

Contribution of secondary raw materials from C&D waste to resource efficiency



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Project

The building stock represents the largest "anthropogenic mine" of our society [1] and at the same time accounts for a significant share of the demand for energy. Both aspects are important fields of action for increasing resource efficiency in the building sector. The research project RessStadtQuartier addresses this problem from the perspective of urban districts in conurbations: specific methods and instruments for municipal planning processes will be developed for increasing resource efficiency in all phases of district development: Planning, (Re-)use and demolition. Among other things, a building-material-cadastre will be developed in the project as a uniform information basis for planning processes and linked with a building information model (BIM).

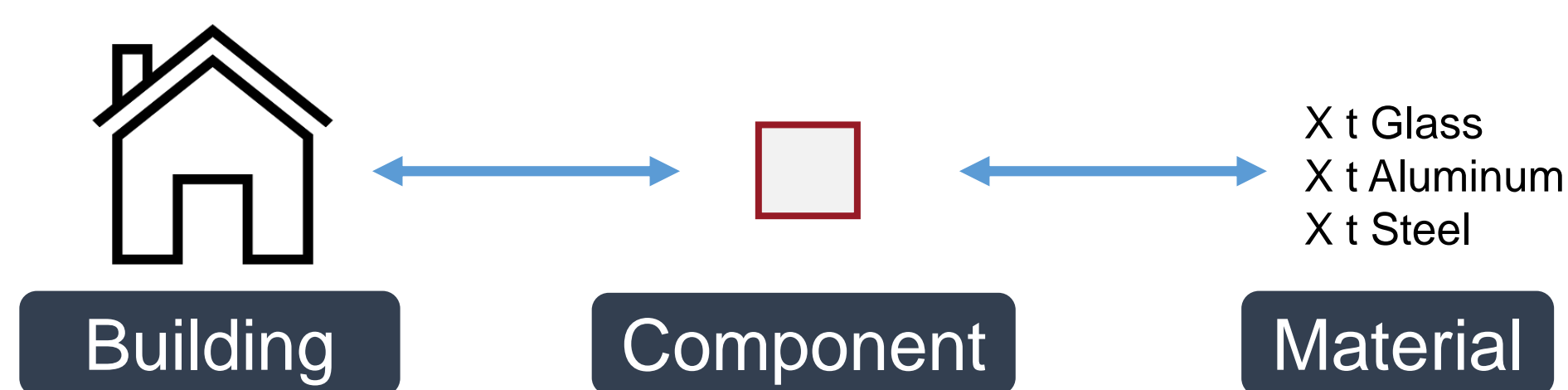
Concerning the End-of-Life (EoL) phase, recovery options for construction materials will be identified and evaluated. In this poster the goals projected and the preliminary methodological approach is presented.



