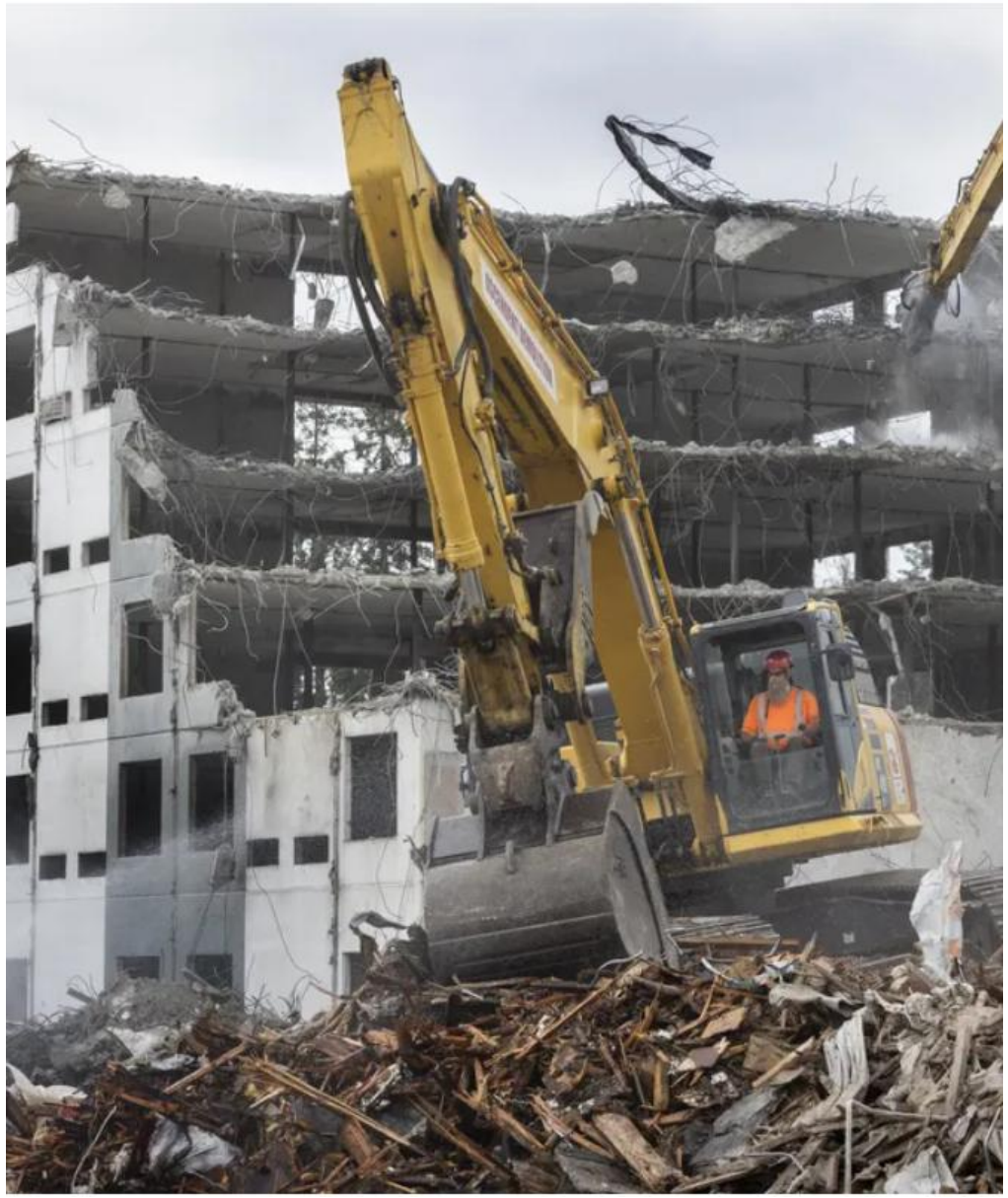
Design for Deconstruction: Social Justice Implications of Circular Construction

Applied Research Consortium

Idris Soliu



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Project Team

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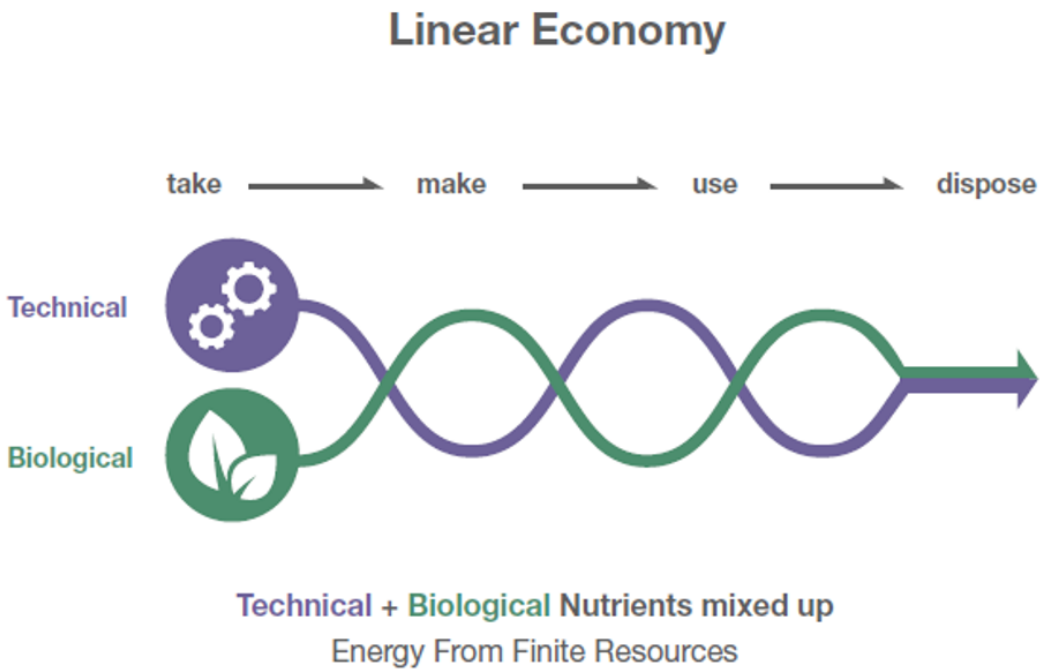
Background and Motivation (Recap)



