

Going sustainable in buildings

TOOL 02

Planning and Design

Introduction

This guidance tool supports users from different backgrounds in exploring how sustainability can be integrated into the planning and design stage of buildings and related products. It is intended for both practical implementation and education and learning, making it suitable for use in real projects, training activities and learning environments. It helps users define the project context, identify sustainability priorities, explore design options, consider relevant data and tools, and select practical actions to improve early-stage decision-making.

There are no right or wrong answers. Use the questions to reflect on your current situation and identify possible next steps.

User Journey

- 1 Identify user
- 2 Design Thinking
- 3 Sustainability pillars
- 4 Circularity Strategies
- 5 Retrofit Planning
- 6 Energy efficiency
- 7 Tools suggestions

WHO AM I?

User profile

Define yourself or your team

Reflect and define your role – Defining a simple user profile in the initial phase is an important step in driving meaningful self-reflection. Encouraging users to reflect on who they are and assess their current situation, helps to gain a clear understanding of users background, needs and context.

This self-awareness lays a foundation for the entire guidance journey. Understanding the current baseline makes it significantly easier to identify specific training needs and select the most relevant tools.

Note: This initial step aims to establish contact between the user and the guidance tool. Although it does not directly influence the selection of tools presented to the user, it prompts them to reflect on their purpose and goals. Defining a profile statement serves to characterize their profile and objectives, guiding their overall action

Select your profile

- ☐ Municipality / public authority
- ☐ Housing provider / developer
- ☐ Architect / designer / engineer
- ☐ Construction company
- ☐ Manufacturer / supplier
- ☐ Construction waste manager
- ☐ Facility or property manager
- ☐ Educator / trainer
- ☐ Student
- ☐ Researcher
- ☐ Other:

Main sustainability
needs

Profile statement

**I am _____ working on _____ and need
guidance to _____ .**

Design Thinking and Project Context

What are we planning or designing?

Start by defining the project context before selecting tools or design actions. This step helps users clarify what they are planning or designing, the project stage, the disciplines involved, and the main sustainability challenge to address.

Question	Guided answer / selection	
Project type	☐ New building ☐ Renovation ☐ Retrofit	☐ Housing block ☐ Component improvement ☐ Other _____
Design stage	☐ Concept development ☐ Schematic design ☐ Detailed design	☐ Licensing ☐ Procurement preparation ☐ Other _____
Main discipline involved	☐ Architecture ☐ Engineering ☐ BIM	☐ Sustainability assessment ☐ Energy analysis ☐ Other _____
Main planning and design challenge	☐ Energy efficiency ☐ Circularity ☐ Retrofit ☐ BIM coordination	☐ Embodied carbon ☐ EPDs ☐ Risk and compliance ☐ Other _____

Project statement

Based on the analysis of the previous questions and answers, formulate a clear project statement.

We are working on

and need planning/design guidance to

in order to

Sustainability Pillars

Sustainable planning and design should not focus on only one pillar. This step helps users understand how environmental, social, economic and cultural priorities can work together in the same design decision.

Balance the four sustainability pillars

Environmental

Energy use, carbon emissions, materials, water, waste, climate resilience, etc

Social

Comfort, health, accessibility, safety, user needs, security, adaptability, privacy, social interaction, community well-being, etc.

Economic

Cost, value of maintenance, durability, profits, etc

Cultural

Local identity, heritage, context, sense of place, cultural values, community traditions, etc.

Task

Select one design decision from the examples below, or add your own. Then use the table to explain how the selected decision balances the four sustainability pillars. The first row provides an example; complete the empty rows with your own design decisions.

Example design decisions — choose one or add your own

Improve façade insulation and shading

Reuse existing building structure

Choose flexible interior layout

Use natural ventilation and daylight

Select durable and repairable materials

Improve accessibility in entrances and circulation

Others / your own decision

Design decision	Environmental benefit	Social benefit	Economic benefit	Cultural benefit
Example: Improve façade insulation and shading	Reduces heating/cooling demand	Improves thermal comfort	Lowers energy bills	Respects local context

Circularity strategies for buildings

Analyse and select the most relevant circularity strategies for the project. Then use the selected strategies to generate design ideas and improvement opportunities.

Step 1 – Analyse and select the most relevant strategies

Design of long-life products

Durable building elements that last longer and reduce replacement.

Design of product-oriented services

Maintenance, repair, take-back or support services linked to products.

Design for recycling

Materials and components that can be separated, recycled or recovered.

Design for materials sustainability

Lower-impact, reused, recycled, renewable or responsibly sourced materials.

