combination of both. Windows are strongly favoured in buildings for the daylight they deliver, and for the visual contact they provide with the outside environment. It is important to ensure windows do not cause visual or thermal discomfort, or loss of privacy.

Natural light greatly influences the individual's psychophysical well-being, improves the perception of environments and a prolonged lack of exposure to natural light can also have physiological consequences. Furthermore, making the best use of natural lighting reduces energy consumption, both because the amount of artificial lighting in the rooms is reduced, and because solar gains increase during the winter. A correct design takes into consideration

the variability of atmospheric conditions, the geographical position, the seasons, the shape of the environment, the internal reflectance and the characteristics of the windows.

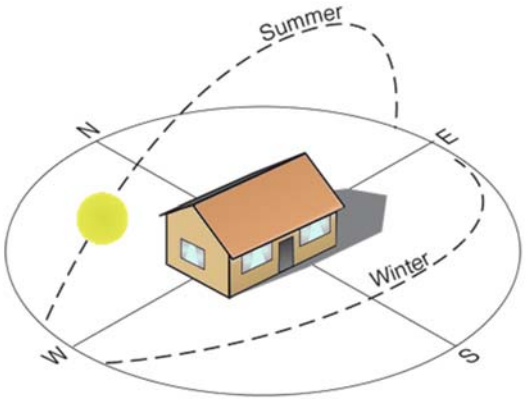


Figure 8: Seasonal path of the sun (source: EcoWho.com)

Direct natural lighting is primarily a function of the orientation of the building and, as it is shown in Fig. 5, it is conditioned by the season. The orientation of houses is an important factor in the planning and design of new housing developments. In hot countries, correct orientation helps ensure that buildings are not overheated by the sun and that at least one cool, shady room is available within the house. Conversely, in cooler regions, radiation can be used to warm dwellings by facing them towards the sun. Orientation planning also has to account for other climatic factors such as wind direction and strength, which can cause excessive infiltration of outside air in cold regions. In these cases, windbreaks and technical measures should be employed while concurrently maximizing sunlight into living quarters through correct orientation. Marked differences will inevitably occur in orientation of buildings in warmer and cold climates, but orientation also depends upon site arrangement and the purposes for which rooms are used. Natural lighting requirements of rooms often form an important factor in orientation.

The ideal orientation of housing allows all sides of the building to be exposed to the sun for some period of the day. Living rooms should receive maximum sunlight, but in hot climates, orientation would need to help keep these rooms from becoming excessively hot. In hot countries, housing is usually planned for coolness by designing rooms oblong in shape with the short axes running NS or NNE and SSW.

Indoor air-quality (ventilation)

Indoor air quality is recognised as an important aspect of the building environment in all EU countries. The benefits of securing proper indoor air quality, either for the well-being of inhabitants or for the safety and health of the building and its fabric, are also underlined in various forms in the building regulations of the European countries.

Indoor air quality is determined by the air quality outside the building, pollutant emissions within the building and the ventilation rate. More than eighty indoor air pollutants have varying adverse health effects, depending on toxicity, concentration, and occurrence inside rooms. In terms of housing, the most common pollutants include carbon and nitrogen oxides, odours,

formaldehyde, tobacco smoke, water vapour, airborne allergens, asbestos and other mineral fibres, airborne pathogens and toxic emissions from polymers and consumer goods. Many of these are by products of construction materials and furnishings, while others are products of household activities.

When the typological characteristics of the dwellings give rise to conditions that do not allow the use of natural ventilation, it will be necessary to resort to centralized mechanical ventilation by injecting the air appropriately captured and with suitable sanitary requisites. In any case, it is necessary to ensure the extraction of fumes, vapours, and fumes at the production points (kitchens, toilets, etc.) before they spread. The "cooking place", possibly attached to the living room, must communicate widely with the latter and must be adequately equipped with a forced extraction system on the stove.

The American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE) has published in 2013 its first residential ventilation standard. This standard defines the roles of and minimum requirements for mechanical and natural ventilation systems and the building envelope intended to provide acceptable indoor air quality in low-rise residential buildings. The standard includes a minimum whole-house ventilation rate, local exhaust rates and other kinds of source control (Sherman, 2009: 10).

The ventilation rate is normally expressed by the volumetric flowrate of subaerial air, introduced to the building. For residential buildings, which mostly rely on infiltration for meeting their ventilation needs, a common ventilation rate measure is the ACH, Air Change per Hour: the hourly ventilation rate divided by the volume of the space. During the winter, ACH may range from 0.50 to 0.41 in a tightly air-sealed house to 1.11 to 1.47 in a loosely air-sealed house (Fig. 6).

Ventilation is particularly important for buildings in humid and dry climates. In dry climates, evaporation can be used to reduce the outside temperature and favor cooler air ventilation inside the building. If evaporation takes place in the shade, it allows the temperature to decrease even by 5 ° C. This phenomenon can occur either by inserting water into the environment (fountains, sprays, nebulizers), or using greenery. In this second case, the cooling power will vary according to the capacity of the tree essence, or the type of plant chosen to release water vapor into the atmosphere.

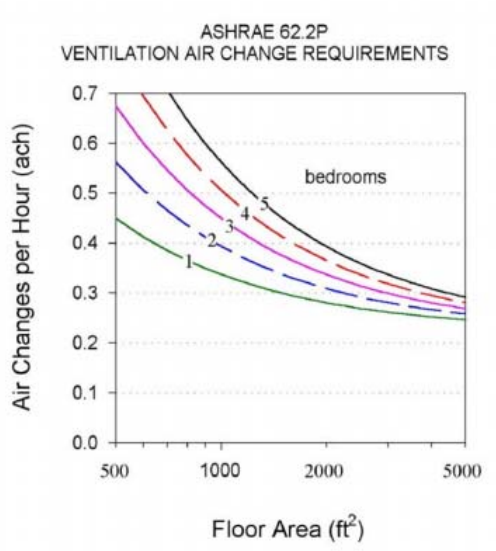


Figure 9: Required ventilation for different size houses (source: Max Howard Sherman)

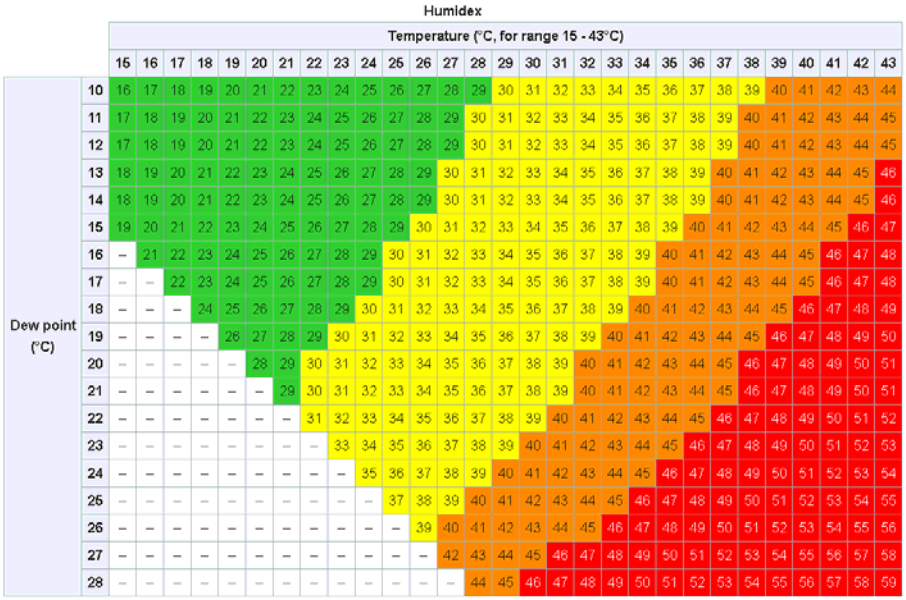
Indoor microclimate (temperature and humidity)