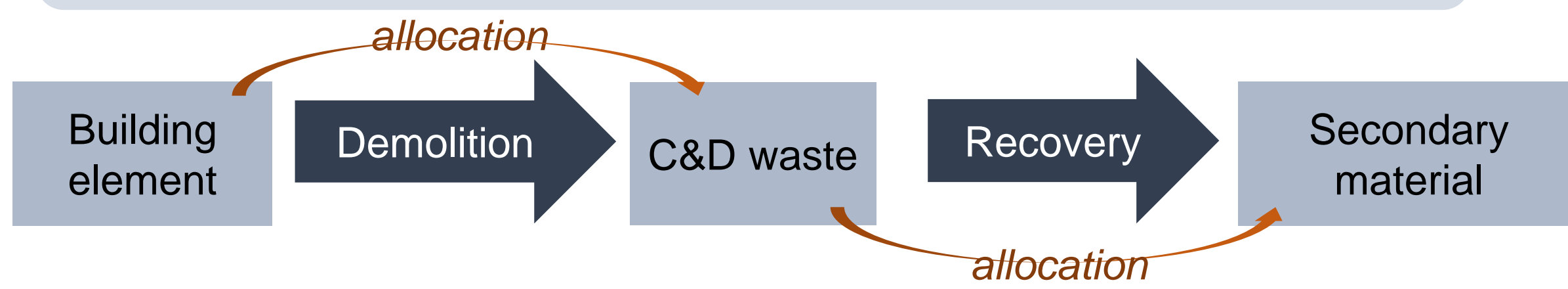
Partner structure

Approach

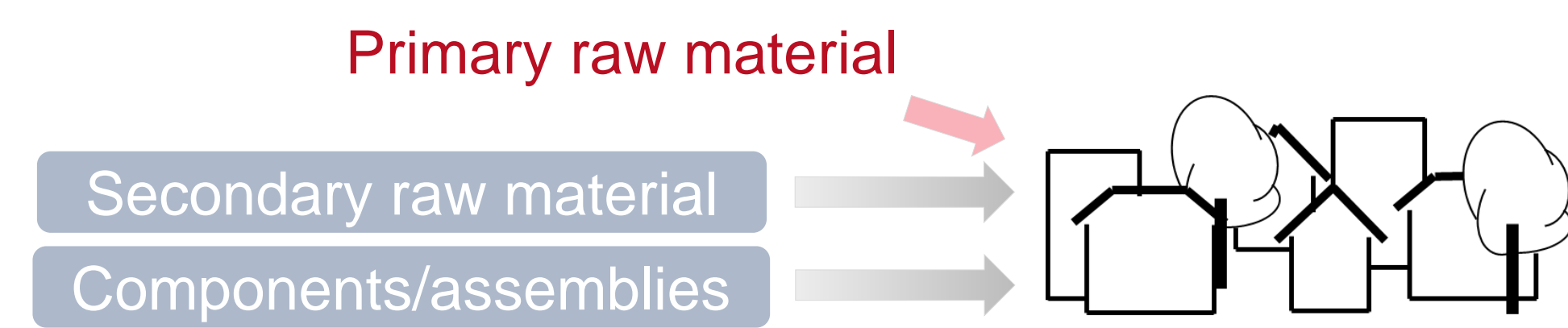
Sub goal 1: Identification of materials in residential buildings relevant for recovery



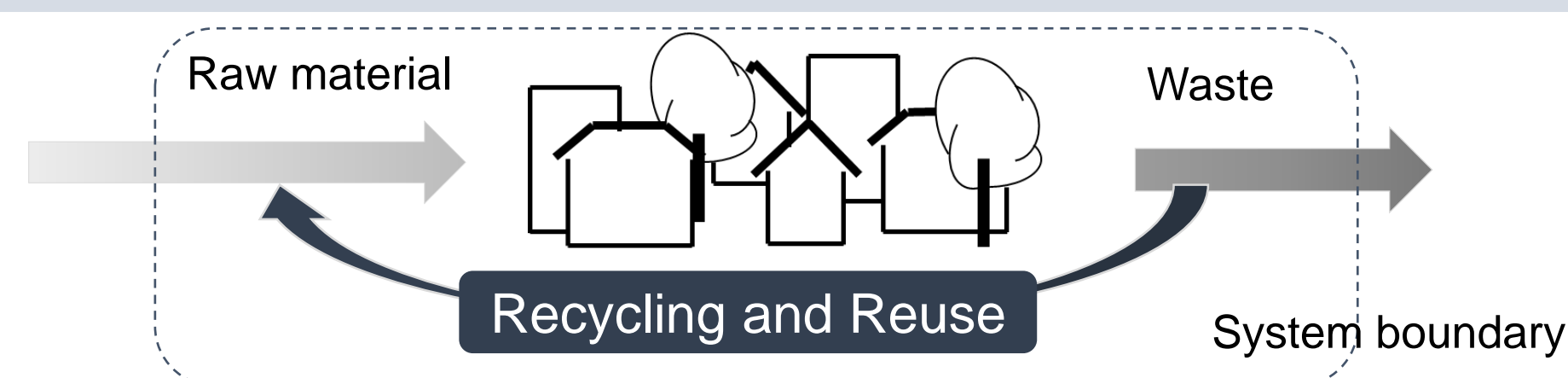
Sub goal 2: Allocation of C&D waste flows to recovery paths and their resulting products