Design for product-life extension

Repair, maintenance, upgrade and adaptation of components over time.

Design of use- or result-oriented services

Performance-based solutions, such as comfort, lighting or energy service.

Design for remanufacturing

Components that can be refurbished, rebuilt or reused in new applications.

Design for energy sustainability

Reduced energy demand through passive design, efficient systems and performance.

Design for disassembly and deconstruction

Connections and assemblies that allow components to be separated, recovered and reused.

Modular Construction

Standardised modules or components designed for efficient assembly, replacement, relocation or reuse.

3D printing / additive production

Layer by layer production that can reduce waste and support customised, material efficient components.

Design for adaptability and flexible use

Spaces and systems that can change function with limited demolitions or major alteration.

Prefabrication and off-site construction

Components produced in controlled environment to improve precision and reduce on site waste.

Design for components and material reuse

Use reclaimed elements and enable components to be recovered and reused in future projects.

Step 2 – Create ideas based on the selected strategies

Task: Choose one or more strategies above, then write circularity ideas and explain their value and first design step.

Selected circularity strategy	Circularity idea	Target user / beneficiary	Value created	Sustainability benefit	First action to develop the idea

Retrofit and Renovation Planning

Identify how an existing building can be improved in order to extend the lifetime of building. This step helps users understand current problems, choose retrofit priorities and define the first planning action.

Retrofit pathway examples

Existing building

Current condition, use and main problem

Retrofit need

Energy / comfort / accessibility / safety / materials

Possible actions

Envelope upgrade / windows / systems / passive design / reuse

First step

What should be tested, assessed or designed first?



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Practical exercise: Create your retrofit pathway

The building needs improvement in:

The main priority is:

The first retrofit action to explore is:

The data/tool needed is:

Examples

Use these examples as inspiration when defining your own retrofit action. You may select one of them or propose another action relevant to your building.

Energy upgrade

Envelope improvement

Window replacement

Comfort improvement

Accessibility improvement

Systems upgrade

Material reuse

BIM documentation

Energy efficiency and passive design strategies

Explore how early design choices can reduce energy demand and improve comfort before detailed modelling or construction decisions are made. This step helps users identify passive design opportunities and decide whether an energy calculation or simulation tool is needed.

Design aspect	What to consider	Project notes / decision
Building form and orientation	Solar exposure, compactness, site conditions, daylight access, etc.	
Envelope performance	Insulation, airtightness, thermal bridges, roof/wall/window performance, etc.	
Shading and glazing	Overheating risk, window-to-wall ratio, daylight and solar gains, etc.	
Ventilation and comfort	Natural ventilation, indoor air quality, thermal comfort and user needs, etc.	
Energy modelling need	Decide if the project needs simple calculations or detailed simulation.	

My first energy design action

Describe your energy priority

Recommended tools

Excel4housing toolbox

Review your answers from the previous pages and identify your main planning and design needs. Then use the tables below to find the tools that best match those needs.

If the user needs...	Recommended tools	Why it fits
To integrate circular and low-carbon principles into design decisions To explore design alternatives that improve circularity, material choices and the environmental performance of product, service or building solution.	KATCH_e CE Designer	KATCH_e CE Designer supports circular-design thinking and the development of product/service improvement ideas.
	EC3 Tool	EC3 helps compare the embodied-carbon impact of construction materials and products, supporting lower-carbon design choices
To improve the energy efficiency of a building design To test how design choices such as envelope, glazing, orientation, HVAC or ventilation can influence building energy performance.	EnergyPlus	EnergyPlus allows detailed simulation of heating, cooling, ventilation, lighting and other energy uses. .
	IDA ICE	IDA ICE supports dynamic simulation of energy performance and indoor climate, allowing different design options to be compared
	OpenStudio	OpenStudio provides a user-friendly graphical environment for whole-building energy modelling using EnergyPlus, helping users compare design alternatives for the envelope, HVAC systems, lighting and other energy-efficiency measures.
	Ubakus U-Wert-Rechner	Ubakus helps assess and improve the thermal performance of individual building elements by calculating U-values and evaluating insulation and moisture behaviour.

