CIRCULAR DESIGN: REUSED MATERIALS AND THE FUTURE REUSE OF BUILDING ELEMENTS IN ARCHITECTURE. PROCESS, CHALLENGES AND CASE STUDIES.

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INTRODUCTION

Presentation plan:

- Design process
- Challenges
- Case studies
- Conclusions

DESIGN PROCESS: THE REUSE OF MATERIALS

- interdisciplinary and flexible design process
- elongated introductory phase
- detailed assessments of materials
- specialist consultations
- material tests
- expertise to meet obligatory standards
- flexible cost plan and project schedule
- defined environmental goals
- additional research, data collection
- defining optimal ways of materials' sourcing, processing and adapting for the new use
- iterative modifications of the project and specifications during the whole design and construction process (non-linear design process)

DESIGN PROCESS: DESIGNING FOR REUSE

- interdisciplinary and flexible design process
- extended introductory phase
- specialist consultations
- material tests
- lifecycle analysis
- defined environmental goals
- additional research, data collection
- guidelines for future users of the building, for its maintenance and disassembly
- defining future waste streams and optimal ways of the future reuse of building materials

DESIGN PROCESS: MAIN DIFFERENCES

- the standard design an construction process

Data and information for new materials

Introductory project → Detailed project → Specification → Purchase of building materials → Construction

- the design and construction process with reused materials

Introductory project → Detailed project (redesigning) → Detailed project and specifications → Construction

Identification of reused materials and their sources

Purchase of reused materials

Possible modifications

- the design and construction process for future reuse

Design for disassembly (DfD) → Construction → Use → Disassembly → Reuse / Recycling of building materials

Design process

REUSE AND DESIGN FOR REUSE (DFR) IN COMPARISON TO THE STANDARD DESIGN PROCESS

Table 1. Reuse and design for reuse (DfR) in comparison to the standard design process

Introductory design phase	Reuse and DfR: elongated time framework, additional data collection, research, consultations, interdisciplinary collaboration, environmental goals definition Reuse: materials sourcing, storing, testing and processing; application for permits for the use of non-standard solutions and materials DfR: future waste streams definition; disassembly and reuse scenarios plan
Project and specification	Reuse: flexible and modifiable cost plan, project schedule and specification DfR: identification and signage of material content; identification of waste streams, disassembly procedures and reuse scenarios; guidelines for maintenance, servicing and disassembly
Education	Reuse and DfR: necessary educational programmes (university level) and reuse-oriented training for professionals
Absence of standardised processes and construction methods	Reuse and DfR: necessary development of standardised tools and technologies for materials sourcing, processing and construction DfR: definition of future sourcing, processing and construction methods

CHALLENGES

- lack of data about materials' availability, amount, quality and ways of sourcing or processing
- lack of adequate education for designers
- no demand for such projects among the general public
- ineffective/insufficient collection, segregation, processing and transport infrastructure
- inadequate disassembly procedures
- contamination of secondary resources
- unstable properties of reused materials
- lack of material certification
- difficult identification of material content
- debatable aesthetic
- higher cost of construction/ regarded as a more expensive solution
- lack of adequate business model framework

