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Building a climate-neutral future together

Sino-Swiss Cooperation on Zero Emissions Building

Technical Report

Zero Emissions Districts

Swiss Experiences

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让我们共同打造气候中和的未来
Building a climate-neutral future together

This report has been produced within the framework Sino-Swiss Zero Emissions Building Project; an international collaboration funded by the Swiss Agency for Development and Cooperation in partnership with the Chinese Ministry of Housing and Urban-Rural Development.

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The Sino-Swiss Zero Emissions Building Project is an international collaboration funded by the Swiss Agency for Development Cooperation in partnership with the Chinese Ministry of Housing and Urban-Rural Development. The project aims to reduce greenhouse gas emissions and enable carbon neural development of the building sector in China by sharing Swiss know-how on sustainable and zero emission building.

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Cover image: Architectural rendering of Shanghai Jiading Future City. Courtesy Shanghai Jiading Future Property Co., Ltd

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1. PROJECT BACKGROUND

About Sino-Swiss ZEB Project

In order to jointly address global climate change and to strengthen cooperation between China and Switzerland in the field of emission reduction in the construction industry, the Ministry of Housing and Urban-Rural Development of the People' s Republic of China and the Swiss Federal Ministry of Foreign Affairs signed a Memorandum of Understanding (MoU) on 24 November 2020. The Memorandum is about the development of cooperation in the field of building energy efficiency. Within the framework of this MoU, the Swiss Agency for Development Cooperation (SDC) initiated and funded the Sino-Swiss Zero Emission Building Project. The project aims to support China in formulating the technical standard of zero carbon buildings and long-term roadmaps for reducing carbon emissions in the construction industry. Switzerland contributes by sharing know-how and use cases of zero emission building demonstration projects in different climate zones, while carrying out various forms of capacity building activities, so as to ultimately promote the carbon-neutral development of China' s construction industry.

Project purpose

- Upgrading existing building energy efficiency standards to Zero Carbon technical Standards
- Implementing demo projects in 4 typical climate zones for testing the new ZEB standards and finding optimization potentials
- ZEB capacity building and knowledge dissemination

Project duration

- Phase I: 15. Mar. 2021 – 28. Feb. 2025

Project impact on climate protection

- Reduce CO2 Emission in building sector

Contribution of FHNW to the Sino-Swiss ZEB Project

The contribution of the FHNW Institute Sustainability and Energy of Constructions (INEB) is to develop ZED implementation guidelines of Zero Emission District (ZED) with specific thematic focusses and advice planning teams of selected Demo Project (DP) projects of Sino-Swiss ZEB Project.

FHNW conducted working meetings and lectures on sustainability in district development and visited some Sino-Swiss DP projects in China and gave practical inputs. Additionally, different Swiss district labels and the Chinese ZED Standard have been compared and the differences compiled. A booklet with the title "Overview of Sustainability Criteria" has been developed that addresses the main aspects for designing and operating sustainable districts. It gives a broad inside in all different sustainability aspects. Based on this booklet a survey was developed to obtain more information on the attitude towards the different sustainability criteria as well as the specific implemented measures in the DP Projects.

Content of this booklet

This booklet explores the pressing necessity for sustainable action in the face of global climate challenges and emphasizes the pivotal role of district-level development in achieving systemic and impactful solutions. Districts offer unique opportunities to address energy efficiency, mobility, resource management, and community well-being in a holistic and scalable manner, making them essential for progress toward zero-carbon emission goals.

Through an in-depth analysis of Swiss district labels – Minergie, SNBS, and the 2000-Watt District – and the ZED China standard, the booklet identifies nine universal Sustainability Criteria. These criteria provide a structured framework to evaluate and guide sustainability efforts across diverse district-level projects, bridging Swiss and Chinese priorities.

To test the applicability of this framework, a sustainability survey was developed and conducted in regards of the Chinese district projects. The survey highlights how these criteria are being implemented on the ground, showcasing successful measures while uncovering areas of untapped potential. The findings offer valuable insights into practical strategies and stakeholder alignment, emphasizing opportunities for scaling up impactful actions.

Finally, the booklet transitions into real-world applications, presenting three exemplary district projects in China – Wuxi Fund Park II, Jiading Future City in Shanghai, and the Yinyue Zero-Carbon Building in Beijing – and two innovative Swiss districts certified as 2000-Watt Districts. These case studies illustrate how sustainability principles are effectively applied in different contexts, providing inspiration for the global advancement of sustainable, vibrant and resilient urban communities.

2. GLOBAL CHALLENGES

This chapter provides an overview of the global challenges we face today and highlights the opportunities available at the district level to address them effectively. The journey from industrialization to the present has shaped the world' s environmental challenges and created the foundation for the solutions we must now implement. This chapter sets the stage for the next by illustrating how global challenges and policy frameworks influence local action.

