GRENSEN 2030: CIRCULARITY APPARATUS

Grensen 2030: circularity apparatus

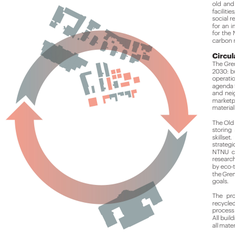
Grensen 2030 is a welcoming and vibrant place in Trondheim: it carefully preserves the existing built and green structures by giving them the new meanings and adapting to face the challenges of the future, responsibly integrates the new structures designed to foster biodiversity and human interaction, prioritizing sustainability, upcycling and circularity.

Grensen 2030 places the synergy and continuous exchange between the existing and new at the focal point for its design. By taking this approach as a starting point, the project becomes a precedent for how the integration of the historical environment with the contemporary technologies can establish a long-term resilient framework dealing with the climate challenges and at the same time creating a new identity and a strong community: the circularity apparatus.

Welcome to Grensen

The site is strategically located in the current geographical center of Trondheim along the fast growing vector of the NTNU Campus development plan 2028. Currently Grensen is not on a periphery, but occupies the central location with a potential to weld together the fragmented urban environment between the City and the Campus.
Grensen 2030 proposal offers a synergetic integration and opens up the campus to its surroundings. Adaptable public infrastructure strengthens the interdisciplinarity exchange and facilitates a biodiverse development of the campus environment.

The Grensen area is particularly charming due to its authentic character and human scale environment enriched by passages, backyard structures, expressed entrances, staircases and wooden canopies. Taking inspiration from the existing site character, the design proposal suggests families of clusters floating in a stream of passages, streets and squares. The project Grensen 2030 creates an adaptable, resilient, and inclusive urban scheme: it offers spaces for organic growth within old and new structures, mixing the technological workshops, public facilities, student residences, and cultural and event spaces. Rising social responsibility towards the circular economy lays the foundation for an interactive and inclusive area, as well as a new testing ground for the NTNU campus, directing Trondheim into the forward-thinking, carbon neutral future.



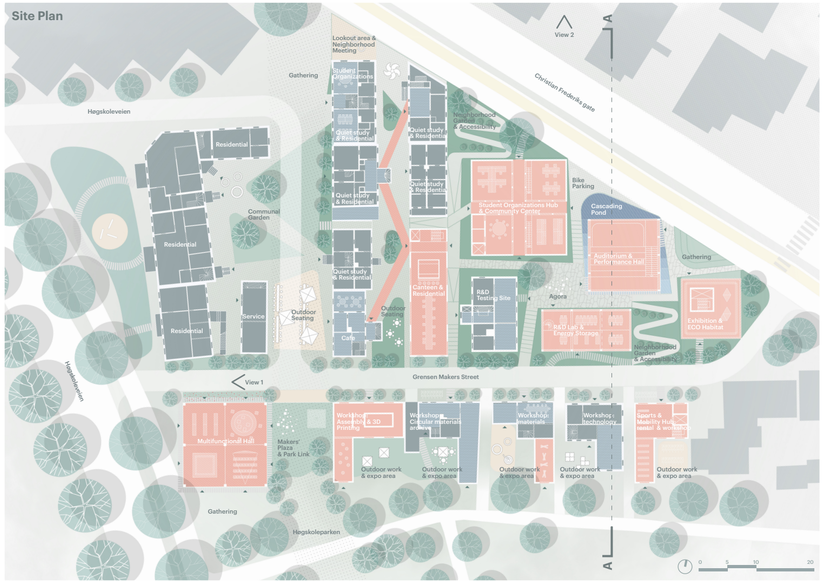
Circular Campus

The Grensen 2030 is a circular city aiming to achieve Zero Net goals by 2030: built from the carbon storing materials, with the limited carbon operational emissions, with a little to no waste. Grensen 2030 sets up an agenda for collaboration around the Zero Net future between students and neighboring communities, creating circular initiatives and reuse marketplace: trading furniture/objects for renovation, or donating as a material to workshops and testing labs.