CHALLENGES

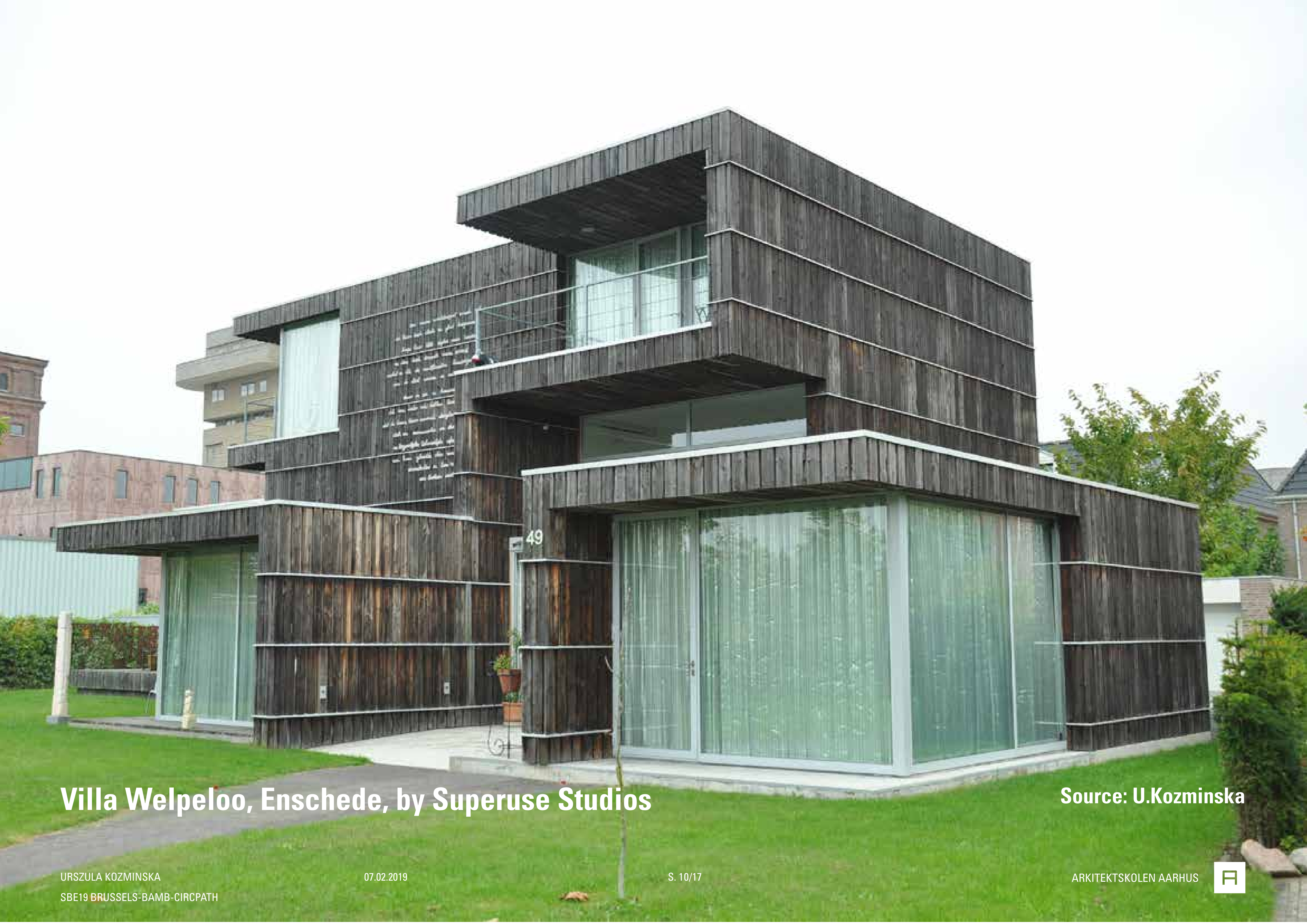
- economic aspects: level of economic development, the demand for reused materials, the presence of economic incentives
- existence of adequate spatial and pro-environmental policies
- flexible and holistic approach to regulations and codes
- urban planning (urban density, typology, function)
- adequate building design
- adequate choice of building materials (forms, dimensions, volume, age, technical properties, aesthetic condition recycling potential)
- amount of waste, the frequency of renovation, the lifespan of a building
- environmental impacts:energy, water consumption, air pollution)
- impact on human health
- social determinants: human customs, behaviours and daily practices, environmental awareness, social perception, authorities' awareness, social status and engagement