2.1. From Industrialisation to Climate Change

The Industrial Revolution of the 19th century, which transformed many Western countries, marked the beginning of an era that profoundly reshaped modern life. The extensive use of fossil fuels such as coal and oil drove unprecedented economic growth but also caused significant environmental issues. This era laid the groundwork for today' s global challenges, including air pollution, overexploitation of natural resources, and rapidly increasing CO2 emissions.

Switzerland' s industrialization, though resource-constrained, was no less transformative. Driven by innovation in textiles, machinery, and later pharmaceuticals, Switzerland relied heavily on hydropower rather than fossil fuels due to its geographic limitations. However, urbanization and industrial growth still led to localized pollution and environmental strain, particularly in its Alpine ecosystems. Switzerland' s early adoption of renewable energy and environmental policies positioned it as a pioneer in tackling climate-related issues.

China, on the other hand, underwent a rapid transformation starting in the 1980s, evolving from an agrarian society into one of the world' s largest industrial powers. Urbanization and industrialization brought economic prosperity and infrastructure development but were accompanied by severe environmental degradation. The reliance on coal-fired power plants and a skyrocketing demand for energy led to significant air and water pollution and a growing ecological footprint.

While Switzerland' s gradual industrialization allowed for early adjustments, China' s accelerated pace presents both challenges and opportunities for swift, large-scale implementation of sustainability measures.

2.2. Political Initiatives towards more Sustainability

As the environmental consequences of industrialization became increasingly apparent, the global community began addressing these issues with coordinated initiatives. Over the past few decades, scientists and policymakers have called for urgent measures to mitigate climate impacts, leading to pivotal milestones such as the First Assessment Report by the IPCC (1990) and the 2015 Paris Climate Agreement.

The Paris Agreement seeks to limit global warming to well below 2°C above pre-industrial levels, with an aspirational target of 1.5°C. Achieving this requires substantial reductions in greenhouse gas emissions, aiming to reach a balance between emissions released and emissions removed by natural or technological means by the second half of the 21st century. Both Switzerland and China, as signatories to the agreement, have pledged ambitious national goals to contribute to this global effort.

Switzerland has committed to achieving net-zero emissions by 2050, while China aims to reach this target by 2060. These net-zero pledges mean that neither country will emit more direct greenhouse gases into the atmosphere than can be absorbed or offset through natural processes, such as reforestation, or technological solutions like carbon capture and storage.

While these national targets align with the overarching goals of the Paris Agreement, they represent independent strategies tailored to the specific needs and capabilities of each country, underscoring their commitment to combating climate change on a global and national scale.

To achieve net-zero targets, major emission reductions must occur in key sectors:

- Buildings: Improving energy efficiency and reducing emissions in construction and operations.
- Transportation: Transitioning to sustainable mobility solutions and reducing reliance on fossil fuels.
- Industry: Implementing circular economy principles and energy-efficient production methods.
- Agriculture: Adopting sustainable farming practices and reducing food-related emissions.

Both nations have made significant progress toward these goals, demonstrating a shared commitment to combating climate change through sector-specific solutions and forward-thinking policies.

2.3. Districts Development for more Climate Protection

As global frameworks like the Paris Agreement emphasize the urgent need to reduce emissions, targeted, scalable solutions are essential. While individual buildings play a crucial role, the potential for significant impact lies in the development of entire districts.

The built environment contributes significantly to global emissions, making it a key focus area for achieving net-zero goals. District-level strategies enable a systemic approach, addressing emissions not only from buildings but also from energy supply chains and daily mobility patterns. This integration offers a unique opportunity to optimize energy efficiency, reduce lifecycle emissions, and enhance sustainability on a larger scale.

Focusing on districts rather than individual buildings offers the unique advantage of maximizing synergies across key sectors, including energy generation, mobility and land use. By integrating these elements, districts allow for more effective climate protection strategies by addressing emissions and sustainability holistically. District-level planning combines emissions from multiple sectors—buildings, mobility, and construction—and extends the scope of climate action to include:

- Energy Generation: Shared systems for heating, cooling, and electricity enable more efficient use of renewable energy for HVAC and power supply.
- Everyday Mobility: Sustainable transport solutions at the district level reduce reliance on fossil fuels for daily mobility.
- Construction Industry: By addressing the entire life cycle of building materials and construction processes, district development significantly reduces emissions.
- District-level planning also delivers additional sustainability benefits that go beyond reducing direct greenhouse gas emissions:
- Resource Efficiency: Shared infrastructure and circular economy principles optimize the use of materials, land, and energy while providing diverse amenities for daily needs, promoting localized living and reducing unnecessary travel.
- Community Building: Integrated spaces promote social cohesion through participatory planning and shared amenities.
- Well-Being: A mix of green spaces, diverse amenities, and sustainable transport improves the quality of life for residents.

District-level development provides a scalable and impactful model for achieving net-zero targets and fostering vibrant, sustainable communities. By integrating environmental, social, and economic dimensions, districts become a cornerstone of holistic climate action and a path to a more sustainable future.

Figure 1: Swiss experts at Nanshan Energy Ecological Park in Shenzhen (Source: intep-skat.)