Arup, 2016

~30% of Material Extraction
(Hossain et al, 2020)

~40% of CO2 Emission
(Pomponi & Moncaster, 2017)

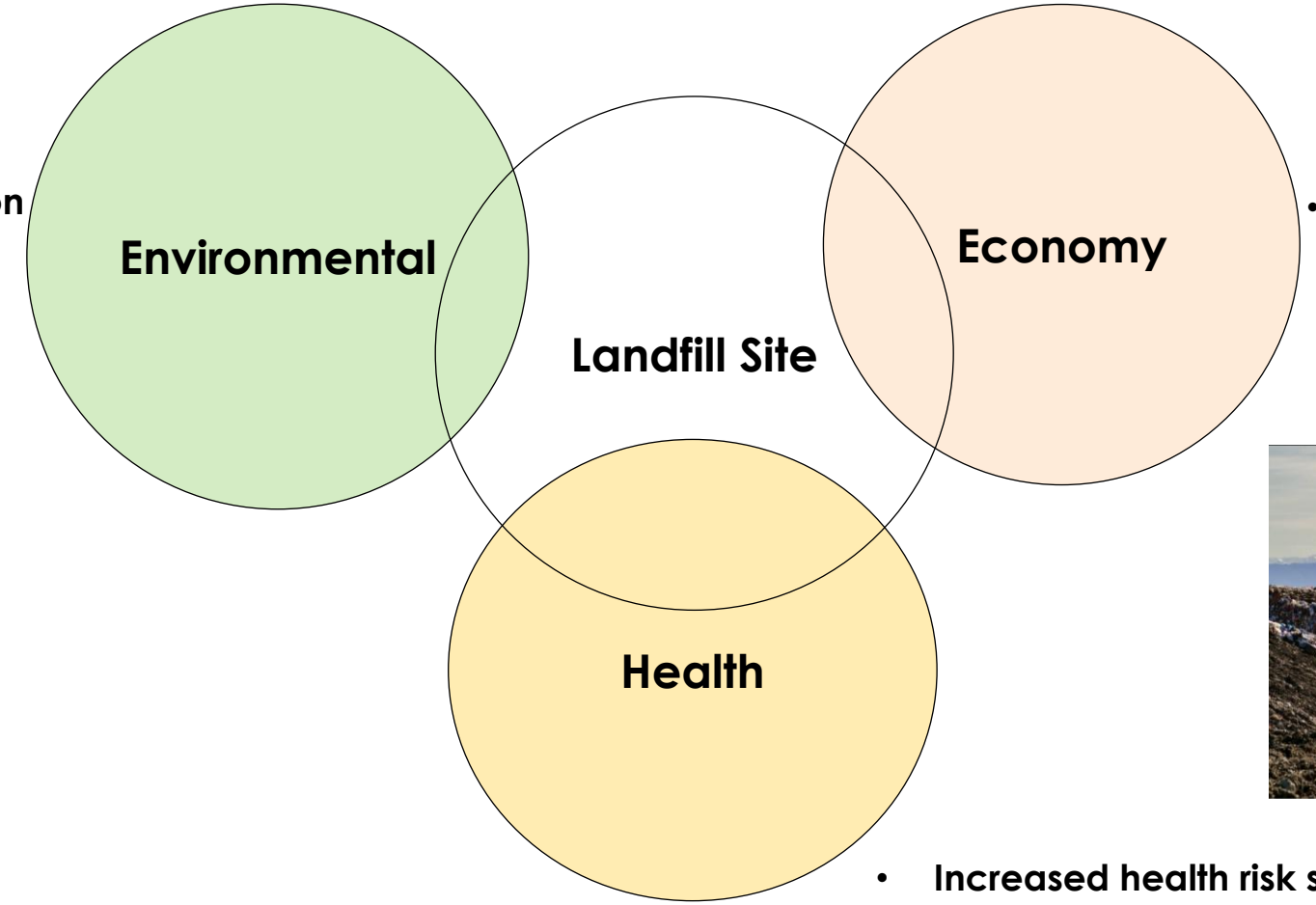
~32% of Energy Consumption
(Peng et at, 2023)

~40% of Solid Waste
(Zhikang, 2023)

Figure 1: Impact of Linear Practice in the Built Environment.

Background and Motivation (Recap)

- Environmental pollution
- Flood
- Groundwater contamination
- Draught
- Wildfire



- Economic exclusion due to a polluted environment

- Increased health risk such as Asthma and other respiratory issues due to airborne particulates

Background and Motivation (Recap)