CASE STUDIES






Source: U.Kozminska

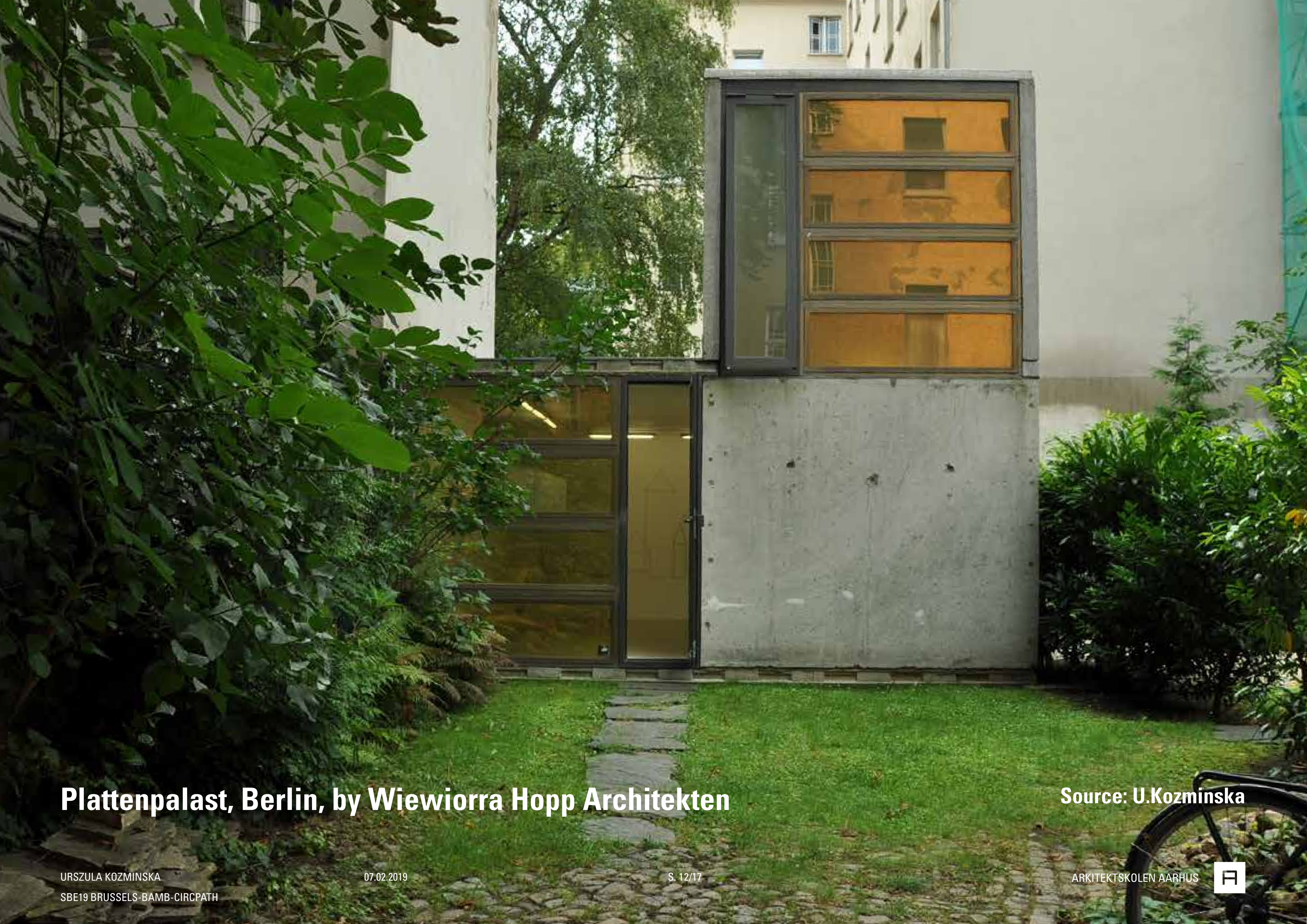


Villa Welpeloo, Enschede, by Superuse Studios

Source: U.Kozminska

Open-Air Library, Magdeburg, by KARO Architekten

Source: U.Kozminska



Plattenpalast, Berlin, by Wiewiorra Hopp Architekten

Source: U.Kozminska

Warssawa Manufacture, Konstancin-Jeziorna, by Mech.Build

Source: Mech.build

Housing on Lisbjerg Hill, Aarhus, by Vandkunsten Architects

Source: U.Kozminska

Resource Rows, Copenhagen, by Lendager Group

Source: U.Kozminska

CONCLUSIONS

The architects are working with construction waste, or they design for further reuse despite **limited access to related knowledge** and data. They **educate** themselves**, source** materials and **experiment** with them, consult architectural solutions with experts, participate in **collaborative** processes, learn from the engineers, contractors, demolition companies, or local artisans. They look **beyond tested solutions** and question standard practices.

The emerging role of the architect, who participates in the circular design process, requires extended **knowledge to negotiate between often contradicting circumstances** without compromising the quality of created sustainable architecture.

The transition towards **more circular practices in architecture requires multi-level actions** concerning development strategies, policies, legal regulations, planning procedures, institutions, economic incentives and education.


THANK YOU.
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