3. SWISS AND CHINESE DISTRICT STANDARDS

Districts are key to advancing sustainable urban development, offering systemic solutions to reduce emissions and optimize resource use. This section introduces three Swiss district labels alongside the ZED China standard. The focus lies on presenting each label' s unique approach, identifying shared principles, and examining areas where practices differ. Insights are provided into gaps within each system and opportunities for mutual learning, showcasing how Switzerland and China can further strengthen their efforts in sustainable district development.

3.1. Swiss District Labels

Switzerland has three different district labels: Minergie, Swiss Sustainable Building Standard (SNBS) and 2000-watt district.

Compared to Minergie, the district labels of SNBS and 2000-watt are more comprehensive sustainability standards. All labels include energy efficiency measures, the use of renewable energy, sustainable construction and mobility concepts. Important principles are the reduction of energy consumption in buildings, promotion of public transport and bicycle infrastructure as well as the use of local and sustainable resources.

Minergie is already present in China. In 2024 the first Minergie-A pre certificate is awarded to the Sino-Swiss ZEB demonstration building "Shenzhen Nanshan Cultural and Sports Centre" on the grounds of the Nanshan Energy Ecological Park in Shenzhen.

Minergie-A is a building related label that requires among other aspects a net zero annual energy balance. According to current calculations, the demonstration building produces more energy than it needs over the course of a year.

Minergie focuses on energy efficiency, comfort and the use of renewable energy and sustainable materials. In Minergie districts, the majority of the buildings must be certified with one of the Minergie building standards and therefore meet high standards of comfort, efficiency and use of renewable energy. In addition, requirements for the outdoor space, mobility and district organization/monitoring are defined.

The Swiss Sustainable Building Standard (SNBS) is a comprehensive approach to sustainable building that integrates ecological, economic and social aspects. Each main aspect includes a lot of criteria. The planner can choose which criteria are addressed and to which extent. To fulfil the district requirements a certain number of points must be reached in each main aspect. Depending on the total point, a silver, gold or platinum certificate can be achieved.

A 2000-Watt District is a sustainable urban neighborhood aimed at reducing energy consumption per person to an average of 2000 watts and limiting CO2 emissions to a maximum of 1 ton per capita and year. This is achieved through energy-efficient buildings, renewable energy, sustainable mobility concepts, and recycling/reuse. These districts promote eco-friendly lifestyles and integrate green spaces and mixed-use planning to enhance quality of life. The goal is to conserve resources and actively combat climate change.

3.2. ZED China Standards

The ZED China standard includes three standards: low-carbon, nearly zero-carbon and zero-carbon communities. All standards consider surrounding environment, energy structure, municipal infrastructure and transport, optimize community planning, design and operation management, reduce community energy demand as well as make full use of renewable energy sources and energy storage. The zero-carbon standard has the highest requirements with an annual operational zero-carbon emission goal.

The ZED China standard integrates buildings and surrounding environment, energy structure, municipal infrastructure, traffic and other community factors to optimize planning, design and operation management. It aims to reduce energy demand through coordinated measures while leveraging renewable energy, energy storage and carbon sinks to achieve annual operational carbon emissions below a specified reduction rate or per capita level compared to a reference district. These reduction rates are different for low-carbon, nearly zero-carbon and zero-carbon districts.

3.3. Shared Principles and Distinct Paths

Swiss district labels and the ZED China standard share numerous similarities, as both frameworks prioritize the following key aspects:

- Energy efficient buildings
- Use of locally generated renewable energy should be as high as possible.
- Reduction of amount of CO2-eq-emission of construction
- Circularity of construction, for ZED standard only via ZEB standard
- Waste collection and separation on-side
- Water management
- Green spaces
- Economical land use
- Mobility aspects
- Communication, cooperation and participation
- Planning Process

Certain aspects are mandatory requirements in Swiss district labels and the same are presented as recommendations in the ZED China standard:

- Energy monitoring
- Waste monitoring
- Mobility monitoring
- Measures for climate adaptation
- Sharing offers for mobility and room for communal use
- Biodiversity for green spaces

Swiss labels and ZED China standard recommend both a good mix of uses and enough offers for daily needs.

Following aspects are not included in the Swiss district labels

- Operation of streetlights
- Zero-carbon emission for operation

Following aspects are not included in the ZED China standard

- Carbon emission targets for everyday mobility
- Operation optimization of the HVAC system
- Social Mixing / Diversity of Users

The Swiss labels and the ZED China standard share common sustainability goals, though their approaches to implementation differ in certain aspects.

The monitoring of various parameters during the operational phase is more robustly emphasized in the Swiss labels. This aspect could be seamlessly integrated into the ZED China standard by elevating recommendations to mandatory requirements. Effective monitoring is crucial to assess whether a district is truly operating sustainably. The collected data enables informed adjustments and optimizations, ensuring continuous improvement toward sustainability goals.