Recommended tools

Excel4housing toolbox

If the user needs...	Recommended tools	Why it fits
To plan and evaluate a building retrofit To model an existing building, develop renovation alternatives and assess how proposed design changes could improve its performance.	FreeCAD BIM Workbench	FreeCAD BIM Workbench supports open-source BIM modelling of existing buildings and development of retrofit design alternatives
	Autodesk Revit	Autodesk Revit Supports detailed BIM modelling, renovation design, documentation and coordination of retrofit interventions.
	EnergyPlus	EnergyPlus can then be used to evaluate how retrofit measures affect building energy performance.
To assess sustainability during project planning and design To evaluate whether your design choices contribute to wider environmental, social and economic sustainability objectives.	VERDE 2030 Building Assessment Tool	VERDE 2030 provides a broader sustainability assessment of the building
	EC3 Tool	EC3 helps compare the embodied-carbon impact of construction materials and products, supporting lower-carbon design choices.
	KATCH_e CE Designer	KATCH_e CE Designer supports circular-design thinking and the development of product/service improvement ideas
	eLCA – Online Life Cycle Assessment Tool	eLCA supports building life-cycle assessment, allowing users to calculate and compare the environmental impacts of building components and design alternatives using ÖKOBAUDAT environmental data
	DGNB Toolbox “Carbon neutral building”	Supports early planning of carbon-neutral buildings by providing guidance on climate strategies, CO ₂ accounting and measures that can inform design decisions.

Recommended tools

Excel4housing toolbox

If the user needs...	Recommended tools	Why it fits
To create BIM models and coordinate design information Need of a digital building model to organise project information, develop the design and coordinate inputs from different disciplines.	Autodesk Revit	Autodesk Revit Supports detailed BIM modelling, multidisciplinary coordination, project documentation and management of design information.
	FreeCAD BIM Workbench	FreeCAD BIM Workbench supports open-source BIM modelling and the organisation and development of building design information.
To compare materials and products based on EPD and embodied-carbon information To compare alternative construction products or materials and understand how their selection can influence embodied carbon.	EC3 Tool	EC3 directly uses EPD information to compare construction products and identify lower-carbon alternatives. link
	VERDE 2030 Building Assessment Tool	VERDE 2030 uses EPD information to compare construction products and identify lower-carbon alternatives.
To identify and coordinate stakeholders during the planning and design process To identify the key people and organisations involved in the project, understand their roles and relationships, and support effective collaboration and engagement throughout planning and design.	NetZeroCities Stakeholders Ecosystem Map (Canvas)	Helps users map relevant stakeholders, understand their roles and relationships, and plan collaboration and engagement during the planning and design process.
To assess solar energy potential and support photovoltaic system planning To estimate the solar radiation available at a site, evaluate potential PV electricity production, or compare different PV system configurations during early design.	PVGIS – Photovoltaic Geographical Information System	PVGIS provides location-based solar radiation and photovoltaic energy-production estimates, helping users assess the feasibility and potential performance of PV systems during early planning and design.

Recommended tools

Excel4housing toolbox

If the user needs...	Recommended tools	Why it fits
To integrate climate resilience into planning and renovation decisions You want to consider climate risks when developing urban, housing or renovation plans and identify suitable adaptation measures.	Climate-ADAPT Urban Adaptation Support Tool (UAST)	UAST helps users connect climate hazards, exposure and vulnerability with adaptation actions, supporting climate-resilient urban planning, sustainable renovation and related planning decisions. It also links users to European data, guidance and practical examples.
To support modelling, quantities and design-related calculations Need of digital tools to develop the building model, obtain quantities or perform calculations that support early design and planning decisions.	Construction Calculator	Construction Calculator supports construction-related calculations for planning and design decisions
	Autodesk Revit	Revit can generate model-based quantities and organises project information to support design and planning
	FreeCAD BIM Workbench	FreeCAD BIM Workbench supports open-source BIM modelling and extraction of building information for design development
To perform detailed building energy and indoor-environment calculations To calculate or simulate energy use, heating and cooling demand, or indoor environmental conditions to compare design alternatives.	EnergyPlus	EnergyPlus provides detailed building energy simulation.
	IDA ICE	IDA ICE combines dynamic energy and indoor-climate analysis
	Laskentapalvelut	Laskentapalvelut provides calculation services for energy, heating and ventilation performance.

Recommended tools

Excel4housing toolbox

If the user needs...	Recommended tools	Why it fits
To explore and compare early-stage site layouts and building massing options To test different site and building concepts and understand their environmental performance before beginning detailed design.	Autodesk Forma	Autodesk Forma supports rapid site planning, massing studies and comparison of design alternatives using environmental analyses such as sun, daylight, wind, noise, microclimate and carbon.
To identify the most suitable Planning & Design tools for your next steps.	EXCEL4Housing 4.0 toolbox filter	Allows users to select tools by need, phase, difficulty, data requirement and sustainability goal.