Sub goal 3: Application of secondary materials



Sub goal 4: Assessment of the ecological impacts of recovery options



Overall Goal: Guide to recovery options and recommendations for action

Instruments and Methods:

Raw material factors

- Material groups and raw materials relevant for recovery are selected and allocated to building components (windows, walls, etc.) from literature-based as well as experimentally measured values
- Collected information will be stored in BIM model
- Raw material inventories can be calculated for individual buildings and entire quarters

Material-process-matrix

- Recovery paths (recycling, remanufacturing and reuse) along the entire chain from demolition to the usable construction material are identified and recorded in an allocation matrix
- State of the art technologies as well as future changes are taken into account

Substitution effects

- Identification of segments, in which primary raw materials can be replaced by secondary materials
- Applicability of secondary raw materials is classified
 - Reuse potential of components/assemblies is evaluated

Life Cycle Assessment

- Holistic view: the ecological effort of the recovery processes is offset against the credit resulting from
 - the substitution of primary raw materials
 - waste deposit prevention

Integration into process model

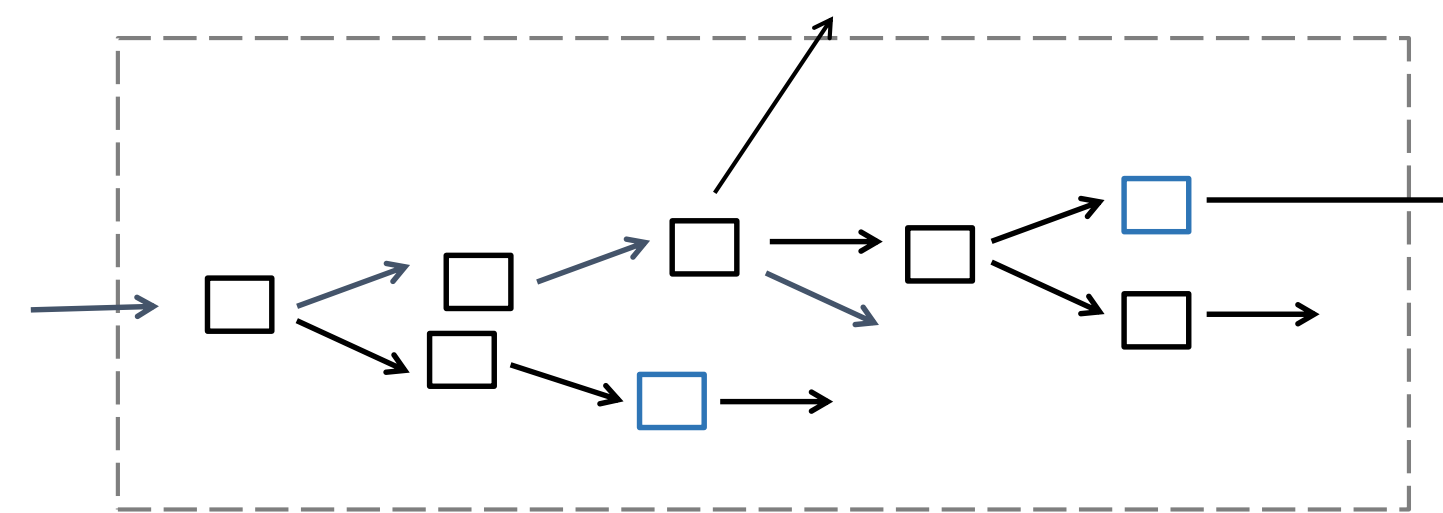
Development of Evaluation Methodology

Material-process-matrix

Material	Process	Demolition	Treatment	Transport	...
In Building		x			x
Waste			x		x
Product					x
...					x