The microclimate refers to the set of environmental parameters, temperature, relative humidity and air speed, which condition the heat exchange between the individual and the environment. The microclimate significantly influences, together with indoor air pollution, the quality of the environments in which to live and therefore the welfare of people. The achievement of thermal comfort, that is the state of full satisfaction with the environment itself, is an essential and priority condition for the achievement of total well-being.

A useful parameter for the definition of a microclimate suitable to a general model of housing is the "Humidex" (short for humidity index), basically an index number used to evaluate the bio-meteorological well-being of human beings in relation to temperature and humidity (the percentage of water vapor present in the air). The Humidex (Fig. 7) places the ideal ratio between 18-24 °C of temperature and 40-60% of humidity; moreover, these values must be valid in all inhabited areas and in services. Finally, in the conditions of occupancy and use of the dwellings, the internal surfaces of the opaque parts of the walls must not show traces of permanent condensation, which depend on the relative humidity of the area in question (Masterson & Richardson, 1979: 45).

To achieve these requirements, it is necessary to realize good external partition elements, thus providing an adequate layer of thermal insulation or the use of air conditioning systems. Preventing air and moisture infiltration and diffusion is vital in hot and humid climates, where the air is wet and warm. When moisture infiltrates the walls of a structure, the warm temperatures allow mould to thrive, and even more so when it can feed off organic building materials (wood, cloth, or paper). Mould and other fungi pose serious health risks, as well as threatening the integrity of the structure’s materials. To ensure a tight enclosure and properly placed moisture retarders to protect the life and value of the home common technical solutions are to use an air infiltration barrier on the outside of exterior walls, like vinyl coverings or other moisture-retarders placed on the inside of exterior walls will trap moisture inside the walls and

promote mould or place a vapor retarder beneath slab floors to stop moisture and gases from entering the house.



Humidex	Temperature (°C, for range 15 - 43°C)																											
	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43
Dew point (°C) 10	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44
11	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45
12	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45
13	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46
14	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46
15	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47
16	–	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48
17	–	–	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48
18	–	–	–	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49
19	–	–	–	–	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50
20	–	–	–	–	–	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51
21	–	–	–	–	–	–	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51
22	–	–	–	–	–	–	–	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52
23	–	–	–	–	–	–	–	–	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53
24	–	–	–	–	–	–	–	–	–	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54
25	–	–	–	–	–	–	–	–	–	–	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55
26	–	–	–	–	–	–	–	–	–	–	–	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56
27	–	–	–	–	–	–	–	–	–	–	–	–	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58
28	–	–	–	–	–	–	–	–	–	–	–	–	–	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59

Figure 10: Humidex table (source: Wikipedia)

Acoustic insulation (from environmental noise)

Environmental noise is the summary of noise pollution from outside, caused by transport, industrial and recreational activities. Noise is frequently described as 'unwanted sound', and, within this context, environmental noise is generally present in some form in all areas of human, animal, or environmental activity. The effects of exposure to environmental noise on humans may vary from emotional to physiological and psychological. Noise at low levels is not necessarily harmful; environmental noise can also convey a sense of liveliness in an area and is not then always considered 'unwanted'. However, the adverse effects of noise exposure (i.e. noise pollution) could include interference with speech or other 'desired' sounds, annoyance, sleep disturbance, anxiety, hearing damage and stress-related cardiovascular health problems.

As a result, environmental noise is studied, regulated and monitored by many governments and institutions. This creates several different occupations. The basis of all decisions is supported by the objective and accurate measurement of noise. Noise is measured in decibels (dB) using a pattern-approved sound level meter. The measurements are typically taken over a period of weeks, in all weather conditions.

The materials used for the construction of housing and their implementation must ensure adequate acoustic protection to the rooms as far as the noises from traffic noise, noises from installations or appliances still installed in the building, noise or airborne sounds coming from contiguous lodgings and from premises or spaces destined to common services. The "passive acoustic requirements" represent one of the specific characteristics of the constructive elements of a building, which qualify the external and internal sound sources / acoustics of the

building itself. At Community level, the technical standards for the design of passive acoustic requirements for buildings are represented by the EN-ISO 12354:2017.

3.4.3 Living space

The indoor space requirements for households depend on the cultural, social and economic attributes of the population involved. There is thus little consensus concerning space requirements or the way in which space is appropriated within a dwelling unit despite the importance of indoor space in satisfying human requirements for health, safety, family life, privacy, rest, and domestic, recreational, and social activities.

Indicators of indoor space are normally expressed in terms of crowding indices or at low space levels in terms of overcrowding. Indoor space (i.e. the living area within the dwelling unit) is normally divided into dwelling space areas, such as living rooms, bedrooms and kitchens, and ancillary space, such as corridors, stairs and storage areas. The size, shape and number of rooms should be able to accommodate the activities normally carried out in these rooms, minimize the spread of infection, ease mental stress and accommodate the social needs of the household. For example, young children require less space than teenagers, teenagers of different sexes should ideally not have to share bedrooms, and parents or guardians normally prefer bedroom accommodations separate from other family members.

No minimum standards have been developed for space requirements based on meeting human health needs, although several countries have developed their own based on pragmatic and economic considerations. As noted in "Healthy housing: a practical guide", despite the United Nations' intention to set general values for space per person, it's essential to consider the different boundary conditions depending on the local geographical characteristics:

> *"The United Nations report on Utilization of space in dwellings (Geneva, 1959), i.e. on the use of space in dwellings, proposed minimum floor space (in m2) according to the size of family. The UN report also concluded that, based on the calculations that a double bed required 7.6 m2 of space for movement on three sides and a wardrobe closet required 1.5 m2 for itself plus another 1.5 m2 for movement, the minimum area of a bedroom for two persons is 10.6 m2. […] A survey by Lebegge on room sizes in European countries found considerable variation in crowding standards. He concluded that a number of reasons accounted for these differences, including climate, way of life, ideas concerning internal arrangement and economic considerations"* (Ranson, 1991: 36-37).