The Old Grensen has something to learn from: it is built from the carbon storing materials, locally sourced, and assembled with the artisan skillset. Grensen deserves a fair treatment and a carefully crafted strategy for recovery plan. Co-existing in close proximity, Grensen and NTNU campus have accumulated knowledge, verified by years of research and testing. The knowledge synergy of the two, enhanced by eco-technological strategies can support gradual transformation of the Grensen area towards the 2030-2050 UN Sustainable development goals.

The proposed new site developments are partially composed of recycled materials discovered in the renovation and adaptation process of Grensen, and are designed for an easy future disassembly. All buildings are provided with a digital building passport to ensure that all material information is properly recorded and available for upcycling.

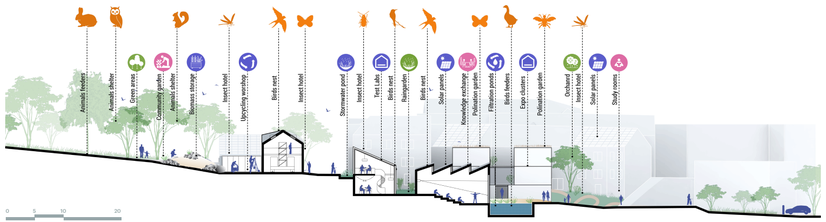
Site Plan



Axonometric view from North-East

View 1. Grensen Makers Street and park link

Site section A-A



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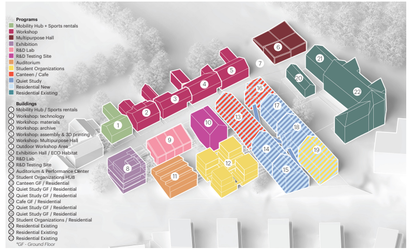


View 2. Porosity towards Christian Frederiks gate

Process and Phasing

Collaborative process ensures that visions of all parties involved are embedded and translated into the built and natural environment. This takes place through a comprehensive user involvement and design process with focus on a clear distribution of roles, transparency and progress in the work process. This includes participatory programming through workshops and interviews with the representatives of the potential site users, both direct and indirect. Proposed project programming is rather a guiding framework principle, and needs to be further clarified within the phasing.

Phase 1: Data and Analysis
Phase 1 is starting from creating a database and archive of the present conditions of the existing buildings and materials, their conditions and needs for replacement/upgrade and upcycling potentials. This forms a base for the guidelines for the application of low carbon emitting materials, carbon storing materials, recycled and reclaimed materials, which significantly reduces the emissions and cost associated with manufacturing and installation of the new construction products.
In this phase, extensive analytical and planning work is performed to prepare an efficient plan for the entire process.

Phase 2: Design and Adaptation
The adaptation of existing and design of the new buildings aim to achieve the net zero carbon goals for 2030 and 2050. Implementing the sustainable technologies and knowledge developed by NTNU, the new developments become a laboratory for the interdisciplinary experiments involving faculties of buildings design, engineering, information technologies and other related parties. Data collected during the design, development, construction and operation will be used for analysis, optimization and adaptation of the future processes. The nucleus for social interaction and circular construction is established by upgrading two existing buildings to café & residences and R&D circularity testing site, enhanced with the addition of the three new structures: multipurpose hall, assembly workshop, and mobility hub integrated with the sports equipment rentals. Landscape works are in progress turning the site into an inviting garden where nature thrives with water management systems in place.

Phase 3: Construction and Upcycling
Active simultaneous co-design and construction processes stimulate the synergies between all involved stakeholders in order to fulfill the program needs for the construction of new clusters.
Facilities necessary for the fully functional circularity processes are complete along the Makers Street, including the adaptation of the existing premises to various workshops together with the new R&D Circularity Lab. Public facilities in the existing buildings are open, including the quiet study rooms and the canteen activating the ground floors together with additional residential premises on the floors above. More natural and green structures are added for enhancing the biodiversity and further integration of nature with the built structures.

Phase 4: Testing and Living
By 2030 Grensen is a fully operational circularity hub and a living lab, where knowledge is exchanged and tested on a daily basis. Vision for the inclusive eco-habitat and a meeting place for campus and the city is fulfilled. The site is a new home not only to residents and users of the area, but also to various flora and fauna species forming thriving natural habitats.
Natural integration powerhouse - ECO Habitat building hosting the Exhibition Hall - is completed, together with Auditorium & Performance center with its cascading filtration pond and energy generating structure, and the Student Organizations Hub where various NTNU departments work closely together, equipped with water storage for irrigation and reuse. These venues establish a new friendly frontage towards the city along the Christian Frederiks street, with multiple gardens and meeting points inviting everyone to take part and contribute to the Grensen 2030 project.