Since residents in a district need to commute to work, school, shop, and more, addressing mobility is essential. Globally, mobility accounts for 23% of total CO2-equivalent emissions. Some Swiss labels include specific CO2-equivalent emission targets for everyday mobility, aiming to minimize fossil-fueled private transport while promoting public transit, cycling, and walking. Incorporating a similar target for everyday mobility could enhance the ZED China standard by fostering more sustainable transportation practices and reducing emissions.

Compared to the ZED China standard, Swiss district labels do not account for streetlights, as these are typically owned and managed by municipalities, falling outside the jurisdiction of district developers. Additionally, none of the Swiss labels currently mandate operational net-zero carbon emissions as a formal requirement.

4. FRAMEWORK FOR SUSTAINABLE DISTRICTS

To establish Sustainability Criteria the ZED China standard was reviewed alongside the three Swiss district labels: Minergie, the Swiss Sustainable Building Standard (SNBS) and the 2000-Watt District (Chapter 3).

This comparative analysis aimed to identify Sustainability Criteria that reflect both Swiss and Chinese priorities and addresses key aspects of sustainable building and urban planning. A set of nine Sustainability Criteria are identified (see Figure 4).

The resulting Sustainability Criteria capture a holistic view of sustainability in the built environment, targeting interconnected factors that reduce environmental impact while ensuring high levels of comfort and well-being for occupants.

These Sustainability Criteria extend beyond building construction and operation to include daily mobility options, water and waste management, quality of outdoor spaces, diversity within communities and shared amenities. Furthermore, they emphasize the importance of ongoing communication and participation from occupants to foster a dynamic and engaged community. Utilizing robust planning tools supports higher quality outcomes in sustainable development.

Through a comprehensive approach that integrates these Sustainability Criteria, sustainable development initiatives can reduce environmental impact, improve quality of life and enhance long-term economic and environmental resilience in buildings and districts.

4.1. Operation

Globally the building operation is responsible for 28% of the greenhouse gas emissions. This is because globally most buildings are still heated with fossil fuels and run on strongly fossil-based electricity. A significant reduction of the operation energy and a switch to renewable energy is necessary. The carbon emissions of the operation phase should in future be as low as possible.

Using energy-efficient systems and technologies, such as well-insulated building envelopes, electric devices and lighting with low energy consumption (e.g. China Energy Label), efficient heating, cooling and ventilation systems will minimize energy consumption significantly.

The generation of energy based on renewable energy sources on-site should be as high as possible. This includes photovoltaic systems, thermal collectors or wind turbines. Electric and thermal storage increase self-consumption and grid-independency. If the entire energy consumption cannot be covered by locally generated energy, energy with a green certificate should be purchased.

Monitoring energy flows is important to find optimization potential in order to implement efficient measures.

Figure 2: Nine Sustainability Criteria for Districts (Source: ebp with adaptations)

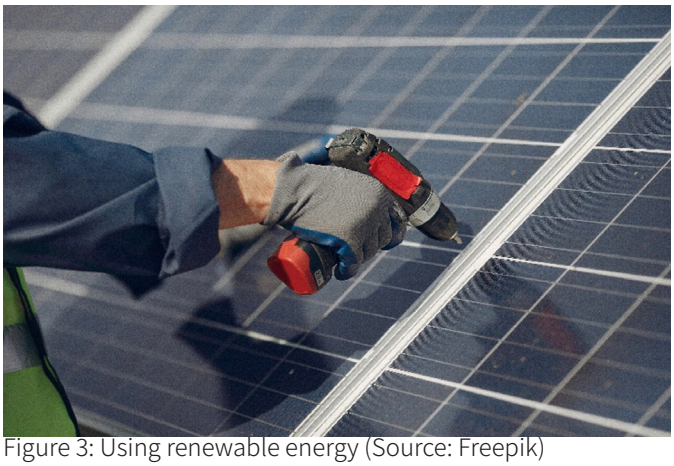
Figure 3: Using renewable energy (Source: Freepik)

4.2. Construction

The building construction industry accounts globally for 11 % of the greenhouse gas emissions. The importance of embodied carbon emissions often increases (e.g. additional insulation) when the emissions from operation decreases. A significant reduction of embodied carbon for the construction resp. materialization is necessary. This includes the use of low carbon (e.g. bio-based and natural), reused and recyclable building materials.

The reuse of materials and components (e.g. windows, steel and timber beams) leads to more circularity in construction and reduces the amount of waste. Integrating techniques and methods that promote long building life spans such as modularity and adaptability to accommodate future changes and requirements are helpful strategies. Measures like compact designs, short spans and appropriate material thickness reduce the amount of resources. A design for disassembly helps to more easily reuse components in future. To reduce embodied carbon it is important to retrofit and extend existing buildings rather than demolish and replace them.


Figure 4: Construction side (Source: pixaba)

4.3. Mobility

Mobility is globally responsible for 23 % of the total greenhouse gas emissions. Planning and building of new districts allow to influence everyday mobility as it depends on the location of the project and the mix of uses.