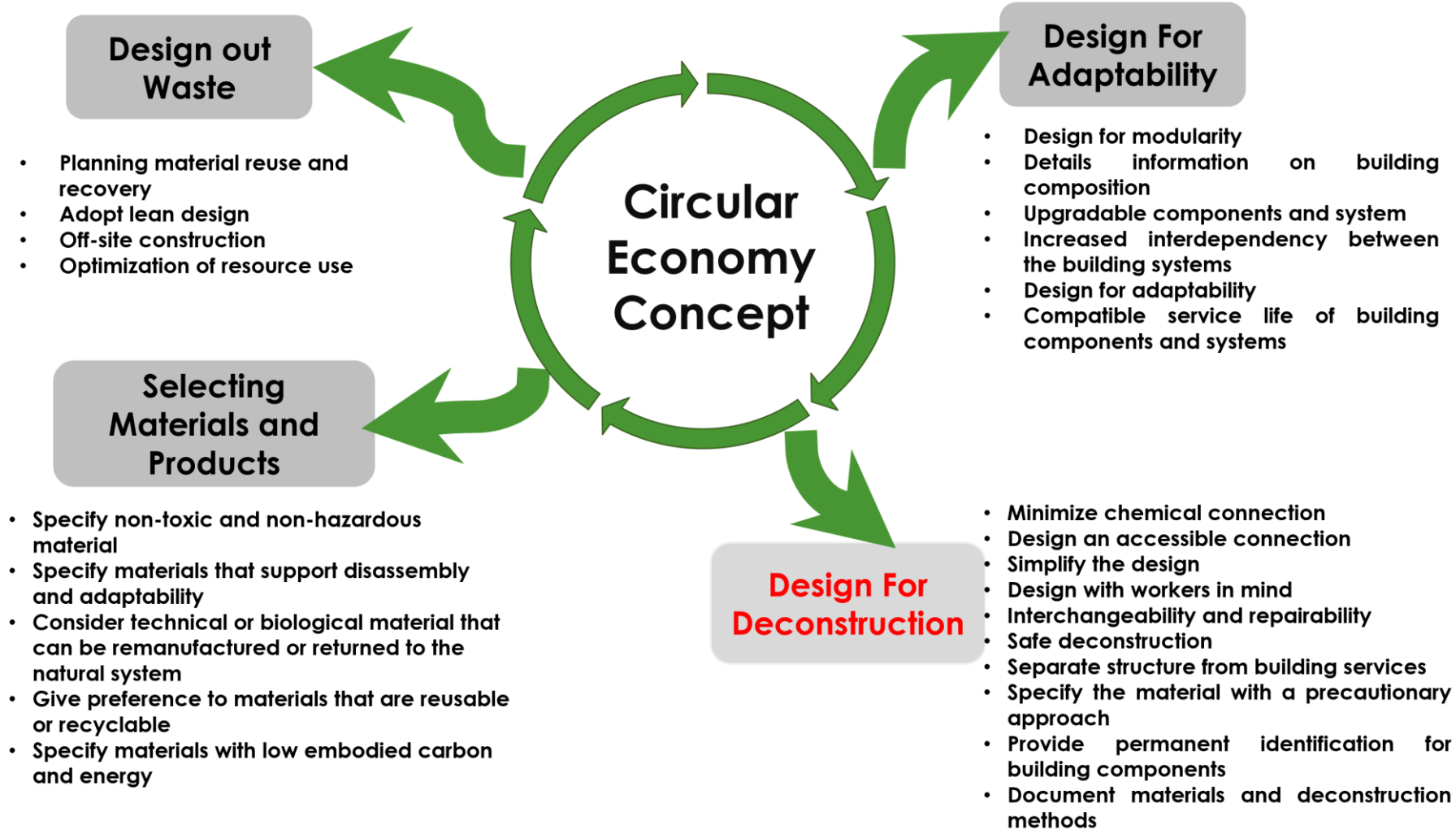


Figure 2: Circular Economy

Design To Demolish Vs. Design To Deconstruct

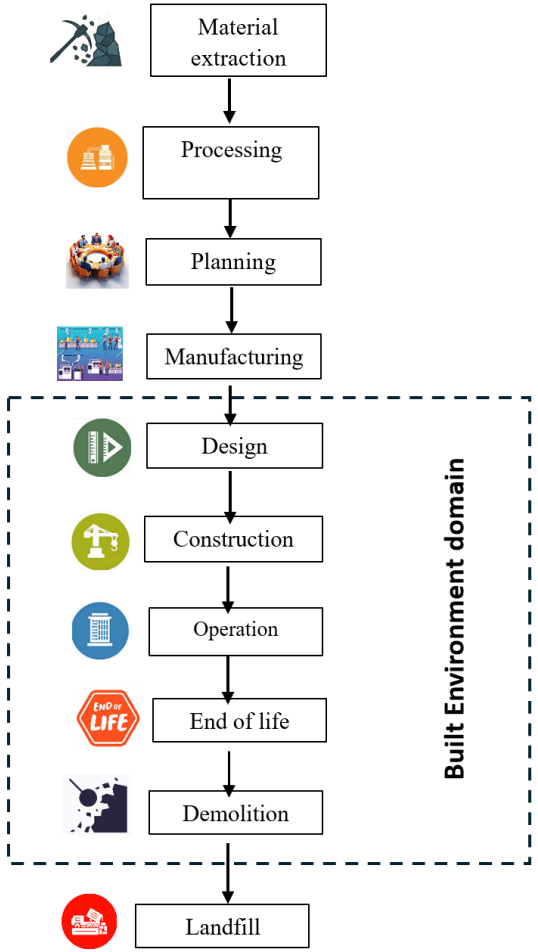


Figure 3: Current Practice

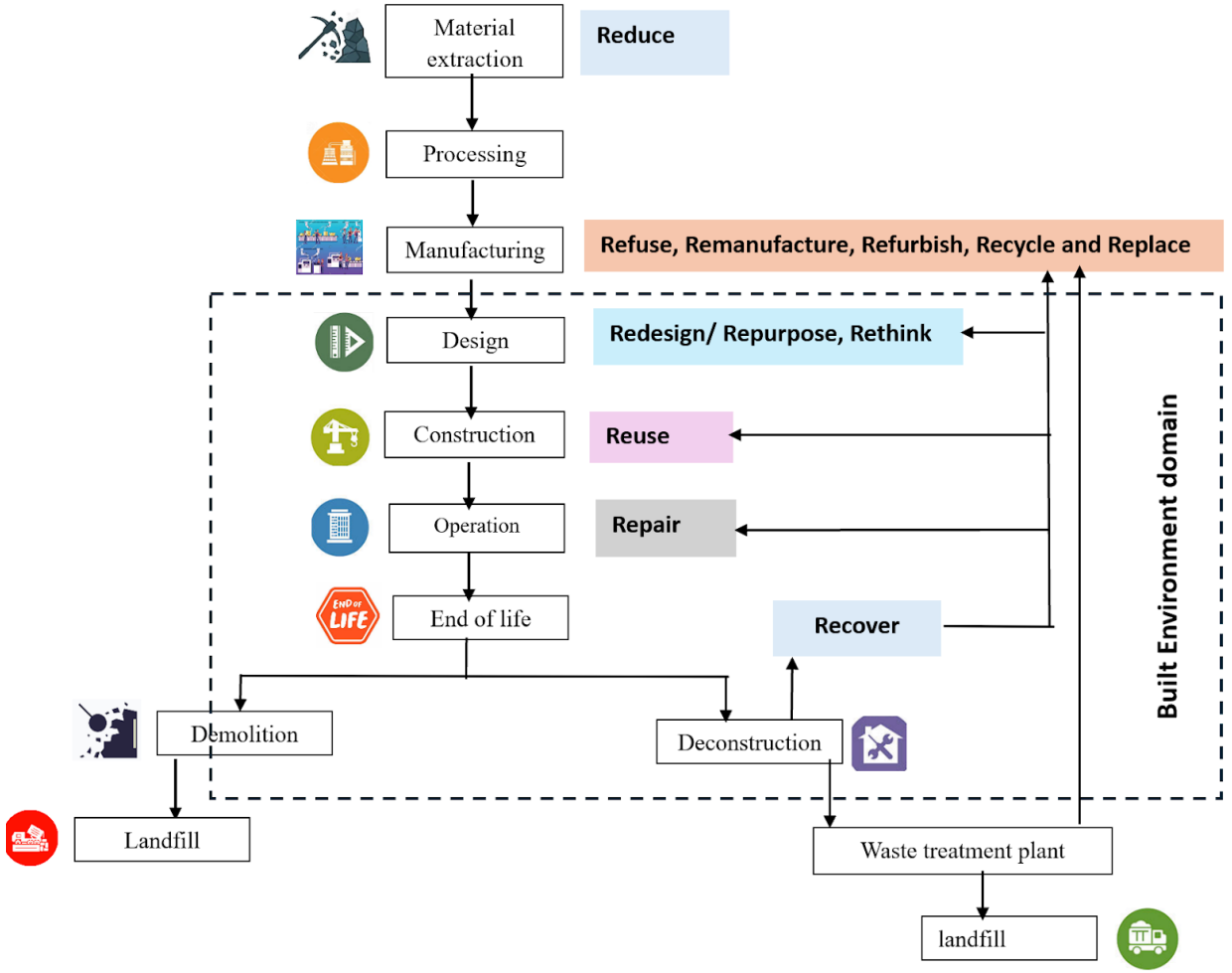


Figure 4: Proposed Practice

Research Questions

How can Design for Deconstruction mitigate the impact of construction and demolition waste in marginalized communities?

RQ1. What are the challenges of implementing design for deconstruction in construction projects?

RQ2. What are the drivers for implementing design for deconstruction in construction projects?

RQ3. What alternative strategy is available to achieve social equity in managing construction and demolition wastes in the built environment

Objectives of the Project

1. To assess the application of design for deconstruction practice in construction projects

2. Identify and analyze the barriers to implementing design for deconstruction in construction projects.

3. Examine the drivers for implementing Design for Deconstruction in the built environment

4. Propose an alternative approach that facilitates social equality in managing construction and demolition wastes in the built environment

Literature Review and Gap Identification (Recap)

Design for Deconstruction Principles	
1. Minimize chemical connection	6. Separate structure from building services
2. Design an accessible connection	7. Design with workers in mind
3. Simplify the design	8. Specify the material with a precautionary approach
4. Interchangeability and repairability	9. Provide permanent identification for building components
5. Safe deconstruction	10. Document materials and deconstruction methods

Literature Review and Gap Identification (Recap)

Barriers to Deconstruction Principles	
1. Awareness of design for deconstruction practices	7. Storage consideration for recovered materials during disassembly
2. Policy support	8. High costs of building disassembly
3. Building codes	9. Limited training on deconstruction procedures
4. Client interest in using recoverable material	10. Reliance on traditional methods of construction
5. Low disposal cost of demolition debris	11. Specialized tools and equipment
6. A large market for secondary materials	12. Construction stakeholders' interest in adopting deconstruction practices

Case Studies (Recap)

Figure 5: Triodos Bank Headquarters Driebergen, Netherlands

Figure 6: The Exchange House London, United Kingdom

Figure 7: Building Deconstruction Washington, United States.

Result

- The building was constructed using a mechanical connection to facilitate recovery and divert waste from landfills.