The Sphere Association identifies key indicators to ensure that people have access to living spaces that are safe and adequate, enabling essential household activities to be undertaken with dignity. These indicators include (The Sphere Handbook, 2018: 254):

- minimum 3.5 square metres of living space per person, excluding cooking space, bathing area and sanitation facility.
- 4.5–5.5 square metres of living space per person in cold climates or urban settings where internal cooking space and bathing and/or sanitation facilities are included.

- internal floor-to-ceiling height of at least 2 metres (2.6 metres in hot climates) at the highest point.

Minimum standards per person must be considered not only for indoor but also for the open spaces related to the building and the settlement where the people live. An open space can be seen as an expansion of the indoor space and as such must be born in mind in the planning phase to meet the required quality requirements according to the different type of user group.

The way in which people use the indoor and outdoor space of their dwellings is highly complex and varies enormously with individual's desires and the opportunities which his environment presents to him. The activities which could take place on private estates are difficult or impossible to quantify but must nevertheless be catered for. Activities will also overlap, for example the same space may be used in many ways and by different people at different times of the day. The space standards could be seen as a basis around which building the housing layout and the environmental quality must be the overriding objective.

Spaces are considered as private, communal, or public depending on how they are used, and on their ownership. Although in many cases ownership and use coincide, this is not necessarily the case (e.g. in co-ownership housing all space and dwellings are communally owned, but only certain spaces are communally used).

The standards applicable to any housing are concerned with access and circulation space, and with space for car parking and garaging. Pedestrian circulation space should be planned as an overall system connecting dwellings as directly as possible with each other, with public open spaces within the estate and with shops, primary schools, bus stops and other destinations outside the estate. It should be possible to reach all the public areas of the estate without having to use steps. In estates of family dwellings, footpaths should incorporate widenings for children's play. These should be not less than 25 m2 in area and not more than 50 m apart.

For settlements, it is appropriate to provide a minimum usable area of 45 square meters for each person including plots for the home. The area must have the necessary space for roads and paths, outdoor kitchen areas or communal cooking areas, educational facilities and recreation areas, sanitation, fire avenues, administration, water storage, distribution areas, markets and areas of storage, limited gardens for individual families. If collective services can be provided by existing or additional facilities outside the planned area for settlement, the minimum usable area must be 30 square meters per person (The Sphere Handbook, 2018: 251).

3.4.4 Privacy and security

Privacy or "freedom from what is felt as unwanted intrusion by other people" (Ranson, 1991: 43) can be expressed by different factors including visual, aural, and social criteria. People's reaction to privacy depends as much on their own attitudes as on physical facts, like being seen, noise, social contact, and communication.

People's subjective reaction to these situations explains how extremely difficult is to define the benefits and disadvantages of privacy or its effects on mental health and human well-being.

An important factor to consider concerns the different cultural and adaptive aspects that can be encountered in the world:

> *"In some cultures, all family members share the same room (and sometimes bed) for sleeping whereas in other cultures, private sleeping quarters separated from the rest of the family are preferred. Similarly, in most cultures, people prefer privacy during personal toilet and washing activities while in others, this is not considered important or in some cases achievable. The need for privacy of the dwelling in relation to other dwellings and the wider community also varies significantly. Privacy must be considered in relation to a number of benefits, some of which may be incompatible with other housing hygiene requirements (e.g., large windows increase daylight - but reduce privacy by making interiors visible from outside; easy access in a housing development reduces privacy in gardens and front rooms; low-rise, high-density development multiplies the chances of intrusions of all kinds). Design measures can compensate only partly for imbalances between such opposing factors*" (Ranson, 1991: 43).

Spacing and visual standards are therefore the main elements on which the existing privacy standards are based. From an urban planning point of view, the privacy requirements must be incorporated in the project idea after having considered the different social and cultural needs (therefore considering the distances between the buildings and the views on public spaces). These privacy-related features are also very important about user security:

> *"Housing developments should be designed so as to avoid hiding places for intruders by careful planning of open walkways and approach roads that are well lit at night. Ground floor front rooms should have adequately sized windows at eye level for effective surveillance. Bay windows and walk-in bays are better than windows flush with the frontage or high-level bays. Front doors should be recessed slightly so as not to impede the line of sight from windows. Front-facing doors are better than sideways-facing ones, providing they can be seen from front doors opposite. No high obstructions, such as walls, hedges, garages, meter compartments, pram sheds or dustbin kennels, should obstruct the view of the street from windows"* (Ranson, 1991: 81).

As it can be seen, the dividing line between privacy and security is very thin, as they can be considered one in relation to the other in inverse proportional way. In this context it can be inserted the opinion of Jane Jacobs, urban planning critic, and author of The Death and Life of Great American Cities (1961), who formulated the natural surveillance strategy, eyes on the street, as she called it.

Jacobs argues that city sidewalks actively participate in the fight against disorder and the preservation of civilization. The healthy city sidewalk is not based on constant police surveillance to keep it safe, but on an "intricate, almost unconscious, network of voluntary controls and customary standards among people, and applied by the same people". Noting that a well-used road is relatively safe from crime, while a deserted road is unsafe, Jacobs suggests that a large volume of human users discourages most violent crimes. In other words, healthy sidewalks transform the high volume of strangers in the city from a liability to a

resource. The self-reinforcing mechanism is particularly strong when the roads are guarded by their "natural owners", individuals who like to watch street activity, feel naturally invested in their unexpressed codes of conduct and are confident that others will support their actions if necessary.

Based on the idea that a lively pedestrian environment is a prerequisite for the safety of the city in the absence of a contracted surveillance force, Jacobs recommends a considerable number of shops, bars, restaurants and other public places "sprinkled along the sidewalks" as a means of this purpose.

3.4.5 Temporary housing requirements

As part of this project, it is essential to understand how the principles and general requirements defined for housing can be applied to the best even for temporary housing.

Temporality and time are complex concepts, as the temporal dimension appears through connectivity among persons, objects, and space in an ever-ongoing process (Munn, 1992: 116). How time is perceived in different contexts and by different actors affects how the temporary building permits should be understood. Temporality can be defined as the human perception of time (Hodges, 2008: 15), and as noted above, Munn (1992) emphasizes that temporality can be understood as constructed through sociocultural processes. She adds that sociocultural time (temporality) can have multiple dimensions. This leaves us with an understanding of temporality that contains a multitude of dimensions, and something that can be experienced differently based on the context they appear in. One kind of temporary intervention is temporary housing, that can be defined either as the physical structure, or a part of a process of re-housing, or a place that serves the function to shelter people until they have a permanent home:

> *"Temporary housing can be characterized and recognized by certain factors. […] One factor, that is slightly more complicated, is to make the housing less comfortable than a permanent housing would be. At the same time, the housing has to live up to the living standards of the society it is placed in, and it has to make it possible for the residents to carry out normal daily routines and activities. Since the temporary home then can be perceived as adequate housing, it can be difficult to motivate the residents to find a new home, especially if the household's economy makes it difficult to find a new home. […] Designing for a certain lifespan is one way to make sure that the housing is only temporary, but as mentioned, that can be difficult. Another strategy is to have a strategy with a long-term plan for the use of the temporary housing. This strategy can for example be to move the housing to a new location or change the use"* (Langefors, 2018: 10).

