Evaluation of Building Material Stock for Reuse & Recycle

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Problem

71% contractors suffer building material shortage

Building material shortage is high in the United States due to the high demand for new residential buildings causing delays in construction. Currently, there is no consolidated location that allows for analyzing building material stock across the United States.
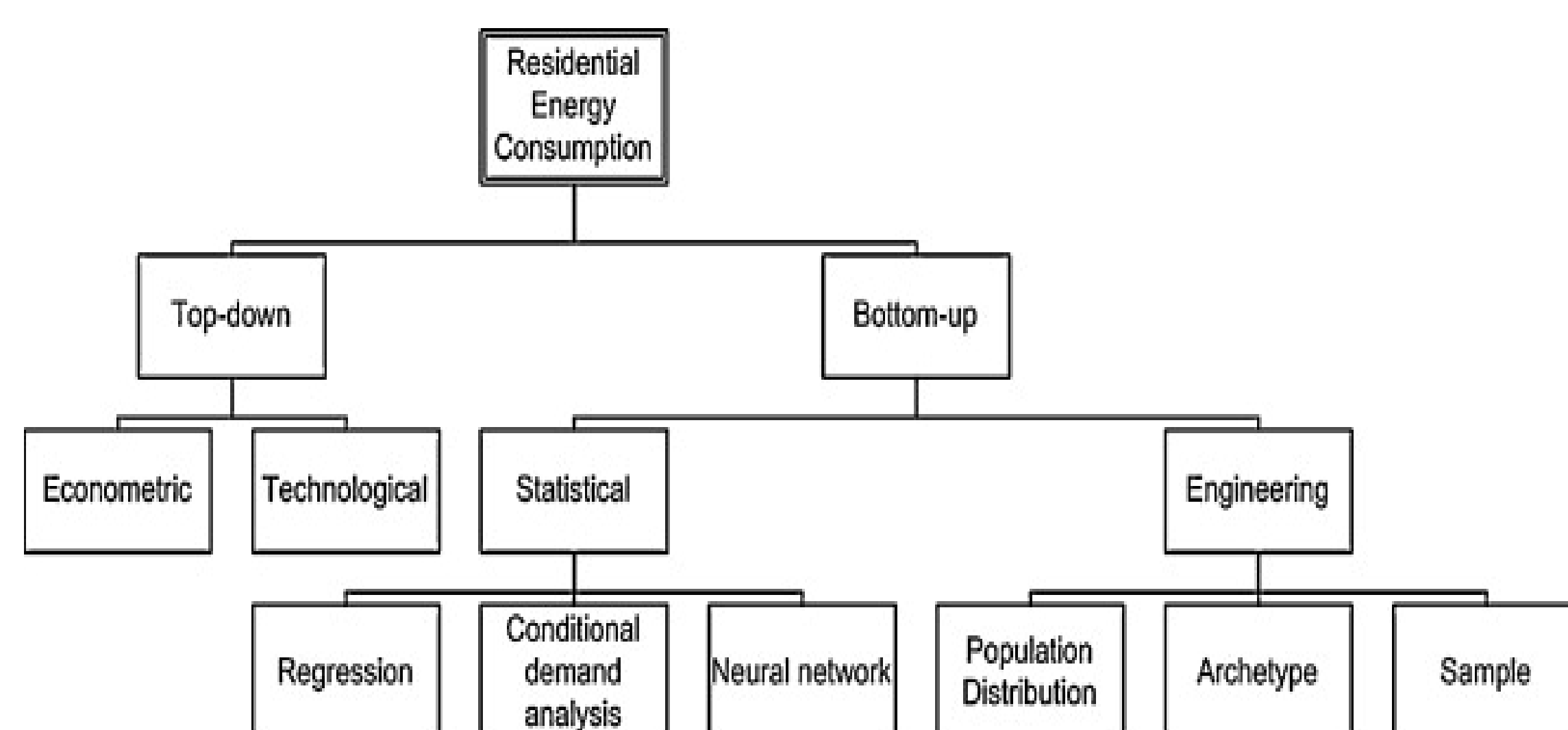
Rationale

Recycling and reusing building materials from demolished buildings can be sustainable and have promising solutions. We propose to utilize existing buildings as a material bank by estimating existing building material stock and creating a national database that allows for building materials to be reused or recycled.