The goal is the reduction of the fossil-fueled motorized private transport to a minimum and promote the use of public transport, bicycles and feet to reduce greenhouse gas emissions.

The support of e-mobility and easy accessibility of good public transport supports the change of occupants behavior. Sharing offers reduce the number of vehicles, which results in a smaller number of parking lots. Short distances between home, work, school, shopping and entertainment promote bicycles and pedestrians. Mobility analysis should be used to improve the mobility infrastructure and behavior towards more sustainability.


Figure 5: Street junction (Source: pixaba)

4.4. Water and Waste

Water is a very valuable good and must be used carefully. This includes not only the reduction of water consumption through efficient water management systems but also evaporation, infiltration and retention areas for rainwater as a precaution for extreme weather conditions (heavy rainfall, drought). A local system for the reuse/recycling of water should be installed.

The aim is to ensure that water is comprehensively considered throughout the entire life cycle of the area. Monitoring different water flows helps to optimize the water concept.

Common measures: water-saving fittings, sealing leaking pipes, unsealing the ground, green roofs, rainwater harvesting

In a densely populated neighborhood, a lot of waste is generated. A detailed waste management

concept helps to reduce, recycle, reuse and dispose of waste to minimize environmental impact and protect public health.

Good delivery and disposal facilities in the area make a significant contribution to closing material cycles and promotes a high recycle rate.

Appropriate disposal facilities for cardboard, PET, paper, glass, residual waste, organic waste and packaging material must be available on-site.

Figure 6: Drinking water (Source: pixaba)

Figure 7: PET water bottles (Source: pixaba)

4.5. Outdoor Quality

Planning and maintenance of green spaces as habitats for native plants and animals to promote biodiversity and reduce urban heat islands. Pristine green spaces and the mix of native plants (no monoculture) contribute to the settlement of native animals. Biodiversity and green spaces promote the microclimate and increase the quality of stay and recreational for the occupants.

In view of climate change, extreme weather events (heat waves and droughts, heavy rainfall, storms, etc.) may occur more frequently, which can have an impact on the well-being and health of the occupants. Permeable green spaces, especially with trees, provide cooler areas in summer and can be used for rainwater management. To reduce the heat island, effect the focus should be on shading and ventilation. Ventilation corridors between the buildings enhance summer night cooling. Sealed ground should be minimized.

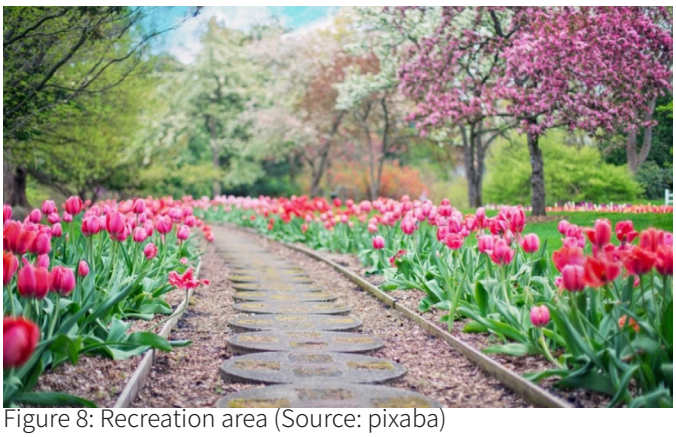

Figure 8: Recreation area (Source: pixaba)

4.6. Sharing

The provision of room for communal use, e.g. co-working space, rooms with washing machines and hotel/pension rooms reduce the floor area per apartment and therefore per capita. Mobility sharing services reduce on-side the number of private cars and bikes and offer alternative means of transportation with less environmental impact.

The reduction of space requirements (sufficiency) and the elimination of unnecessary ancillary use and traffic areas leads to less material expenditure, less environmental impact and thus to more cost-effective construction.

Figure 9: Sharing (Source: pixaba)

4.7. Diversity

A social mix in a neighborhood promotes social cohesion as it leads to a diverse exchange of ideas, experiences and resources. It also supports the creation of an inclusive environment that promotes equal opportunities and reduces social isolation.

A lively neighborhood for all different types of people offers apartments and offices in different price segments and different apartment layouts: assisted living, multi-generational house, apartments for the elderly, shared flats, family flats, student flats.

The range of uses in the district consolidate, complements or expands the existing range of uses in the neighborhood. These include uses such as residential, office, retail, restaurant, cultural facilities, medical and social services and school facilities. A public and public-facing use of the ground floor will enliven the neighborhood and strengthen interactions between users.

Figure 10: Friendship (Source: pixaba)

4.8. Planning process

Land use: Soil is a non-renewable and finite resource: it must be taken care of. To ensure economical land use, the potential of the area in terms of inward densification and settlement development must be considered. The land should be used efficiently with an environmental impact per capita as low as possible.