It is clear how, for the definition of the requirements related to temporary housing, the temporal aspect is fundamental; the same concept of "adequate housing" must be filtered considering the temporary nature of the housing and the specific situation that required the need for temporary housing.

Some countries have treated in detail the subject of the requirements of the temporary housing, with particular attention to how the requirements considered up to now in this text, as general for each type of dwelling, can be filtered and adapted to the specific temporary situation.

In Australia, for example, the Queensland Development Code, part 3.3-Temporary, provides a uniform and acceptable standard for all temporary accommodation buildings. The code requires temporary accommodation to meet a range of minimum standards, including: the same structural wind loading requirements that apply to permanent buildings; adequate fire safety standards, such as smoke alarms and emergency exits; defined amenity standards such as minimum space for beds, power points, communication facilities and storage lockers, as well as a minimum number of facilities such as toilets, bathrooms, kitchens, laundries and refrigerators; pest, dust and noise mitigation measures; energy and water efficient fittings, as well as appropriate insulation.

The code is a performance-based code, meaning that it sets mandatory objective style requirements (called performance criteria) that must be met. It also details several acceptable solutions that can be used to meet the performance criteria. Licensed building certifiers can approve alternatives to the acceptable solutions if the alternative is equivalent to the acceptable solution or meets the performance criteria. However, temporary accommodation buildings can only remain on site for a maximum of 2 years, unless the local government approves a longer timeframe before the 2-year period expires.

Another interesting and very recent example is the new Stockholm building regulation which also focuses on temporary housing. “Temporary housing in Sweden represents a very small part of the sector. Only 4% of all building permit applications concerned temporary building permits, and those include several other interventions as well as temporary housing. Despite this, it has received attention both nationally and in Stockholm. For example, in May 2017, an addition to the regulations concerning temporary building permits in the Planning and Building Act was passed by the Swedish parliament. This meant that it is now possible receive a temporary building permit for housing, even if the need is deemed to exceed the time limit of 15 years. The only requirements are that the application concerns a temporary building permit, and that the place can be restored. With the new addition, it is also possible to receive a temporary permit for housing without fulfilling requirements for suitability, accessibility and usability, something that received criticism from the Swedish Agency for Participation and the Equality Ombudsman” (The Swedish Agency for Participation, 2016; The Equality Ombudsman, 2016).

Finally, the regulations on temporary housing in Vienna are particularly relevant within the context of our project. Section 71 of the Building Code of the City of Vienna focuses in detail on temporary housing and the requirements that these must meet: “the use of legally existing structures and the construction of new and additional buildings in lightweight construction (containers, prefabricated buildings and the like) need for the purposes stated in par. 1 for a maximum of 6 months, neither a building permit nor a building notice, if this use is organized by the state. The provisions of this Act and the Regulations adopted pursuant to this Act shall not apply, provided that the general requirements for mechanical strength and stability, fire

protection, hygiene and health and safety in use are considered. Services that are otherwise required in connection with the building permit or construction work do not have be provided. The beginning of use must be brought to the attention of the authority in writing within one week" (building code for Vienna, 2018: section 71). The requirements associated to housing do not fully apply regarding temporary housing, as all the usual regulations do not have to be completely fulfilled.

3.5 POTENTIAL AREA TYPES

Based on the international examples of the data pool, general area and space types were derived, which also seemed to be relevant for the Viennese context. The more specific requirements regarding use for temporary housing of the respective land types are elaborated and described in more detail in Deliverable D2 (see also the developed GIS-based tool). In the following figure these main area /space types are briefly summarized.

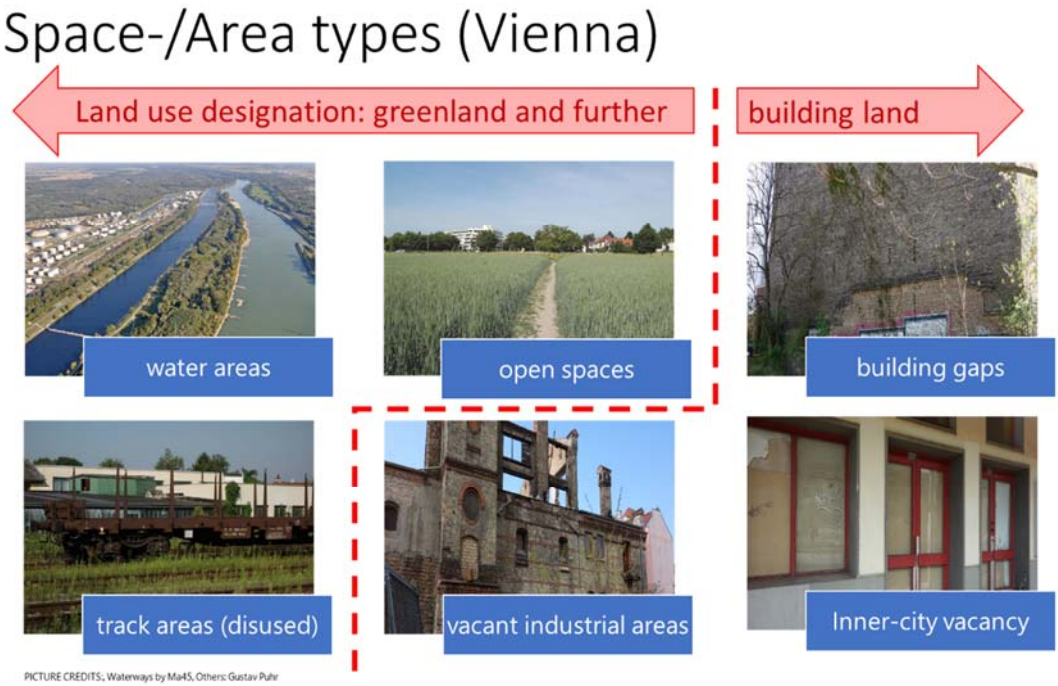


Figure 11: Overview of space / area types relevant for temporary housing options (in context to the City of Vienna)

4 SYSTEMATIZATION AND INTERRELATIONS OF THE THREE ELEMENTS

Within the context of this project, three “elements” were defined as being the focus of this project: PEOPLE, HOUSING and AREA (see Figure 12). The interrelations and specific impacts on urban environmental systems are acknowledged and to be deliberated more closely.