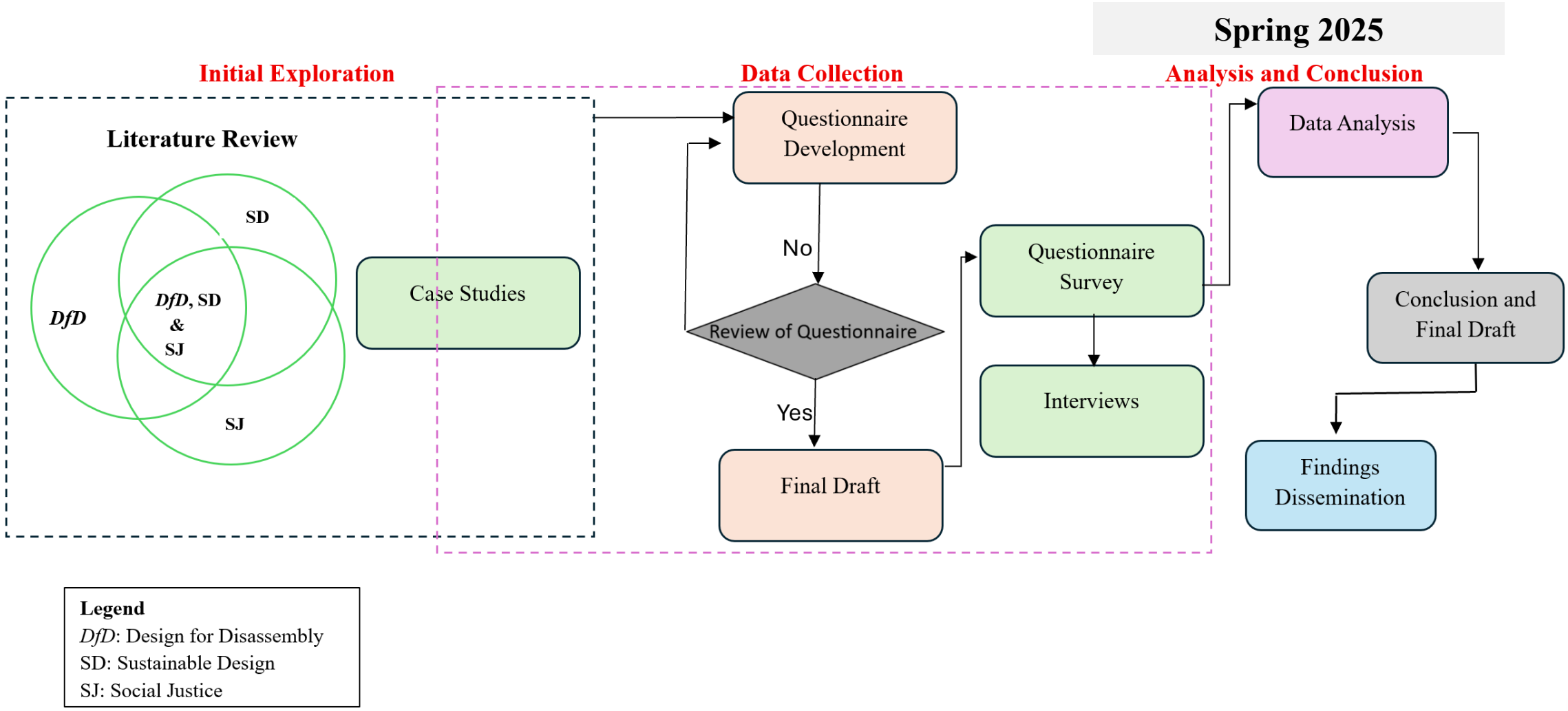
- About 5,889 items, including doors, windows, carpets, and other electrical components, were salvaged and donated to people

- Divert 137 tons of waste from landfills

- Two buildings were deconstructed, and the materials were donated to Habitat Clallam County for repurposing and resale as secondary building materials.

- The third was relocated, diverting 40 tons of waste from landfills.