Site selection and development: Consideration of environmental conditions and integration into local infrastructure, such as proximity to public transport-tation, to reduce traffic and associated emissions. Usable space on the ground floor should be suitable for public use. The premises must be barrier-free.

Planning Process: Planning tools can be used to ensure more sustainability in the planning process. The interactions between ecological and economic as well as technical and social issues increase the complexity of the development, planning and construction process. Accordingly, the process must be well structured. Quality management helps to achieve sustainable goals.

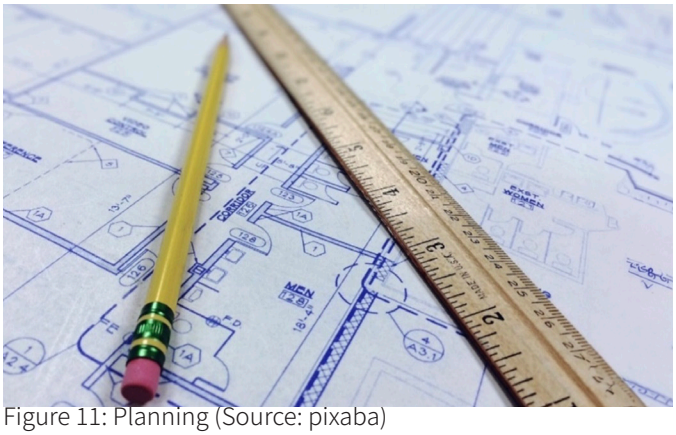

Figure 11: Planning (Source: pixaba)

4.9. Communication, Cooperation and Participation

A high degree of participation by the concerned stakeholders and later the users, good communication between owner, administration and user as well as towards the public helps significantly for a smoother development and higher degree of acceptance. Stakeholders and the local population are involved in the planning, implementation and operation processes.

The owners ensure that users are regularly sensitized to efficient energy use and environmentally friendly mobility behavior with information and offers during the company. The owners communicate to the outside world their exemplary activities to achieve sustainability goals.

Users can be involved in workshops, by surveys, newsletters, information evenings etc.

Figure 12: Communication (Source: pixaba)

5. INSIGHTS FROM THE SUSTAINABILITY SURVEY

This chapter examines how the nine identified Sustainability Criteria are being implemented within China' s major district projects, based on a survey targeting stakeholders involved in sustainable district development. The survey evaluates the feasibility of these criteria and their alignment with stakeholder priorities. Building on these insights, the chapter highlights the most effectively integrated measures, and the key priorities emphasized by stakeholders across society, building partners, and government entities.

The survey engaged over 60 professionals, including sustainability consultants, architects, planners, HVAC engineers, and students, with the majority representing universities, research institutions, consulting firms, and architectural offices. Most respondents had intermediate to advanced experience in sustainable building, ensuring a solid foundation of expertise.

While participants came from diverse sectors, there was a significant concentration of respondents from urban planning and construction, particularly in regions experiencing rapid urbanization. These regions, such as Shaoxing (Zhejiang), Jiading District (Shanghai), Harbin (Heilongjiang) and Shenzhen, exemplify areas where sustainability efforts are critical to managing the challenges of accelerated growth. However, the geographical diversity of the survey enhances its relevance and credibility, reflecting the adaptability of the Sustainability Criteria to varied regional contexts and priorities.

The findings show that the identified Sustainability Criteria are widely acknowledged and deemed feasible by stakeholders, reflecting general support and agreement on their relevance. While this broad consensus highlights the practicality of these measures, it may also suggest a need for further investigation into stakeholders' specific priorities and challenges in implementation.

By summarizing the results, we found common ground across different Sustainability Criteria, where similar measures address shared goals. The following unified perspective highlights the practical steps that resonate most with stakeholders, demonstrating how widely adopted strategies can effectively support sustainable development and foster resilient, future-ready communities.

Renewable Resources & Energy Efficiency

Projects emphasize renewable energy sources like

- photovoltaic systems.
- energy-saving measures such as LED lighting.
- smart energy management tools.
- This approach promotes CO2 reduction and optimized energy use, lowering the environmental impact of building operations.

Waste and Water Management

Waste and water management are key themes, with many projects implementing

- recycling programs.
- reuse of materials.
- water-saving measures.

This approach fosters a circular economy through material reuse and waste reduction, while efforts like rainwater reuse improve water efficiency. Water monitoring concepts are also gaining traction, although there remains some room for expanded implementation in certain regions.

Community and Social Integration

Projects prioritize social integration by providing

- shared spaces.
- affordable housing.
- community activities.

Communication strategies such as events, workshops and feedback mechanisms enhance user involvement, strengthening social bonds and improving overall community quality of life.

Climate Adaptation and Environmental Resilience

Adaptations for extreme weather are widely implemented, such as

- shading.
- green spaces.
- enhanced insulation.

These features create comfortable, resilient environments that are well-prepared for climate challenges while also promoting biodiversity.

Sustainable Mobility and Reduced Fossil Fuel Use

Many projects incorporate measures to reduce reliance on fossil-fueled vehicles, such as offering

- bike-sharing.
- EV charging stations
- shared parking options.

