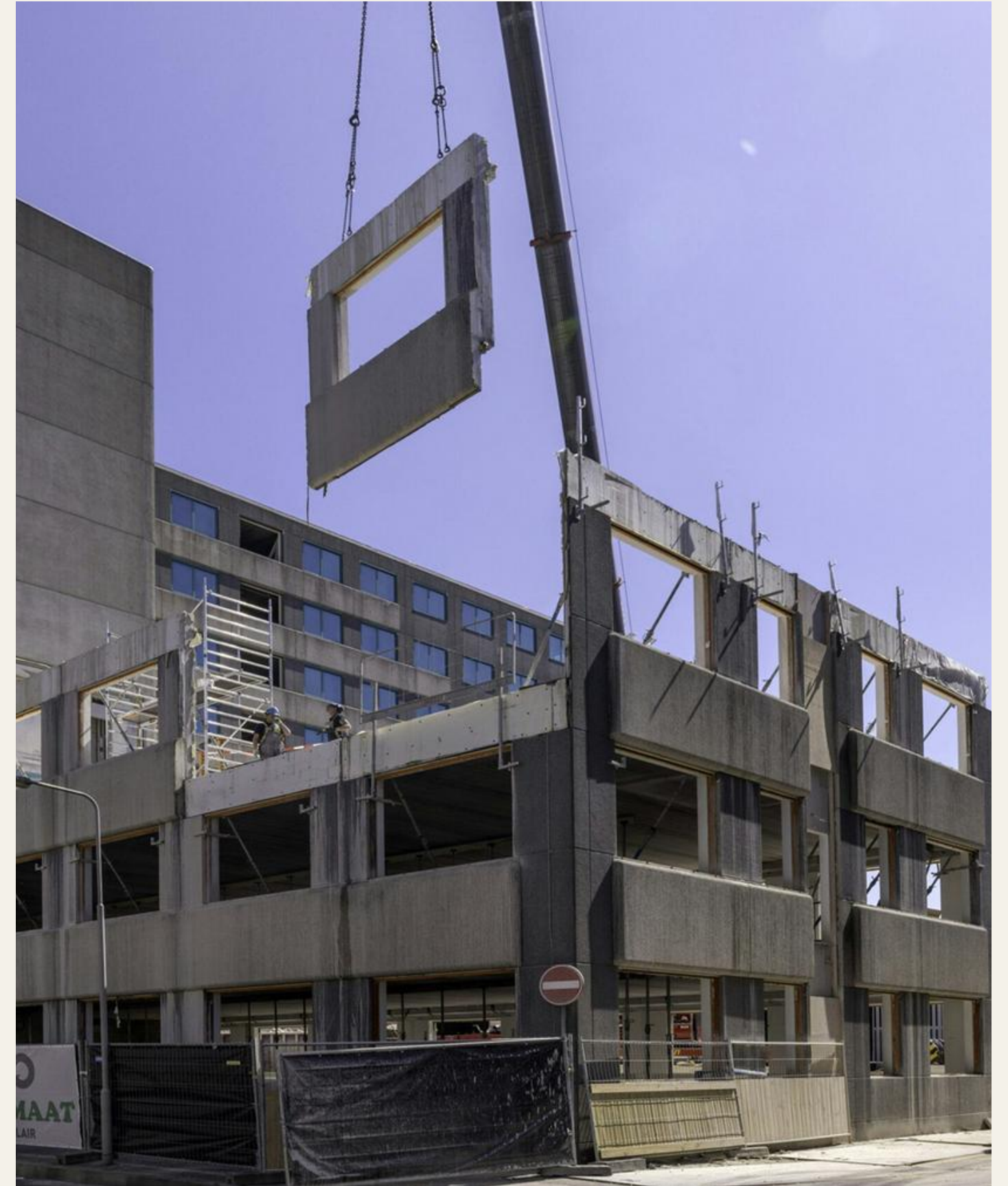


# Enabling the reuse of structural components through collaboration

P5 presentation – Milan Bezem

30-06-2025



# Linear construction project



Initiation

Design

Pre-  
construction

Construction

Demolition



# Demolition



Incineration or landfill



Recycling





# Waste management strategies

The R-ladder



(VCI, 2024)