Annual 600 million tons of C&D debris

Literature Review

Two main methods exist in material stock estimation: Top-down and Bottom-up. Bottom-up stock analysis methodology focuses on geospatial data that is broken down into research-centered archetype categories. With both engineering and statistical components centered around consumption statistics or material intensity. It is most often used when analyzing building characteristics.


Research Framework

Based on the Bottom-up methodology, a research framework has been created for compiling building material stock. Steps include:
- Identify necessary regional locations
- Utilize data lakes
- Organize into categories
- Analyze material stock estimations
- Adjust findings as needed

This framework can be used to recreate data sets for various archetypes and geospatial locations.
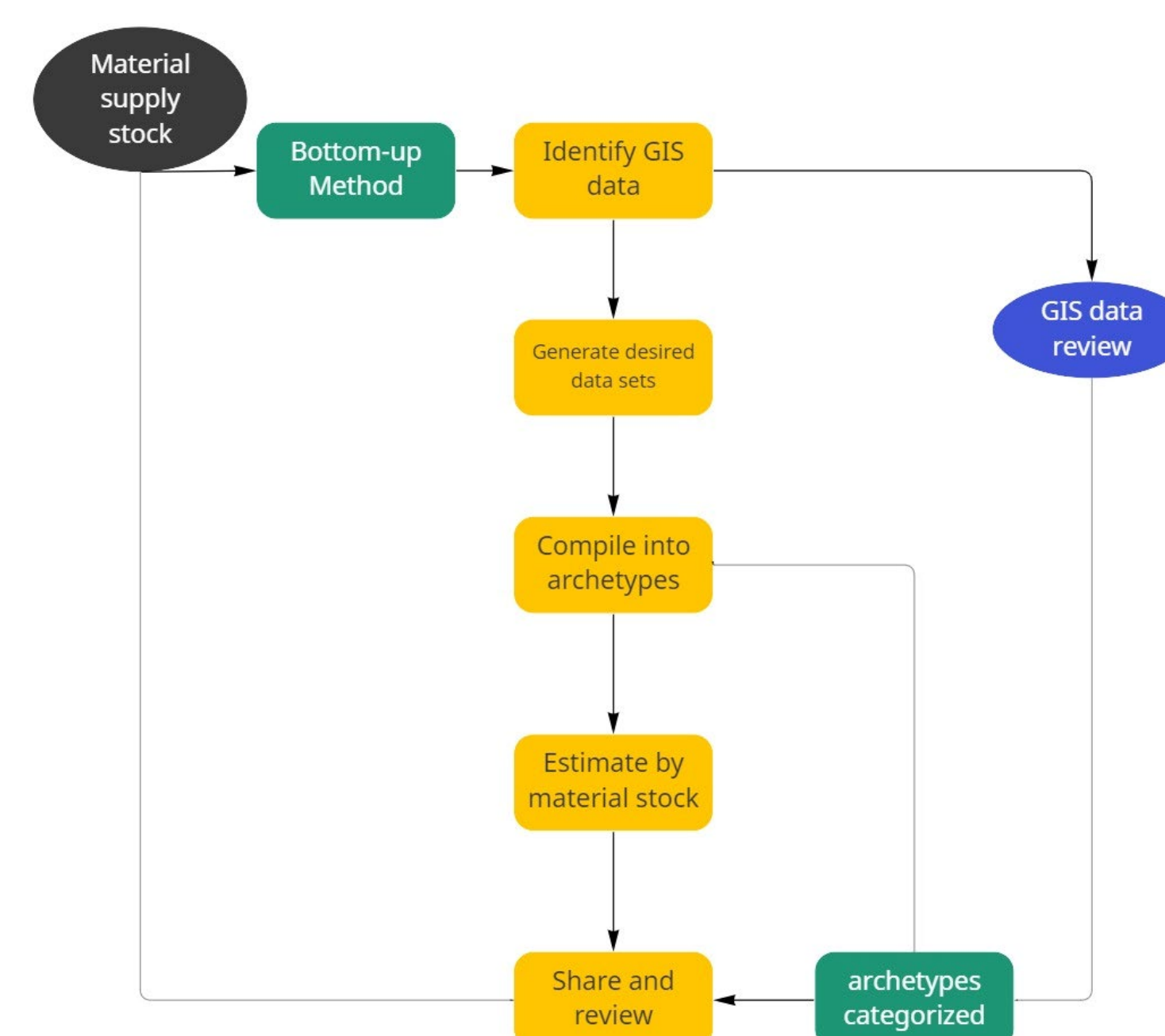
Data Analysis