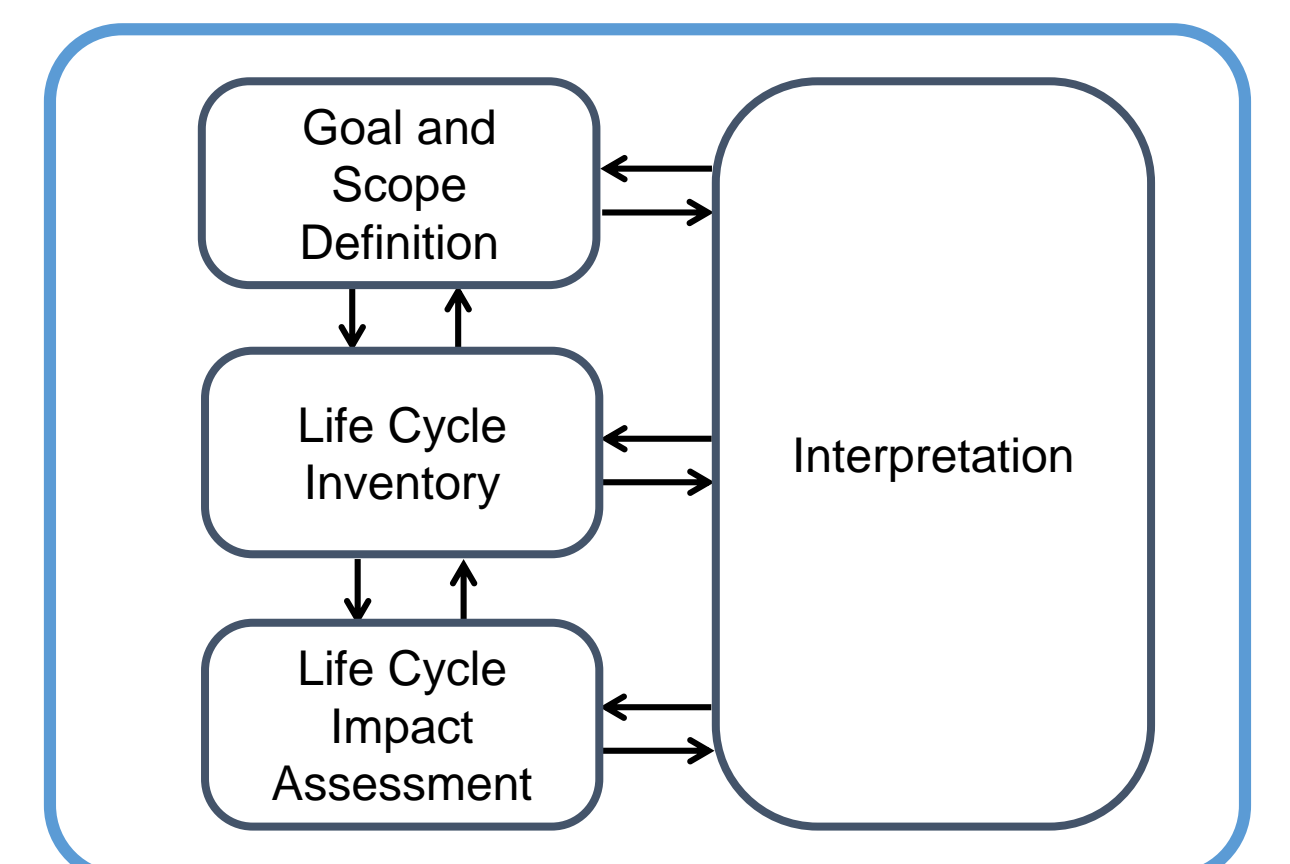
- Materials are classified according to their processing state
 - Processes are classified according to their type of material transformation
 - Matrix determines the suitability of a process for a certain material
- Matrix serves as a basis for the connection between processes and thus for the formation of recycling routes