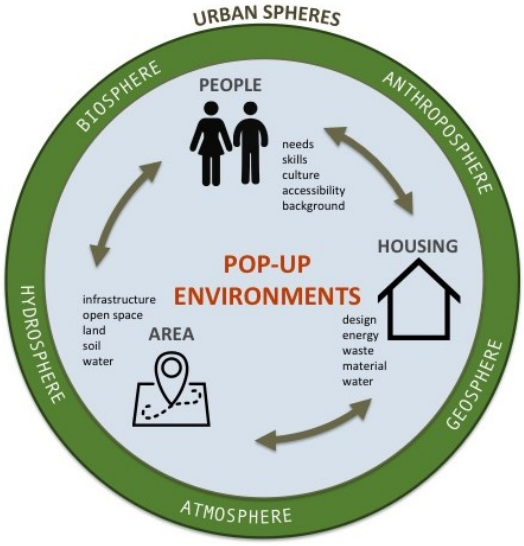


Figure 12: Elements of "pop-up environments" within the urban system

Based on the results and insights of the previous chapters, the collection of real-life examples in the database were analysed in terms of trigger, user profiles, housing types and areas to uncover general connections and interrelationships.

Figure 12 shows a simplified illustration of the interrelations between the elements of Housing and People. Housing requirements are derived from human needs but must be specifically shaped for the corresponding group of users.

In the following, a series of conceptional “use cases” for temporary housing are presented, that have emerged in our research and data sources to illustrate the interrelationships of the three elements and focusses to address the following question: Under which circumstances could temporary housing offer a (potential) comparative advantage compared to permanent housing?

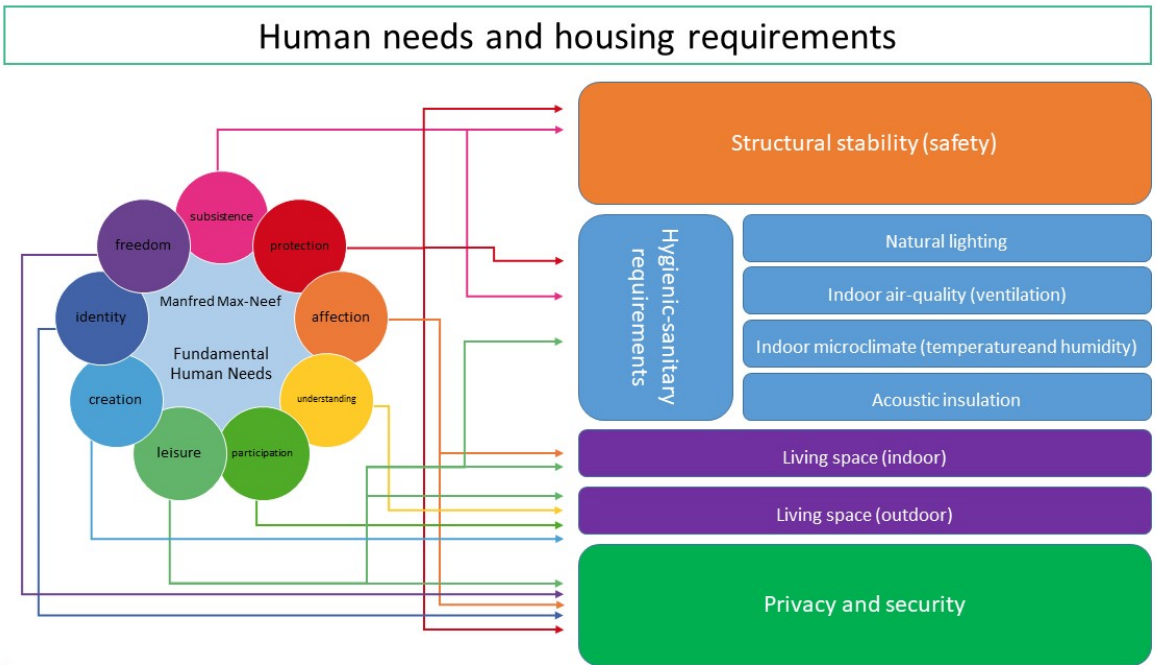


Figure 13: Interrelations between the elements of housing and people

For the following graphic illustrations, the blue lines show the current demand for living space and red lines indicate the amount of living space covered by permanent structures. The green areas highlight the gaps between supply and demand and thus a potential application field for temporary housing. There are different general scenarios: Temporary housing due to an increasing population, temporary housing due to a loss of living space, pre-use of an area to be developed, temporary housing due to personal choice or as an alternative to conventional housing.

4.1 TEMPORARY HOUSING DUE TO AN INCREASE IN POPULATION

4.1.1 Planned, time-limited peak in population size

Due to a planned event, the population size increases for a limited period. The additional persons are planning to leave the location after a defined period. Therefore, the population size is expected to decrease to its initial level after this defined and predictable time.

Prime examples for this situation are large-scale events such as festivals, Olympic games, conventions, etc. Once the event has passed, the population size returns to its original state. Also, time-bound large scale assistance operations could fall into this category.

Temporary accommodation is provided either because the regular hotel capacity of the location is exceeded or as a supplementary option or alternative to conventional accommodation (e.g. more affordable, more liberties, …). No additional permanent structures are constructed, as there is no long-term increase in population size and therefore investing into permanent structures would most likely generate lots of vacancies.

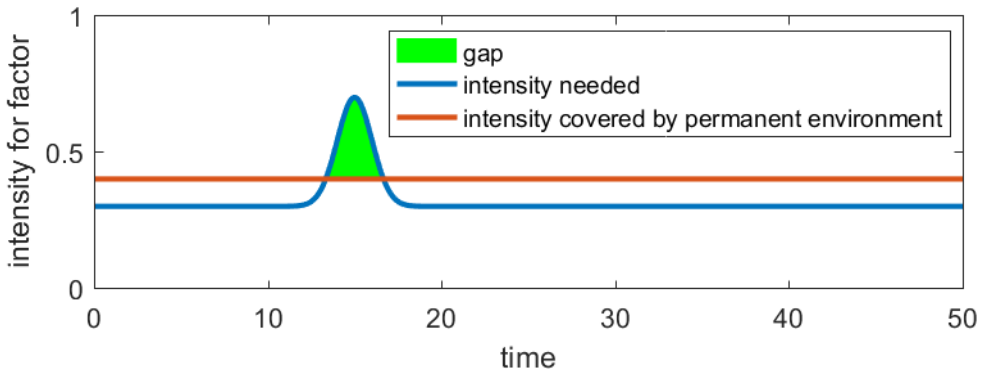


Figure 14: Graph illustrating the planned, time-limited peak in population size

Real-life examples of temporary housing, that were collected in the database and could be allocated to this category are Nr. 19, 48, 51, 65, 81. This scenario is relevant for all three user profiles A, B and C and mainly tents, hard shell accommodations and repurposed commercial buildings were used. Vacant land and vacant buildings were the two main types of area for this situation.