Research Process and Project Timeline



Data Analysis

Descriptive Statistics: Background Information

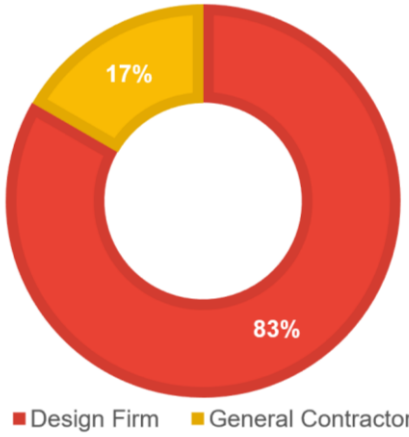


Figure 8: Type of Organization

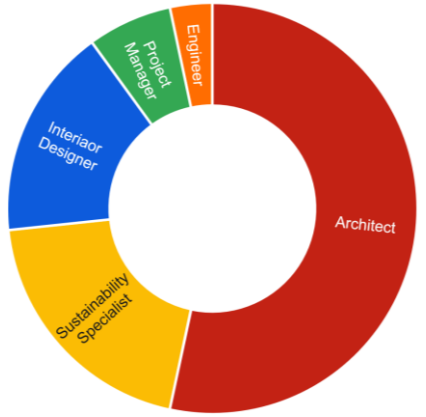


Figure 9: Profession

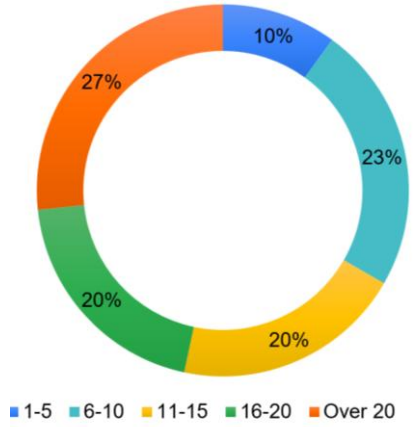


Figure 10: Years of Experience

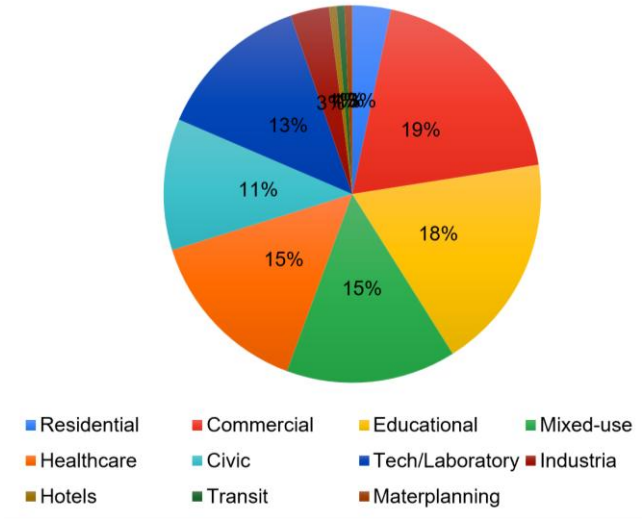
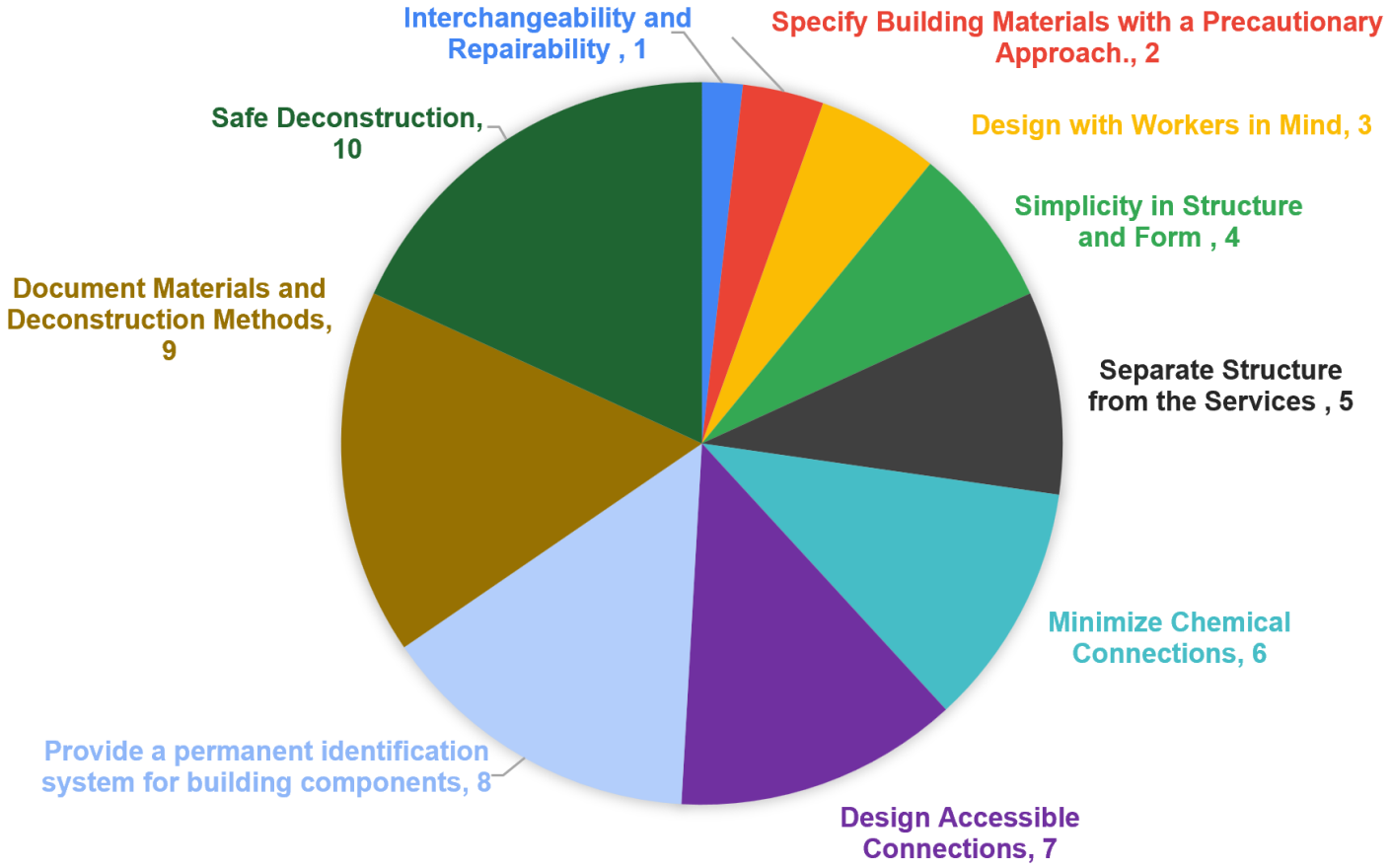