The data shows promising progress in reducing reliance on fossil-fueled transportation, with all projects implementing measures, yet the variability in implementation underscores significant potential to scale up efforts, set clear carbon targets and expand shared mobility solutions.

Diverse Land Use and Public Access

Projects show a strong commitment to

- mixed-use spaces
- blending residential office
- public areas with accessible
- open ground-floor spaces.

This diversity of uses supports social interaction, reduces the need for long commutes, and enhances community vibrancy.

6. HIGHLIGHTS OF SUSTAINABLE DISTRICTS

6.1. Introduction

Building on the Sustainability Criteria outlined in Chapter 4 and the survey findings presented in Chapter 5, this chapter highlights key features of three exemplary district demonstration projects in China: Wuxi Fund Park II in Wuxi, Jiading Future City Project in Shanghai, and Yinyue Zero-Carbon Building in Beijing.

Additionally, two Swiss projects, both certified as 2000-Watt-Districts, are presented. These projects stand out for their unique locations, innovative development and transformation approaches, and their strong focus on minimizing environmental impact while enhancing social well-being. Together, these examples illustrate diverse pathways to achieving sustainability at the district level.

6.2. Chinese Demonstration Projects

Wuxi Fund Park II Construction Project, Jiangsu province

The Wuxi Fund Park II Construction Project is located South of Jiangsu and at the north shore of Taihu Lake in Wuxi. The region is in a hot-summer and cold-winter climate zone. The mixed use will include offices, a hotel, conference and cultural facilities. As shown in Figure 6 the district is made of five U-shaped petals and one drop-shaped financial convention center forming an internal shared garden system.

The project convention centre shows several highlights as for example:

- Huge borehole field under the buildings for geothermal energy use
- The regeneration of the ground temperature due to free cooling in summer increases the efficiency of the heat pumps in winter.
- A roof top photovoltaic system will be installed with a yield of 10 % higher than the annual building consumption.
- A good use of daylight will be unsured by installation of skylights
- A comprehensive monitoring system regarding energy consumption

Figure 13: Wuxi Fund Park II. (Source: AAI Int' l. Architect Office)

Shanghai Jiading Future City Project, Jiading district Shanghai

The Shanghai Jiading Future City Project is located in Jiading District in Shanghai. The northern plots with the Exhibition Hall and the Community Center or so-called Market (see Figure 7) achieve the goal of a near-zero carbon emission community (40% carbon reduction). The region is in a hot-summer and cold-winter climate zone. It is a real showcase in regards of a sustainable development project due to following highlights:

- Extensive use of rainwater in the market (e.g. for water curtain to reduce temperatures at the skylight, automatic dripping system for gras, afforestation irrigation, garage and road flushing)
- Natural ventilation concept with automatic windows/louvres and ceiling fans at market
- Steel supporting structure with a timber interior construction for the market
- Very attractively designed Exhibition Hall showing all the sustainability qualities of the district

Great mix of uses with restaurants, shops, exhibition, dwellings, etc.

Yinyue Zero-Carbon Building, Fangshan District, Beijing

The Yinyue Zero-Carbon Building is located in the Fangshan District in the Southwestern part of Beijing and planned and built by SUP Atelier of THAD, China. The region is in a cold-, dry-winter and hot-summer climate zone. The district is built around Gongchen Zero-Emission Community Center which received the RADAR Award from the Active House Alliance and was a finalist for the UIA 2030 Award. It has several highlights to present:

- The façade consists of building-integrated photovoltaic elements.
- The surplus electricity is stored in large batteries
- Several garden elements as well as the outside wall of one staircase are made from reused materials.
- A very sophisticated passive ventilation system has been installed.
- The community centre offers a large common room with kitchen and several rooms for elderly people.

