“RZ MITMACHEN”
Minimal makes Maximal

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This paper focuses on the DDRs computer data centre in Potsdam, in the following referred to as “Rechenzentrum”. It discusses how an existing building with a historical context, being part of the cities political debate can be repurposed. Using the LCA method, the advantages and disadvantages of reuse and renovation compared to (partial) demolition are discussed and also put in context with the future usage.

1. Rechenzentrum in context

The Rechenzentrum, a building less than 15 minutes away from Potsdam's main train station, has become the subject of controversy in recent years. Citizens, users, but also politicians and activists discussed whether the DDR building in the centre of the city has a right to exist. This debate was and is not an exception in Potsdam. Demolition and historical reconstruction dominated the design decisions in the city centre.[1] Due to the growing resistance of citizens and users against the handling of existing buildings being demolished, politicians ultimately decided in favour of preserving the building.[2] The controversy started by the Stiftung Garnisonskirche plan to rebuild the bombed nave. At that time, part of the nave stood on the site of the current Rechenzentrum. Therefore, the Rechenzentrum was to make way for the planned reconstruction. But since 2015, the former data processing centre is no longer empty. In the meantime, the structure is used by creative and cultural workers. Originally, the lease was approved by the city as an interim use for three years. Due to the louder voices in favour of preserving the data processing centre (e.g. FÜR e.V.), this lease has now been extended. The city decided that a building with mediating function between Garnisonskirche and the Rechenzentrum should be built. The proposal is for a House of Democracy, where Potsdam's politicians will also hold regular meetings.

This was the context in which our design task lay. Even before the politicians made any decisions and at a time when the mood was correspondingly much more tense, we investigated responsible solutions for the preservation of the building.

2. Design proposal

By mapping the situation of the RZ and the needs of the users we got a better feeling for the necessities the place needed. Even though everything seems kind of improvised, users love the place and the community.
Through the deep analyse of the context and the existing building, we quickly agreed on our approach. It was important for us to think of the current users of the Rechenzentrum as key stakeholders.
Since many things already work very well and are self-organised, we want to try to expand and spatialise uses through minimal intervention. The simple basic structure of the building allows us to break out of the grid and thus generate new spaces and qualities. To guarantee the ongoing usage while renovating and to keep the community’s ability of financing the project by themselves a key part is to renovate the building in different phases and therefore stretching the financial load.

Typical for DDR buildings, the Rechenzentrum consists of a robust concrete skeleton structure. The five floors form a ring enclosing an inner courtyard. Remarkable is the “Mittelflur” floor plan, which separates the rooms into the courtyard rooms and the rooms aligned to the city. In its current state, the ground floor is accessible only through a small entrance door. The public nature of the building is not reflected in the appearance of the ground floor. Many walls have been bricked up, as parts of the Rechenzentrum have already been demolished. The only public space besides the small sales room is the “Kosmos”. Here discussions are held, events are organised and small exhibitions are shown. A large part of the ground floor has a different level and were originally technical rooms, which are no longer used. An important part of the public appearance is the mosaic that is spreading over almost half of the facade on the street level. Monument protection was set up for the mosaic and the trafo doors.[3]

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[1] Sanierungsträger Potsdam GmbH: Integriertes Leitbaukonzept, https://www.potsdamermitte.de/index.php?id=32, accessed 18.08.2022
[2] Degener, Peter: Garnisonkirchen-Kompromiss: Mehrheit für das Forum an der Plantage in Märkische Allgemeine Zeitung, https://www.maz-online.de/lokales/potsdam/garnisonkirchen-kompromiss-mehrheit-fuer-das-forum-an-der-plantage-VP6FEL2KNUOAXF7V6XA372QDWI.html, accessed 18.08.2022
[3] Hauf, Gottfried und Tschesch, Kristina: ÜBER-ECK – Bauerbe der DDR, https://rz-potsdam.de/cms/umgangmitmosaik/, accessed 18.08.2022

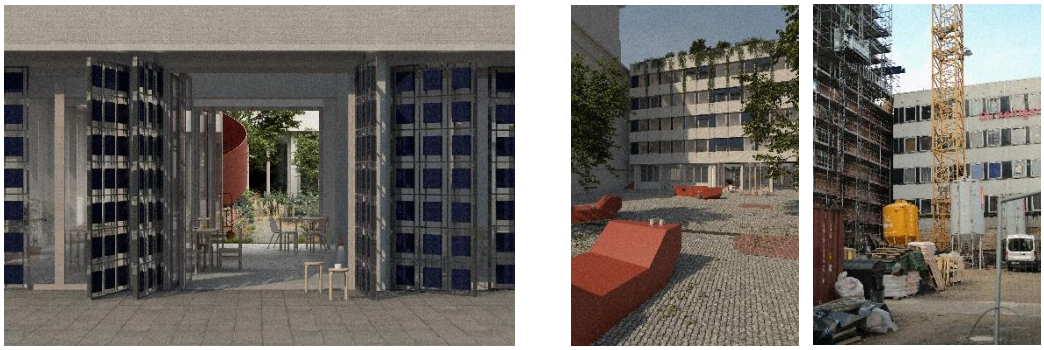

Figure 1.from left to right; trafo doors opend up to passage, city square after and before renovation