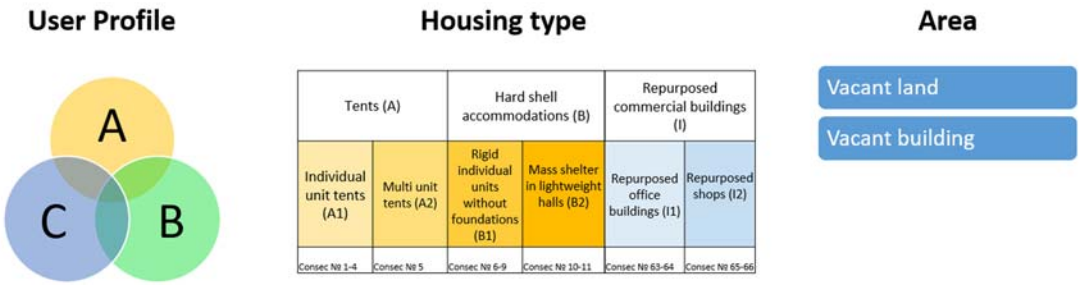


Figure 15: User profile, housing type and area for the planned, time-limited peak in population size

4.1.2 Sudden peak in population size (Migration)

A sudden peak in population size, resulting in long-term increase of population size, which decide to stay long-term is characterized by the term migration. In contrast to the previous example, there may also be an unforeseen increase in the population size. If this sudden increase in population size is significant and the preparation time for accommodating incoming people is very short, the increased housing demand might not be immediately covered by permanent structures. (In theory, there might be enough permanent, vacant structures available in a location, however, from a logistical and administrative effort it might take time to make these structures available. Property owners can also not be forced to make their property available.)

If the incoming population intents to stay long-term, it often results in the decision to build additional permanent living units in the long run. However, until these efforts are underway, temporary housing can gap this period until new buildings are ready.

Large scale refugee movements are an example for this scenario.

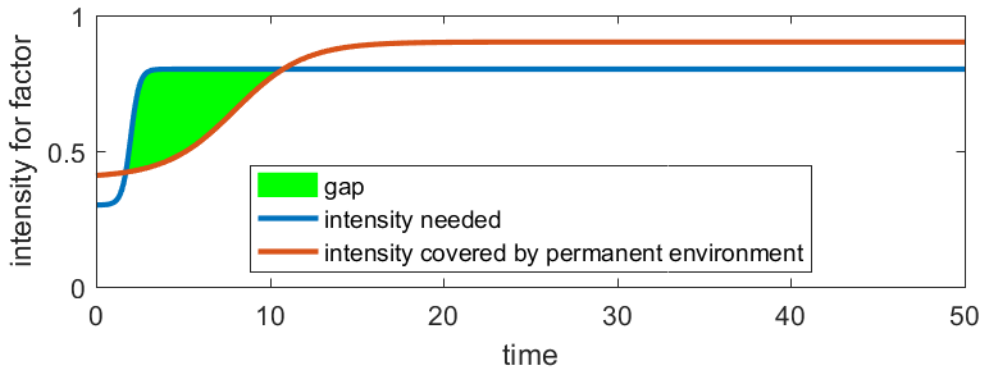


Figure 16: Graph illustrating the long-term increase in population size

There were many real-life examples of temporary housing that were collected in the database and can be allocated to this category: Nr. 8, 9, 17, 22, 32, 41, 42, 44, 45, 49, 50, 54, 59, 60, 67, 68, 69, 70, 71, 72, 74, 75. This can be explained since this project was conducted in the aftermath of the refugee movements to Europe of 2015 and 2016, where many temporary housing facilities were operated.

In the investigated examples, this situation was mainly relevant for user profiles A and C. There was a huge range in housing times, from tents, mobile accommodations, individual and multi-unit buildings and repurposed social facility buildings. Again, areas used were vacant buildings or vacant land.

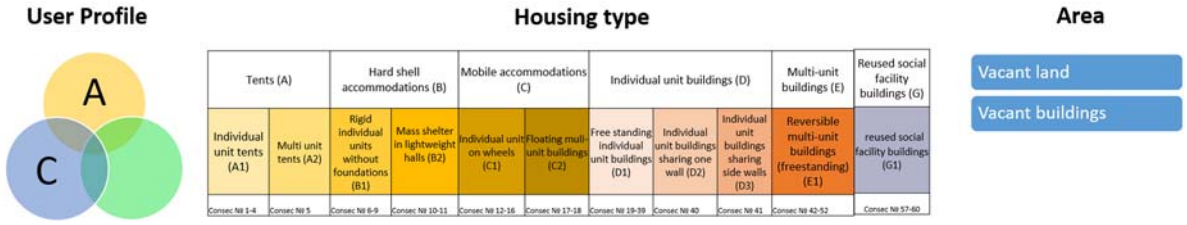


Figure 17: User profile, housing type and area for long term increase in population size

4.2 LOSS OF LIVING SPACE

Other conditions are given if there is a loss of space that is used for housing. This is often accompanied by major natural forces and can lead to a temporary or permanent loss of space.

4.2.1 Sudden loss of living space / rehabilitated after a certain period

A sudden, unpredictable loss of space to live is characteristic of this scenario. This can be the result of a disaster, such as flooding, tsunami, earthquake and even some industrial accidents. An area is devastated, clean-up activities take time. However, the initial living space is expected to be restored within a foreseeable time frame: houses are rebuilt, debris and rubble is removed.

In the meantime, however, the local population must be provided with temporary shelter to bridge the period of reconstruction. This scenario is represented by the following real-life examples in the database: 6, 12, 14, 46, 47, 53, 62, 73, 80, 82.

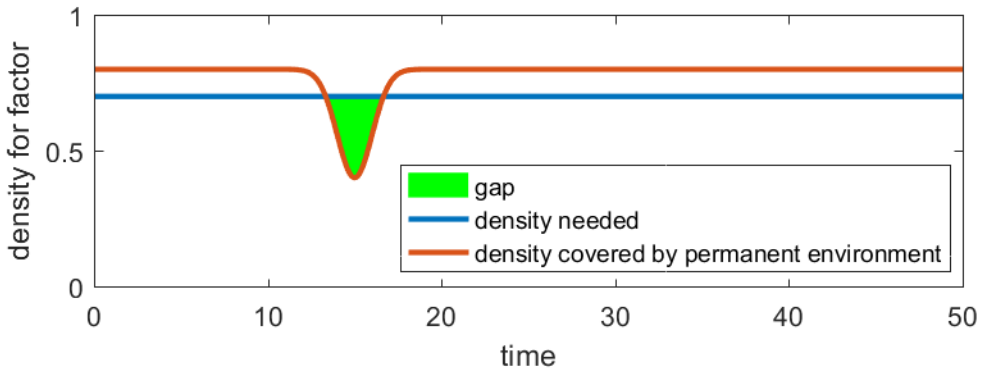


Figure 18: Graph illustrating the sudden loss of living space rehabilitated

In the investigated examples, this situation was mainly relevant for user profiles A and B. There was a huge range in housing times, from tents, mobile accommodations, individual and multi-unit buildings and repurposed social facility buildings. Again, areas used were vacant buildings or vacant land.