Figure 11: Types of Project

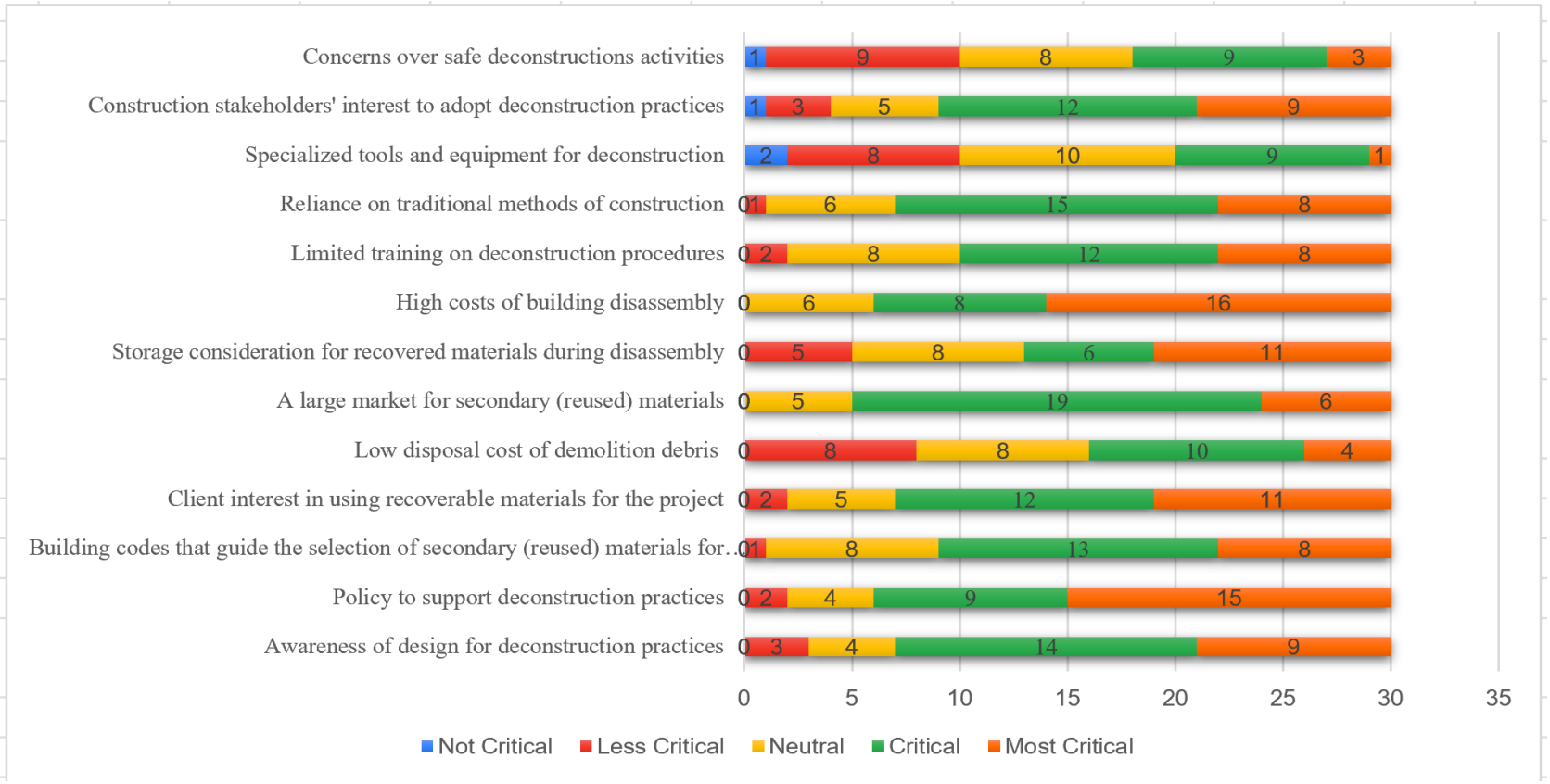
Analysis and Discussion: Application of DfD



Most Applicable Principles

1. Interchangeability and repairability
2. Material specification
3. Design with workers in mind

Analysis and Discussion: Barriers to DfD



Top two Barriers

1. **Cost of deconstruction**
2. **Lack of Policy support**

Analysis and Discussion cont'd

Results of the Interview on the Top Two Barriers

- Demolition costs ranged from $7 to $16 per sf, and Deconstruction is between $10 to $25

Cost Driver

- Labor intensity
- Time required
- Material handling and sorting
- Accessibility

Policy Support

- Tax incentive for building deconstruction
- Mandatory deconstruction for a certain type of building
- Prioritize permitting for DfD

Driver for Implementing *DfD* Principles

- Development of an appropriate policy
- Create awareness of DfD Practice
- Collaborate with a deconstruction specialist at the design stage
- Provide tax incentives for deconstruction
- Develop DfD playbook

Contribution of the to Knowledge

Policy Development

- Develop a policy, e.g, deconstruction ordinance
- Provision of tax break
- Prioritize permitting for DfD

Training Programs

Training and retraining of skilled labor on:

- Deconstruction techniques
- Safety protocols
- Material sorting

Market Infrastructure

- Develop a large reuse market to make reused materials accessible and divert waste from landfills.

Community Engagement

- Promote community-driven sustainability awareness
- Educate the client on the social impact of the current practice.
- Using the salvaged material for social housing.

Cost Mitigation

- Subsidize deconstruction costs through grants, low-interest loans, etc.
- Support resale and encourage small businesses