To generate an accessible building for the whole city, the biggest changes are made on the first floor. The aim is for it to become an important part of the urban society and thus indispensable. A passage from east to west will enable guests to discover a wide variety of workshops as well as event rooms and a canteen from the inner courtyard. As an essential element of the facade the protected trafo doors on the west side will be opened up. [1] In order to guarantee the independence of the users, these doors can also be closed to offer workshops etc. but at the same time still guarantee a view into the interior from the street. On the east side an open canteen is formed for the users of the RZ but also for the people working in the Garnisonskirche as well as citizens. [2]

The historical context is made visible on the new city square between the RZ and the Garnisonskirche. The imprints of the demolished buildings are shown by different floor coverings.

On the upper floors, the interventions are limited to minimal changes. The division into four fire compartments, made possible by the new staircases, will allow a new use of the corridor. Through the deliberate demolition of individual walls, the corridors are to be enhanced, illuminated and made usable. This will create new qualities, which leads to better exchanges between users. The tea kitchens adjoin the corridors and become new common spaces. The staircases link the different floors and, above all, create a connection to the rooftop floor. Because the staircases are external the roof can be accessed independently.

The roof will be upgraded for energy efficiency and converted to a green roof. This will also allow non-human actors to enter the existing building. In addition, different material cycles can be spatialised here. Rainwater can be collected and either evaporate or be collected and used to irrigate the plants. The organic waste of the house can be collected at compost spots and thus produce soil for the flower beds and provide space for birds and insects. A small bar made of scrap wood provides entertainment on the roof and invites to events. The roof is treated as a fifth facade to attract people looking down from the tower of the Garnisonkirche to the roof of the RZ. With gardening beds on the roof, the façade is greened. The original lesene of the Rechenzentrum are reinterpreted and replaced by plants that can grow on red wires.

Besides the roof, also the windows need energetic renewal. The facade will be updated through changing the windows to wood windows and treating the plaster with a brush stroke pattern. A new depth is formed through a new insulation on the outside and playful awnings ensure the protection from the sun, which are highly efficient without adding electric technology.

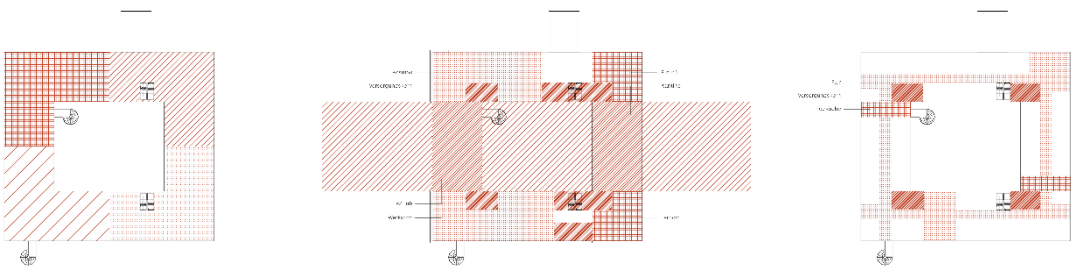

Figure 2. from left to right; fire compartments, ground floor usage with passage, upper floors with tea kitchen and common areas

The renovation is to be carried out in different phases. The equalisation of the construction process should allow cost sharing and ensure the ongoing operation in the construction process. Users can share their rooms for a short time as there are many different time schedules of the users. The operating system for the Rechenzentrum demonstrates how the new spaces can function and how the RZ can be used in a socially sustainable way. Different responsibilities are being clarified and recurring events are proposed that involve the urban community.

3. Life Cycle Assessment

The life cycle assessment considers the Global Warming Potential (GWP), as well as the total primary energy demand (PEges) of the existing Rechenzentrum in Potsdam and the associated design RZ-Mitmachen. All values

were calculated with the life cycle assessment tool eLCA (www.bauteileditor.de), which uses the ÖKOBAUDAT data sets. All values refer to the total net floor area (NFA) of 7560 m2, and a balance period of 50 years.

3.1 Global Warming Potential (GWP)

The GWP of the existing building is 3367.96 t CO2-equivalent (t CO2-eqv.). Whereby 2518.87 t CO2-eqv. are due to manufacturing, 229.15 t CO2-eqv. to waste recycling, 22.86 t CO2-eqv. to disposal and 597.08 t CO2-eqv. to maintenance. The GWP of our design is 3832.84 t CO2-eqv. Whereby the shares of production, disposal and maintenance are clearly distributed differently.