Process model



- Materials are represented by input and output flows
- C&D waste treatment processes are linked by flows
- Each process chain depicts recovery route
- LCA data is attached to each process
- Summation over a process chain evaluates environmental impacts of a recovery option in relation to

Life Cycle Assessment

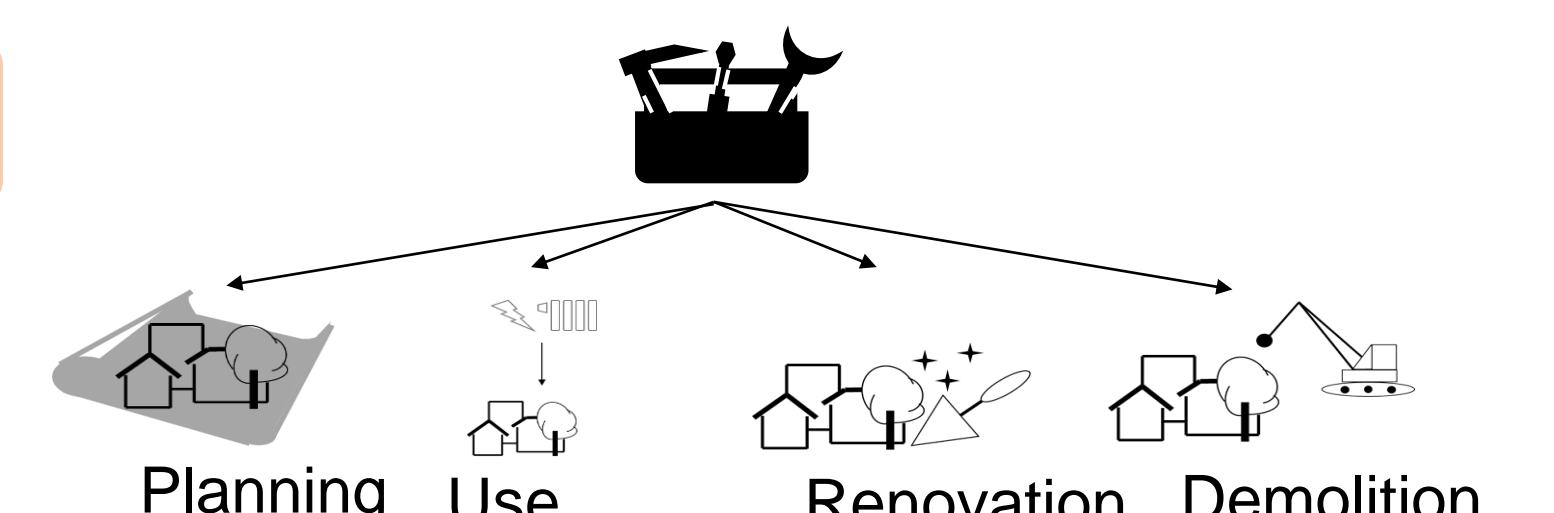


LCA Phases according to ISO 14040/14044 [2,3]

- LCA data is collected and evaluated
- from LCA databases and studies
 - experimentally from demolition processes

Impacts of expected results

- Guideline to resource efficient planning of district development
- Information base and thus planning capability is improved
- Integration of end-of-life activities in planning processes
- Strengthen the acceptance of secondary raw material
- Open paths for novel recycling strategies and technologies



References:
 [1] Schebek et al. (2017): Material Stocks of the Non-residential Building Sector: the Case of the Rhine Main Area. RESOUR CONSERV RECY, 123, 24-36.
 [2] DIN EN ISO 14040 (2009): Umweltmanagement - Ökobilanz - Grundsätze und Rahmenbedingungen (ISO 14040:2006). Berlin: Beuth Verlag GmbH.
 [3] DIN EN ISO 14044 (2006): Umweltmanagement - Ökobilanz - Anforderungen und Anleitungen (ISO 14044:2006). Berlin: Beuth Verlag GmbH

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