Single-Family Detached	Wood Frame	<1940	4,900K
		1940-79	9,798K
		>1980	8,192K
Masonry or Steel Frame		<1940	1,229K
		1940-79	4,187K
		>1980	2,098K

Vintage bin	Brick	Concrete	Steel Frame	Wood Frame
<1940	18%	2%	0%	80%
1940-79	26%	4%	0%	70%
>1980	17%	4%	0%	80%

Discussion

Datasets currently in use for residential buildings include single-family and multi-family units but lack building material stock details. Limited information was found on the expected set of building materials as seen in the figure. Wood is the only noted reusable material.

■ Concrete	■ Clay brick	■ Wood
■ Glass	■ Ceramic	■ Gypsum
■ Roof gravel	■ Aluminium	■ Steel
■ Bitumen	■ Cast iron	■ Other

Challenges that could arise due to data collection issues:

- Existing datasets lack material stock analysis
- Delay in published data
- Limited material stock breakdown

This research seeks to improve these issues.

Future Direction

With this research framework, the goal is to create a circular economy with data that is used to:
- Compile building materials from multiple regions
- Organize stock by reuse or recycle
- Develop an open source building material database
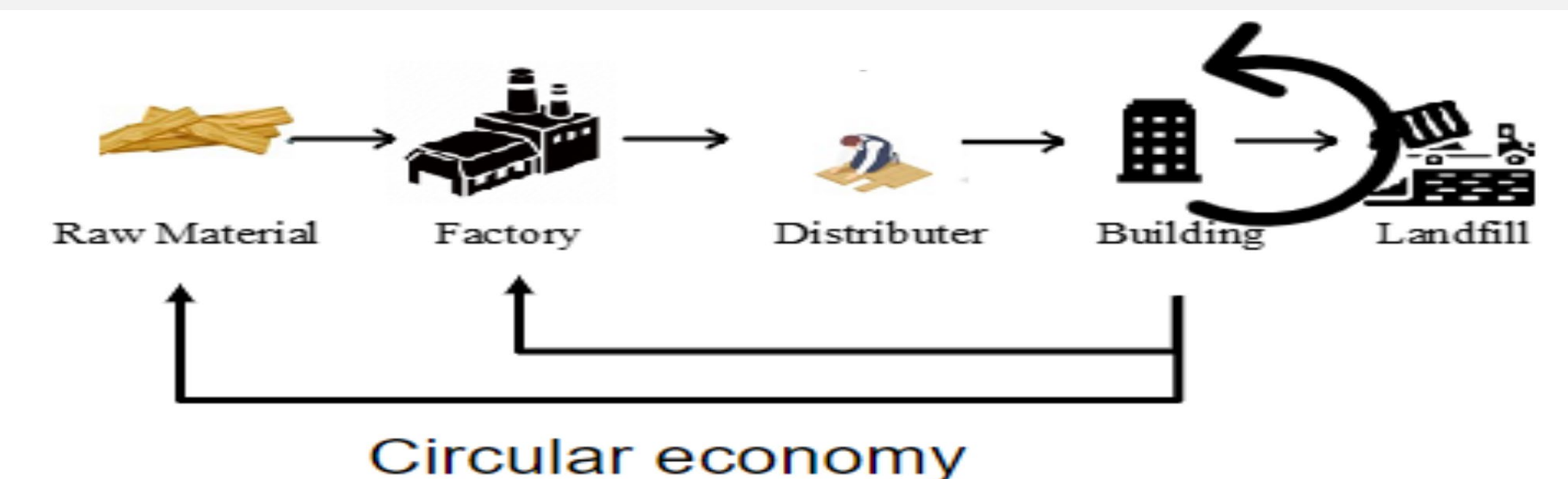
Raw Material → Factory → Distributer → Building → Landfill

Circular economy

Acknowledgments

References

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