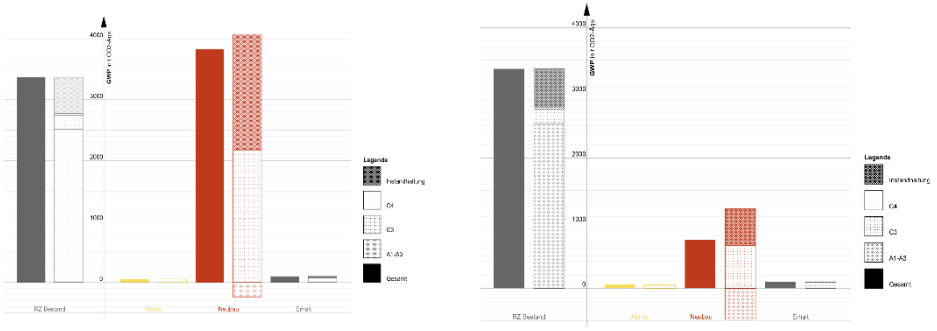

Figure 3. GWP - comparison of the existing building with the design, divided into demolition, new construction and preservation; **Figure 4.** GWP - comparison of the existing building with the design, divided into demolition, new construction and preservation, if wood fiber insulation is not burned but recycled.

The GWP of the newly constructed building parts from manufacturing is -239.35 t CO2-eqv., from waste recycling 2173.65 t CO2-eqv., from disposal 5.95 t CO2-eqv. and from maintenance 1892.59 t CO2-eqv. The negative GWP in manufacturing can be attributed to the use of wood and wood fiber insulation. By using renewable raw materials, CO2 can be sequestered at this point. Much of the GWP can be attributed to the wood fiber insulation as shown in Figure 3 and 4. The life cycle assessment tool eLCA foresees the incineration of the wood fiber insulation and other wood-based materials. If we assume that the wood-based materials are recycled and returned to the cycle, the diagram [3] can be adjusted. The GWP of the new building will decreases significantly [4].

3.2 Total primary energy demand (PEges)

In the case of our design, the PEges of 110,398,610.1 MJ is significantly higher than the PEges of the existing building of 40,963,982.9 MJ. On the one hand, this can be explained by maintenance. Many of the materials required for the energy retrofit have a lifespan that is shorter than the balancing period of 50 years. As a result, all the new elements we propose must be replaced once in the life cycle period of the building, and therefore primary energy demands of maintenance is nearly as high as the primary energy demand of manufacturing. Through appropriate maintenance and care, the lifespan can be extended if necessary and the values for maintenance can be reduced. Furthermore, it should be noted that the existing building from DDR times is almost uninsulated and does not correspond to the current state of the art. A comparable new building made of reinforced concrete, considering the current state of the art and the Building Energy Act (GEG), would achieve a much higher primary energy requirement.

4. Conclusion

In the component analysis, the new materials, such as insulation, have high CO2 emissions and a high total primary energy requirement. Therefore, it is especially important to use materials whose energy can be transported back into the recycling circuit. This means that the energy consumption of the newly built elements is initially higher than those of the existing building but can be compensated by appropriate recycling. The materials used in the existing building do not allow this possibility.

Even if the CO2 amounts and energy amounts in relation to the existing building seem alarmingly high at first, the disposal of the raw materials considered in the program must be looked at more closely and their potentials explained [3,4]. In addition, it must be considered that a completely new building with tons of new concrete in the ceilings and walls is more harmful for the preservation of our planet. In addition, the existing building would have to be demolished. The problems lie not only in the mass of the material, which could not be recycled or only to an extremely small extent, but also in the supply of the new building materials. Where do the new materials come from? Removing the debris also requires resources. The proper disposal of the non-recyclable elements cannot be done on site.

Nevertheless, the diagrams [3,4] show that remediation has an impact on the environment. Therefore, we planners should carefully consider or calculate which elements must be removed and which are worth preserving. In our specific case, this means, to what extent is the complete opening of the first floor and the levelling of the height necessary to ensure long-term preservation? Further developing of the concept could lead to only opening the east-west axis and preserving the small-scale structures in the north and south of the first floor. Also in the

upper floors, the possibilities can be explored to limit the common areas, to tea kitchens and a wider zone. Nevertheless, it seems important to us to increase the quality of the building in order to convince those who are also pro-demolition for long-term preservation. In addition, the demolition in relation to the new construction is only a small part of the GWP and PEges.

However, the energy-related renovation measures, which make up the main part, are mandatory. These include insulation and replacement of windows. Only in this way can the energy demand of the building be greatly reduced and the heating requirements of the building can be lowered. Especially considering the rising prices, this is not only a purely ecological argument, but also economic.

All in all, it can be said that our design is reduced to the minimum and only necessary interventions. The measures for the energetic renovation and for the desealing through the greening of the flat roof are necessary from an ecological and economical point of view. The individual interventions that go beyond the energetic renovation make up an insignificant part of the life cycle assessment and, from the user's point of view, are a great benefit for everyday life in the Rechenzentrum, which is why we also consider them necessary.