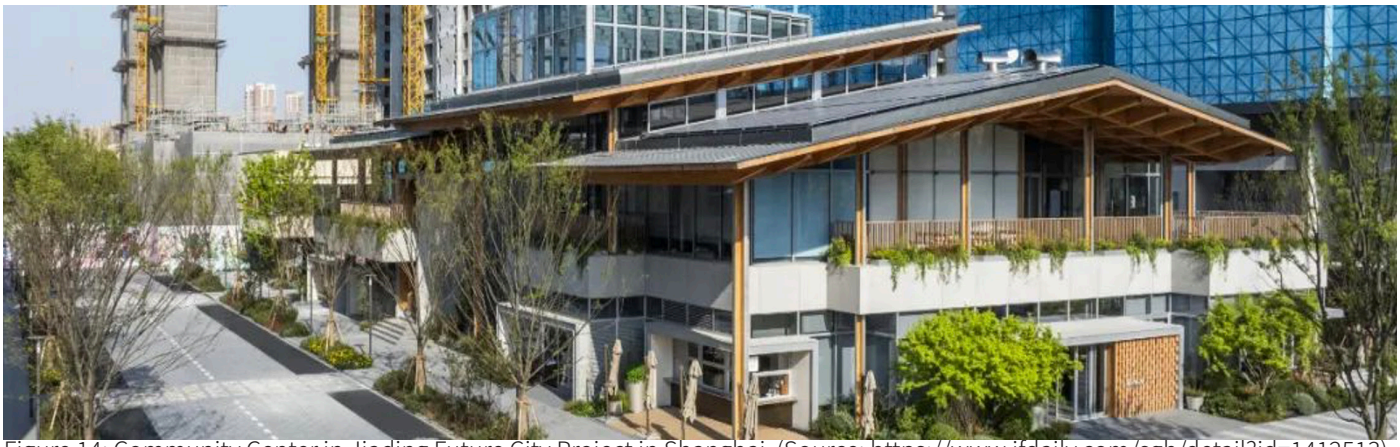

Figure 14: Community Center in Jiading Future City Project in Shanghai (Source: https://www.jfdaily.com/sgh/detail?id=1412513)

Figure 15: Yinyue Zero-Carbon Building, Fangshan District, Beijing (Source: Gallery of Architecture for Sustainable Development Goals)

6.3. Swiss Projects

Kalkbreite, Zürich

The 2000-Watt-District Kalkbreite in Zurich is a pioneering example of sustainable urban living. It embodies the principles of the 2000-Watt-Society, combining energy efficiency, renewable energy use, and innovative community design to minimize environmental impact while enhancing quality of life.

The buildings are constructed on top of a tram depot to strict energy standards. The huge building integrates residential, commercial, and cultural spaces, fostering a vibrant, multifunctional community. This reduces the need for commuting and promotes local living. The district prioritizes sustainable mobility by being largely car-free, encouraging walking, cycling, and the use of public transport. Community engagement is at the heart of Kalkbreite, with shared spaces, cooperative housing models, and a focus on social inclusion. Further-more it incorporates green roofs, communal gardens, and outdoor areas,

Figure 16: Kalkbreite in the city of Zurich (Source: Lokstadt, Winterthur

Lokstadt, Winterthur

The 2000-Watt-District Lokstadt in Winterthur has a strong focus on preservation of Industrial Heritage. It creatively integrates and repurposes the historic architecture of the former industrial site, blending modern living with cultural and historical significance. It exemplifies urban development in the sense that it is addressing environmental, social, and economic sustainability while creating a vibrant and attractive environment for residents and visitors.

Key qualities of Lokstadt include sustainable constructions with energy-efficient buildings that meet or exceed Minergie-P-Eco Standards. The district includes a balanced mix of residential, commercial, and recreational spaces, fostering a lively, multifunctional community that reduces reliance on commuting. Generous green areas, such as parks and communal gardens, enhance biodiversity, improve urban climate, and provide spaces for community interaction and relaxation.

Figure 17: Lokstadt in the city of Winterthur

7. COLLABORATIVE PATH TO SUSTAINABLE DISTRICTS

This booklet highlights the transformative potential of district-level planning in achieving global sustainability and climate goals. Both Switzerland and China demonstrate innovative approaches to sustainable district development, leveraging their unique strengths and addressing shared challenges through the Sino-Swiss ZEB project.

Switzerland' s well-established district labels – Minergie, SNBS, and the 2000-Watt District – provide robust frameworks for energy efficiency, circularity and social integration, setting global benchmarks for sustainability. In parallel, China' s projects, such as Wuxi Fund Park II, Jiading Future City in Shanghai, and Yinyue Zero-Carbon Building in Beijing, demonstrate the country' s ability to scale and adapt sustainability principles to rapidly urbanizing regions, driving impactful urban solutions.

A comparative analysis of the ZED China standard and Swiss labels identified nine shared Sustainability Criteria that align with both Swiss and Chinese priorities, addressing key aspects of sustainable building and urban planning. These Sustainability Criteria provided the foundation for the survey, which evaluated their implementation and perceived effectiveness across various stakeholders related to sustainable district development in China. Key successes were observed in areas such as renewable energy integration and community engagement. The survey revealed strong progress in renewable energy integration and community engagement and highlighted potential for growth in areas such as water monitoring and mobility solutions. Addressing these gaps offers a pathway to further enhance sustainable district development and foster collaboration between Switzerland and China.

By addressing these gaps, districts can evolve into sustainable ecosystems, leveraging shared infrastructure and innovative measures to reduce emissions, foster community engagement and optimize resource efficiency. The results underscore the importance of aligning stakeholder priorities with practical, actionable measures, offering insights to scale up impactful initiatives and expand sustainability practices.

This collaboration between Switzerland and China exemplifies how shared learning and innovation can advance global sustainability goals. By integrating insights from each other' s successes and addressing challenges with targeted strategies, district development becomes a powerful lever for reducing emissions, fostering innovation, and building vibrant, resilient communities. Together, Switzerland and China demonstrate that collaborative efforts and aligned actions are essential to driving meaningful progress toward a sustainable future.

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