Place-defining clusters

With respect and care for the existing buildings the new program is inserted in an acupuncture method activating the surrounding and facilitating the exchange. Drawing inspiration from the existing buildings on the site, the proposed architectural strategy is not composed of autonomous buildings, but rather of interconnected clusters of diverse volumes and functions. Surrounding and defining public spaces, they consist of blocks of different shapes and heights. Each cluster has an identity corresponding to a program and purpose on a site.

With a strong focus on testing, reusing, and re-inventing, the types of programs that activate the area range from student residences, fabrication laboratories, makers workshops, exhibition spaces, recreation and sport facilities, unions and municipal offices. By mixing the student occupied facilities with the public it is ensured the 24 hours cycle of life. Grensen is pulsating with life!

The main challenge of the successful design is integrating new developments while maintaining a sense of belonging between the existing and new buildings. The optimal balance is achieved by using the potential of existing facilities and interlocking the program through adaptation and new clusters of development in a span of time. Proposal visualizes a spatial framework for the interdisciplinary collaboration and facilitates knowledge exchange between students and researchers, and between academia, business and the local community.

Interconnected Grensen

Interconnected, stream of urban energy of Grensen is an inclusive space in between. The public space perceiving the neighborhood and connecting to the city. It is a striving social interface between the neighborhood, Grensen and the campus, and an eco-habitat, absorbing and retaining water and serving as a home for a wild species.

The streets and squares of the masterplan are defined by the surrounding architectural volumes, both new and existing. The design solution distributes passages, alleys, inner streets, squares and courtyards throughout the site changing scale from residential to urban. It facilitates more connections and new entrances, promoting a walkable and accessible space of a human scale that is designed around public and student life areas. These outdoor spaces are well-defined from project onset and create an interconnected network.

The ground floor of existing residential buildings is transformed to accommodate the shared student facilities (study rooms, cafes, workshops etc). The increased density of workspaces on the ground floor facilitates conditions for interaction and exchange: workshops, makers and other logistic facilities (inside and outside), while housing, shared and semi-private spaces are located on upper floors. The Grensen 2030 is an interconnected ecosystem, where energy, water, working space, and waste solutions are shared within clusters of the built environment.

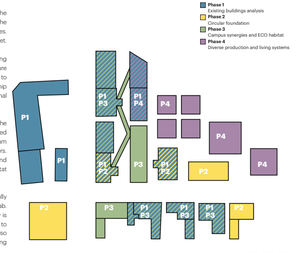
Sustainability and biodiversity

Grensen 2030 is a decarbonized Near Zero Net energy site with a resilient ecosystem. Each building plays a particular role in contributing to the overall performance goal, becoming a testbed for various sustainability aspects. Combined, these structures form a sustainability superpower: the Circularity Apparatus.
All buildings accommodate elements to boost the site's biodiversity: bird feeders, animal shelters, and pollination roof gardens. Buildings' are upgraded with photovoltaic panels. Energy storage is provided in the R&D Lab, water storage in the Student Hub, green roof with a the Multipurpose Hall, solar technologies in the Auditorium. Robust ECO-habitat is established at the Exhibition Hall, dedicating the outer layer to a vertical garden. Landscape design further empowers the green vision: rain gardens and green surfaces store rainwater. Hardscape materials are porous allowing for the efficient water runoff, and excessive water is directed to the filtration pond in front of the Auditorium for further storage and reuse for irrigation and other needs.

Phasing

Phase 1: Creating a database for the existing buildings, documenting the conditions of materials and structures. Estimation of upcycling, planning, budget.

Phase 2: Designing and constructing the supporting upcycling infrastructure (adaptation and construction) in order to create the first precedents for donorship and circular construction. Functional residences and community nodes.

Phase 3. Stimulates synergies in the co-design process within all involved stakeholders in order to fulfill the program needs for construction of the new clusters. Ground Floor Students facilities and workshops are operational. ECO habitat framework is established.

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