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Contribution to Practice

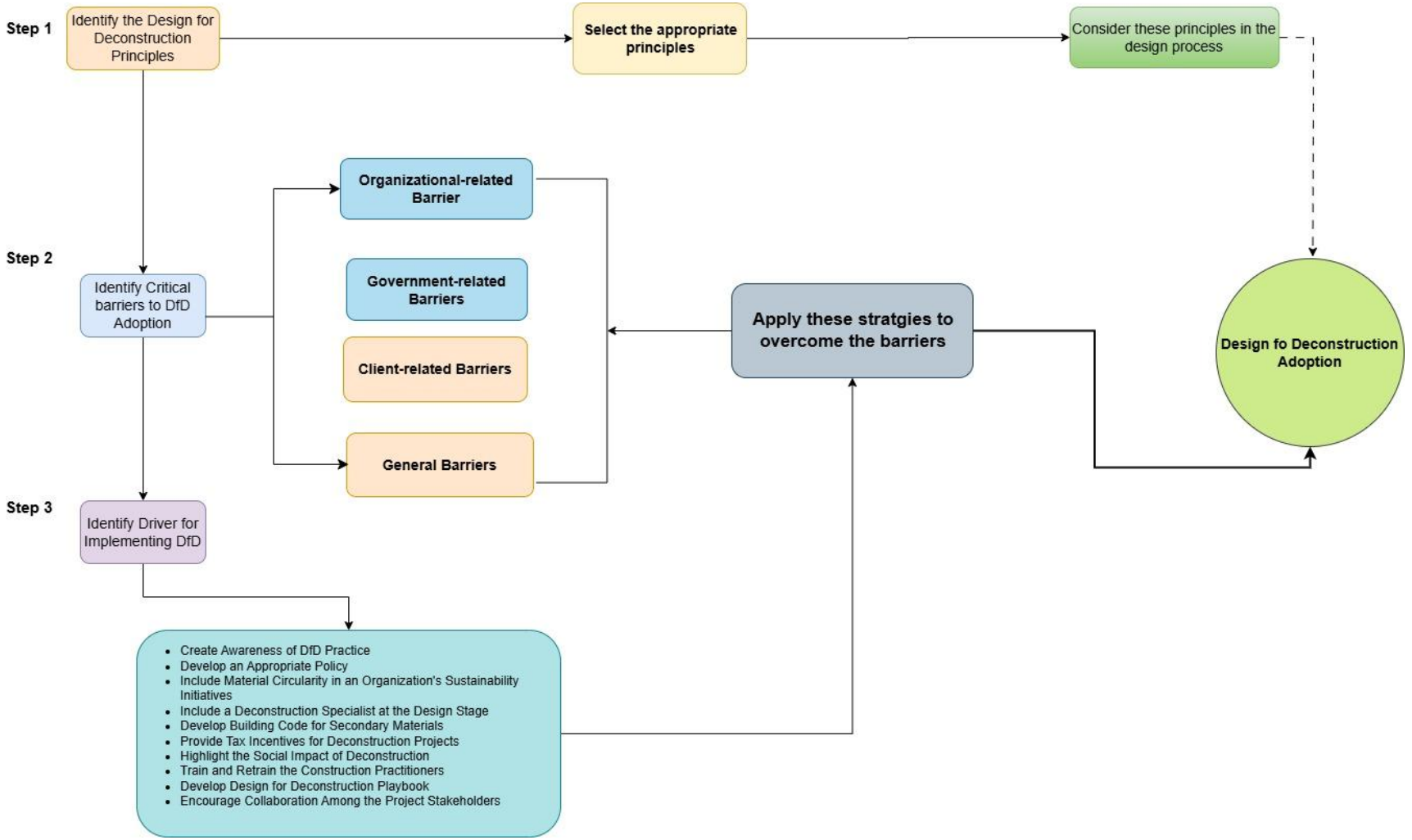

Figure 14: Proposed Design for Deconstruction Strategies

Contribution to Practice

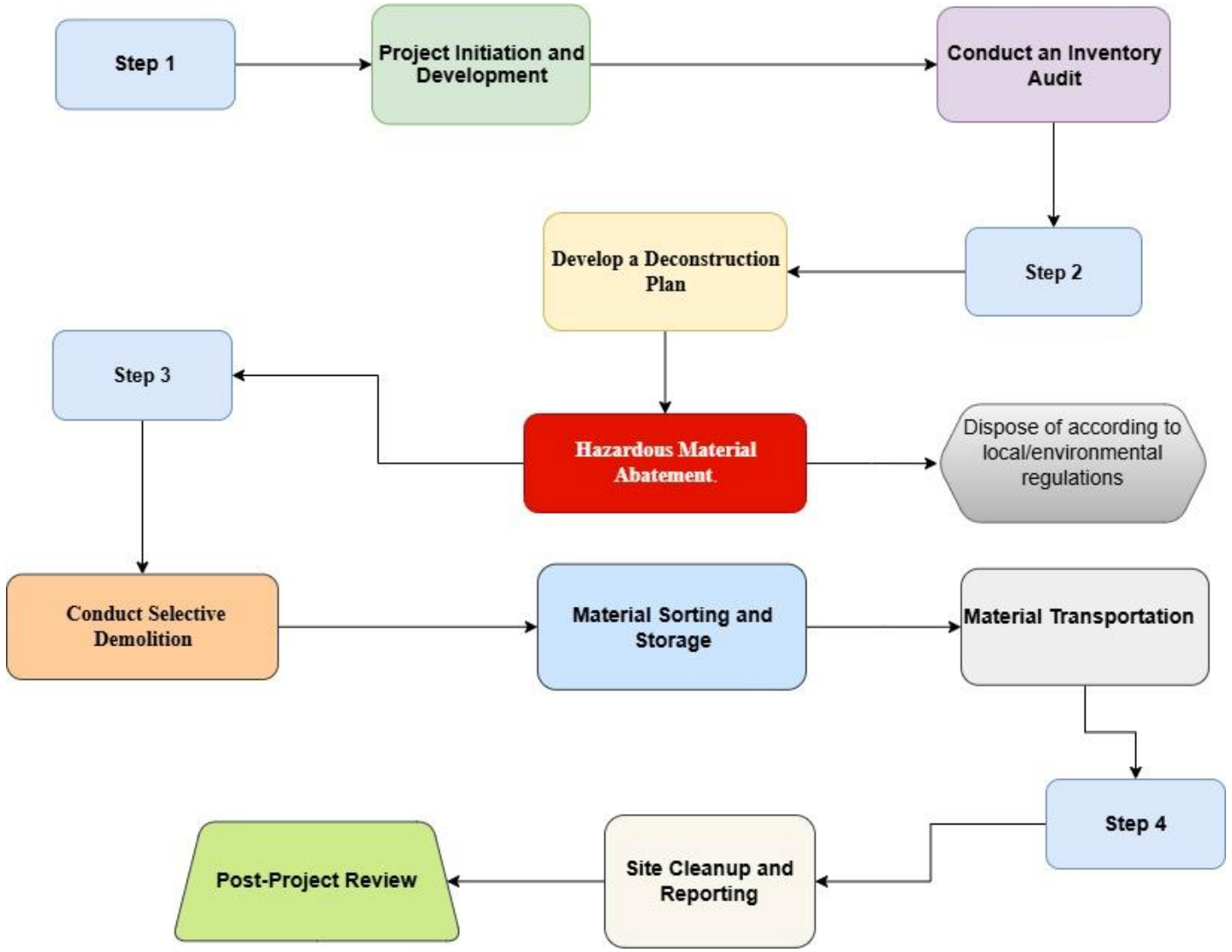

Figure 15: Proposed Deconstruction Strategies For an Existing Building

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Thank you for listening