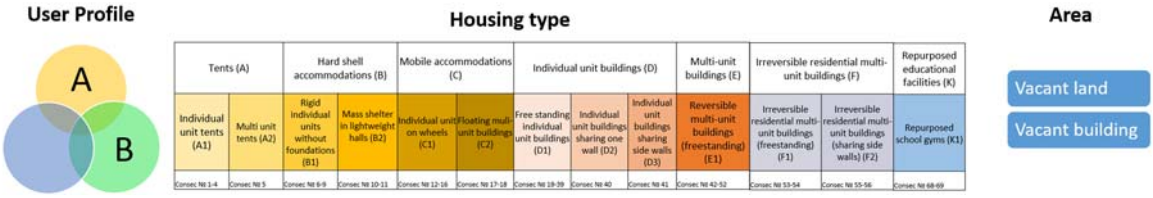


Figure 19: User profile, housing type and area for sudden loss of living space rehabilitated

4.2.2 Sudden loss in living space / not rehabilitated after a certain period

There are also situations, where after a sudden loss in living areas is so severe, that the itial area cannot be rehabilitated. Either the efforts would be to high and costly, or the area is significantly contaminated, so it would pose a health risk. so that there is ultimately the official decision that permanent resettlement must take place from the affected area.

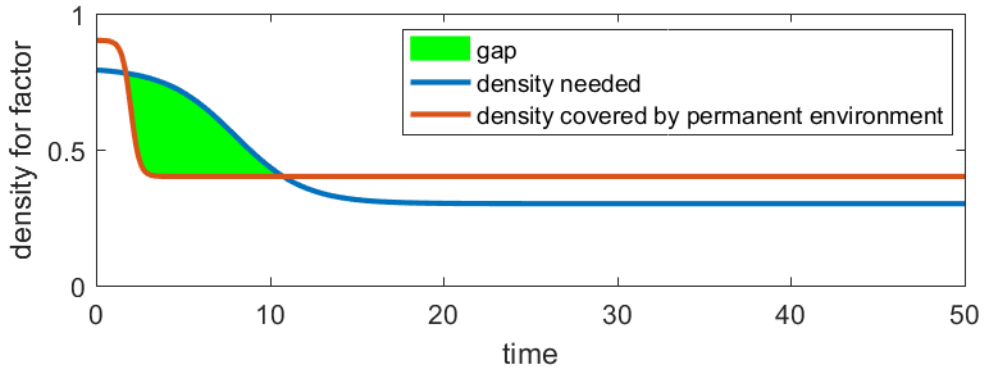


Figure 20: Graph illustrating the sudden loss of living space not rehabilitated

However, in the immediate aftermath of the event, people who lost their homes need shelter. So temporary structures are needed until decisions are made and the whole impact of the event is assessed.

As this is fortunately a relatively rare occurrence, there are no examples which fall into this category collected in the project database. However, examples could be abandoned settlements after hurricane Katrina or the aftermath of nuclear accidents.

4.3 TEMPORARY HOUSING AS "PRE-USE" OF AN AREA TO BE DEVELOPED

If areas in cities are newly developed, this is often a lengthy process. However, the framework conditions are often well defined, detailed plans are available on how a given area should look like in the future. This means the lead time is often quite long, which could be an opportunity for temporary housing, as it allows efficient use of vacant lots, where there are already fixed plans for future permanent housing, but there is a time window open, during which the plot is vacant.

This pre-use of an area can be seen as an opportunity for temporary housing, as it makes best use of vacant lots.

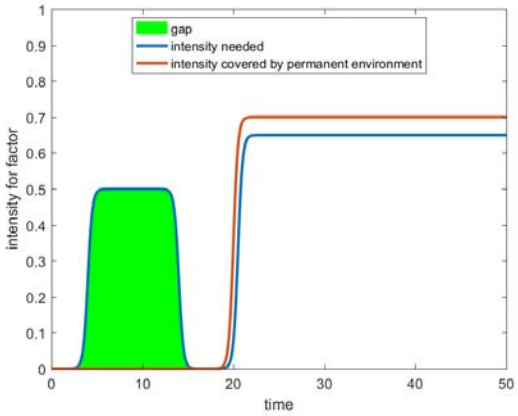


Figure 21: Graph illustrating the pre-use of an area

A prominent example in the database for temporary housing is Nr. 25, Pop-up dorms in Vienna. It is used by user profile C, is a multi-unit building and resides in a vacant lot, that is supposed to be developed in a few years. By then, Pop-up dorms could move to the next vacant lot in the area.

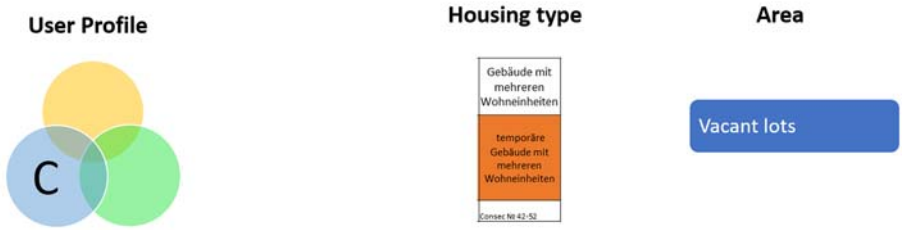


Figure 22: User profile, housing type and area for pre-use of an area

4.4 TEMPORARY HOUSING FOR PERSONAL FLEXIBILITY AND WAY OF LIFE

If the phenomenon of temporary housing is investigated from the perspective of individuals, it can be concluded, that regardless of supply of permanent building area in a city or region, there are people who don't want to commit to permanent structures and rather prefer living temporarily in temporary housing. Often, this is a personal choice for a certain life section, with reasons ranging from: high flexibility, not being tied to a specific place, freedom, mobility, lifestyle, experimentation, etc. In part, the tiny house movement or trailer parks can be cited as examples of this.

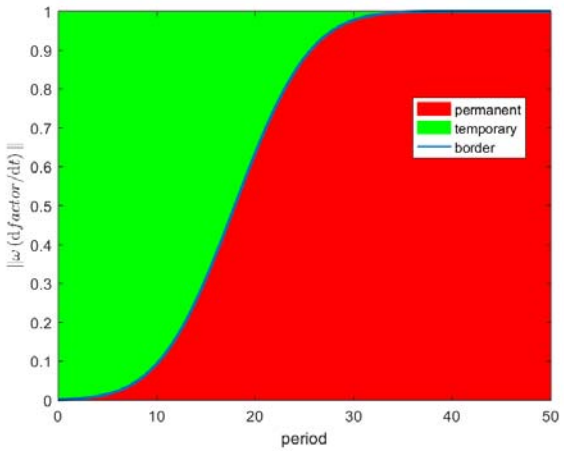


Figure 23: Graph illustrating the use of temporary housing for personal flexibility

In the database for temporary housing, quite several examples fall into this category: 3, 4, 5, 10, 11, 15, 16, 23, 28, 29, 30, 33, 38, 43, 58, 61. As an experimental or niche innovation character is sometime prevalent in these living forms, there might be an inherent bias towards such examples through the focus of this project.

All three user profiles (A, B, C) were part of the examples listed, also the range of housing types was diverse, including tents, lightweight constructions without foundations, mobile

accommodation, single-unit houses and repurposed industrial buildings. Vacant land or vacant buildings were used for this type of temporary living.

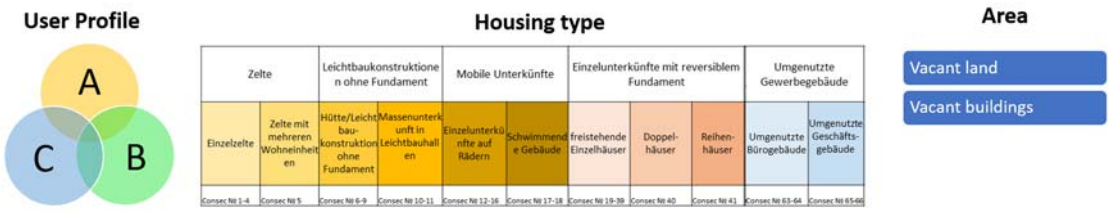


Figure 24: User profile, housing type and area for temporary housing for personal flexibility

4.5 TEMPORARY HOUSING AS ADDITION TO PERMANENT STRUCTURES

The previous pages have shown a diverse field of applications for temporary housing. Often temporary housing is used to fill a gap or imbalance between supply and demand of permanent (or conventional) housing. Taking all this into account, there can still be temporary housing examples be observed that exist, even though the housing demand could be met by permanent housing alone. In these situations, temporary housing represents an addition to conventional living. But sometimes there is a shortage here, in this case for example of affordable living space or an “artificial” shortage of supply for permanent living options (“speculations”).

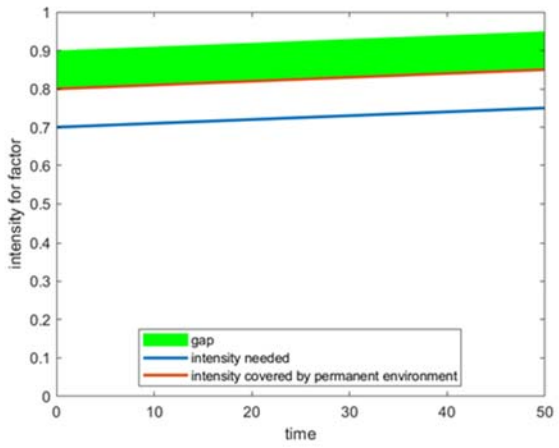


Figure 25: Graph illustrating the use of temporary housing as addition to permanent structures

Examples 15, 18, 31, 37, 52, 60, 66 and 83 represent this type of occasion for temporary housing. All three user profiles might be involved, housing types range from mobile accommodation to single- or multi-unit housing, to repurposed educational facilities. Areas also vary from vacant lots to vacant buildings, repurposed buildings, etc.

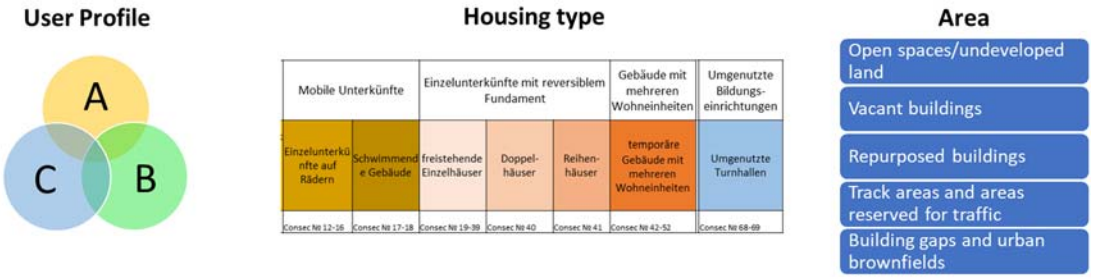


Figure 26: User profile, housing type and area for temporary housing as addition to permanent structures

5 REFERENCES

Agarwal, Bina. 1992. 'The Gender and Environment Debate: Lessons from India'. Feminist Studies 18 (1): 119–58.

Arvidson, P. Sven. 2014. 'Interdisciplinary Common Ground: Techniques and Attentionall Processes'. Issues in Interdisciplinary Studies 32: 170–196.

Biswas-Diener, Robert, and E. D. Diener. 2006. 'The Subjective Well-Being of the Homeless, and Lessons for Happiness'. Social Indicators Research 76 (2): 185–205.

Biswas-Diener, Robert, and Ed Diener. 2001. 'Making the Best of a Bad Situation: Satisfaction in the Slums of Calcutta'. Social Indicators Research 55 (3): 329–52.

Doyal, Len, and Ian Gough. 1991. A Theory of Human Need. Guilford Press New York.

Félix, Daniel, Daniel Monteiro, Jorge M. Branco, Roberto Bologna, and Artur Feio. 2015. 'The Role of Temporary Accommodation Buildings for Post-Disaster Housing Reconstruction'. Journal of Housing and the Built Environment 30 (4): 683–99. https://doi.org/10.1007/s10901-014-9431-4.

Gough, I. 2003. 'Rethinking Human Needs and Well-Being'. WeD Newsletter 1 (2): 1–2.

Johnson, C. 2007. 'Impacts of Prefabricated Temporary Housing after Disasters: 1999 Earthquakes in Turkey'. Habitat International 31 (March): 36–52.

Kriz, Jürgen. 2008. 'Gestalttheorie Und Systemtheorie'. In Gestalttheorie Aktuell, edited by Hellmut Metz-Göckel, 39–70. Wien: Krammer.

Langefors, Linda. 2018. Welcome Home, Please Leave Soon: Exploring Temporary Housing in the City of Stockholm. http://urn.kb.se/resolve?urn=urn:nbn:se:kth:diva-234229.

Maslow, Abraham Harold. 1943. 'A Theory of Human Motivation.' Psychological Review 50 (4): 370.

Max-Neef, Manfred A., Antonio Elizalde, and Martín Hopenhayn. 1991. Human Scale Development: Conception, Application and Further Reflections. New York: The Apex Press.

McGregor, J. Allister, Laura Camfield, and Alison Woodcock. 2009. 'Needs, Wants and Goals: Wellbeing, Quality of Life and Public Policy'. Applied Research in Quality of Life 4 (2): 135--154. https://doi.org/10.1007/s11482-009-9069-7.

Nussbaum, Martha C. 2009. 'Creating Capabilities: The Human Development Approach and Its Implementation'. Hypatia 24 (3): 211–15.

Quarantelli, E. L. 1995. 'Patterns of Sheltering and Housing in US Disasters'. Disaster Prevention and Management: An International Journal 4 (3): 43–53. https://doi.org/10.1108/09653569510088069.

Streeten, Paul. 1995. 'HUMAN-DEVELOPMENT-THE DEBATE ABOUT THE INDEX'. International Social Science Journal 47 (1): 25–37.

Wolf, J., Audrey Burnam, Paul Koegel, Greer Sullivan, and S. Morton. 2001. 'Changes in Subjective Quality of Life among Homeless Adults Who Obtain Housing: A Prospective Examination'. Social Psychiatry and Psychiatric Epidemiology 36 (8): 391–98.

6 FIGURES AND TABLES