◀ Re-use



◀ Recycle



# Facts

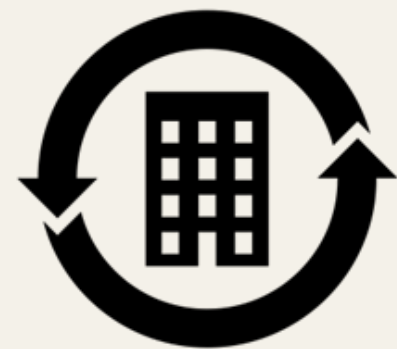
The Netherlands:

88%



Recycle

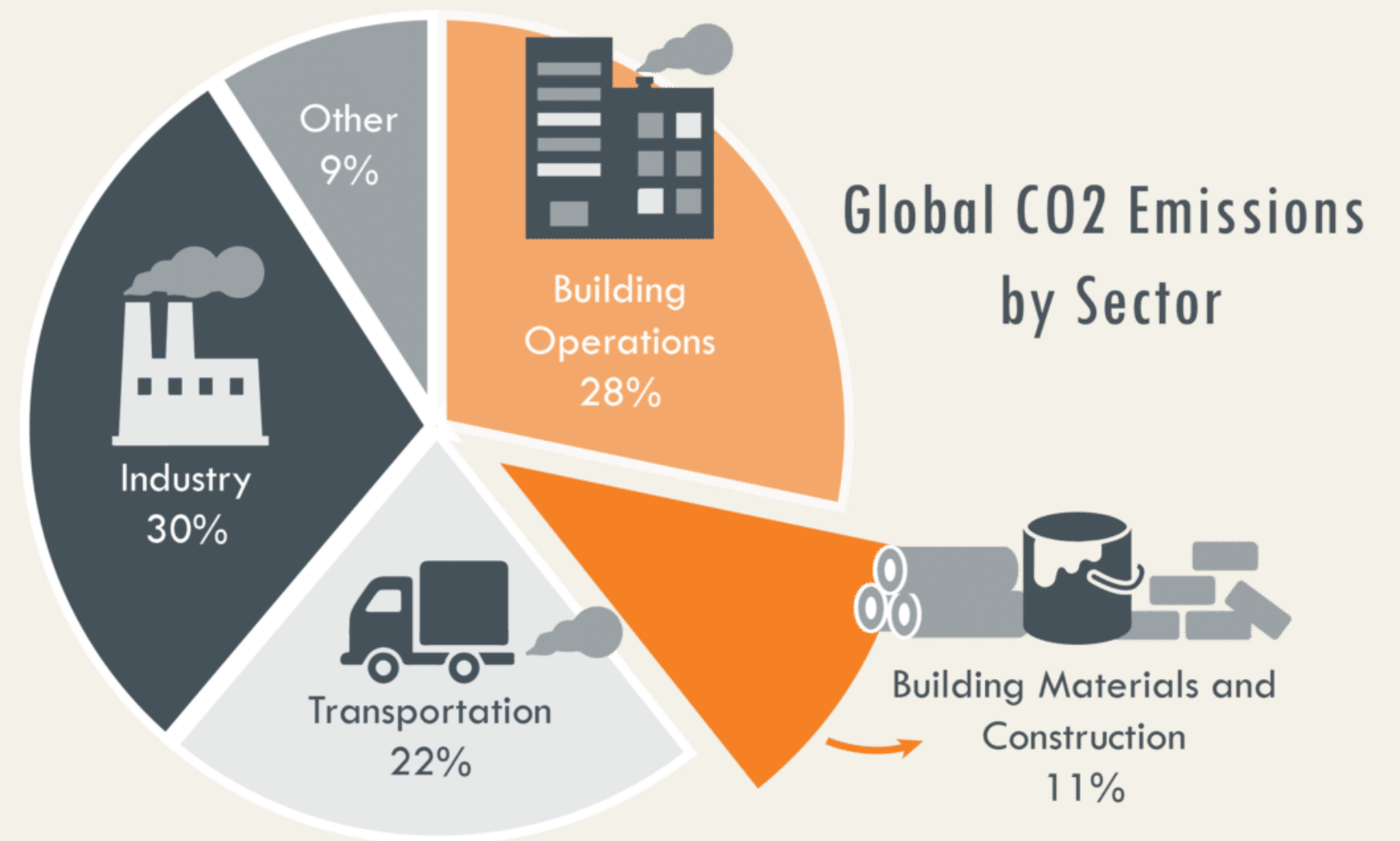
8%



Re-use

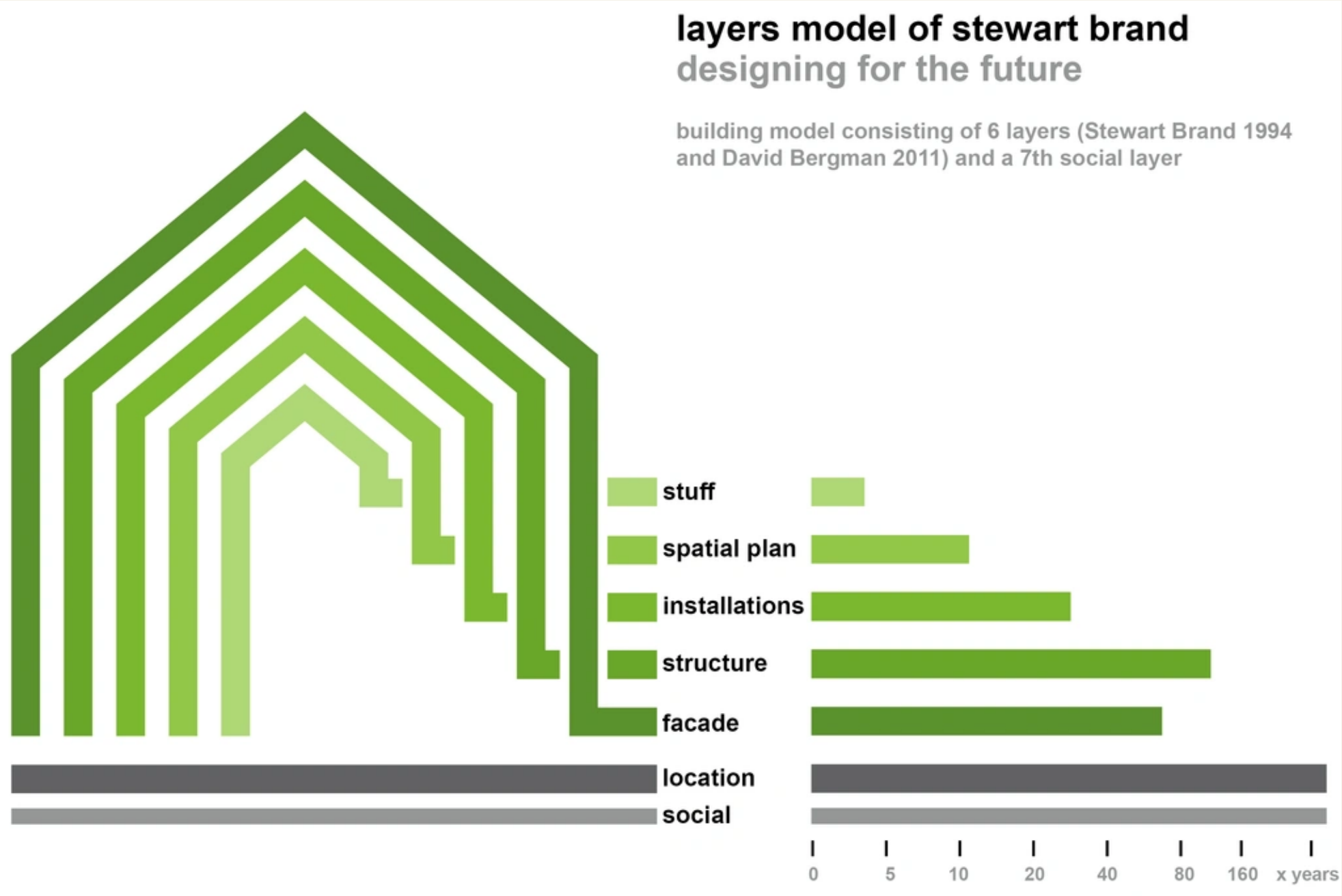
*(Circle Economy, 2022)*

Global:



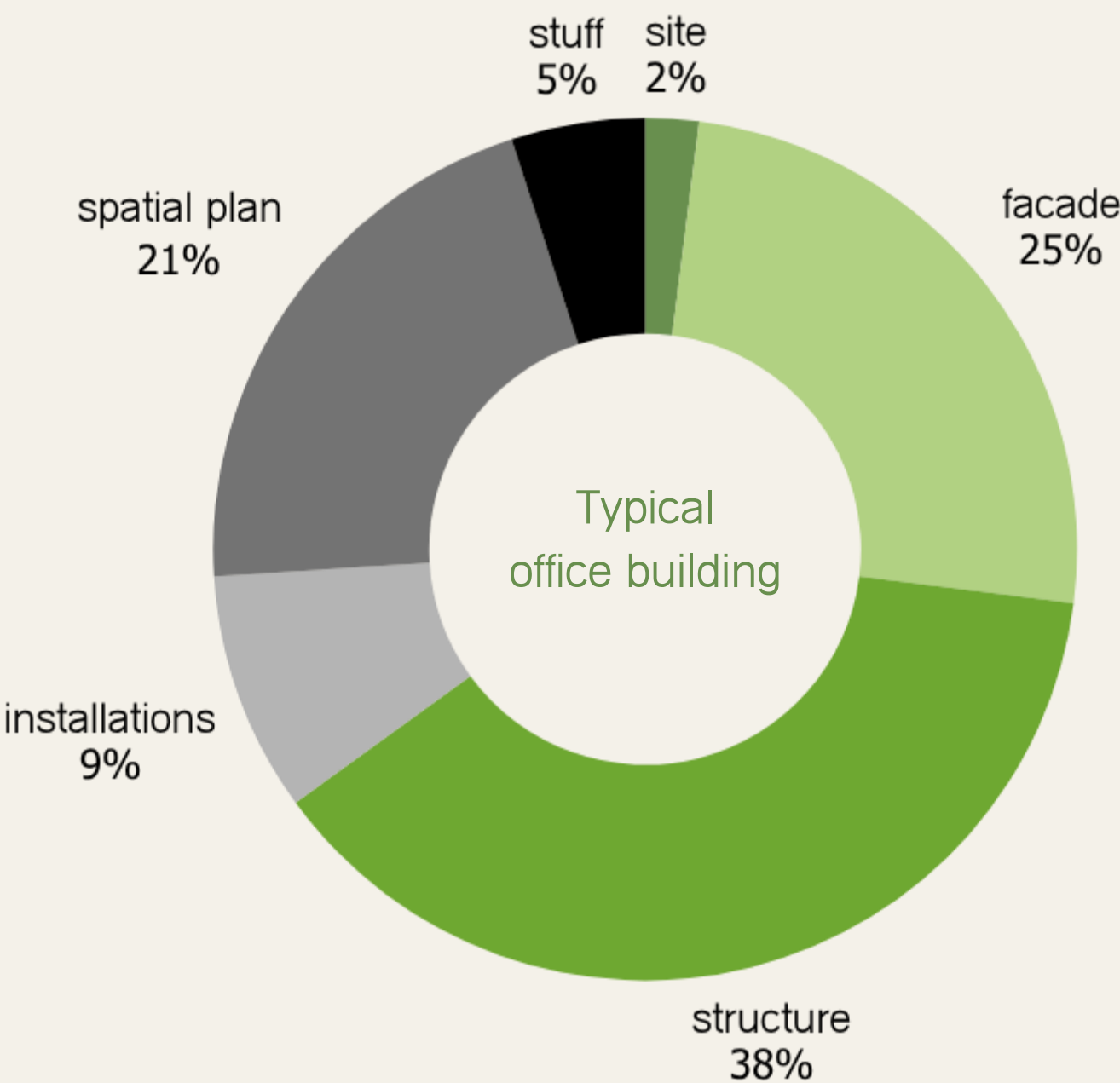
*(nbi, 2020)*

# Building layers



(Cepezed, 2022)

## Embodied carbon



(STOK, 2021)

# Why not more often?

## Barriers:



Technical



Regulatory



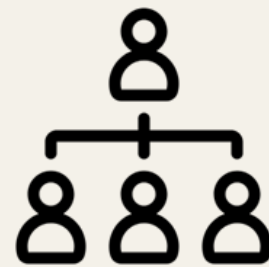
Environmental



Economic



Social



Organizational



## Collaboration





# Research question

*“How can **collaboration** between key actors in the construction value chain address key reuse barriers to **enable** the reuse of structural building components from existing buildings reaching the end of their lifecycle?”*



# Overview

- |   |            |
|---|------------|
| 1 | Cases      |
| 2 | Results    |
| 3 | Discussion |
| 4 | Conclusion |
| 5 | Reflection |

# Circular construction project



Initiation

Design

Pre-  
construction

Construction

deconstruction



# Tijdelijke Rechtbank Amsterdam

- Demountable Building
- Structural steel and concrete slabs
- 90% reuse-rate

Amsterdam



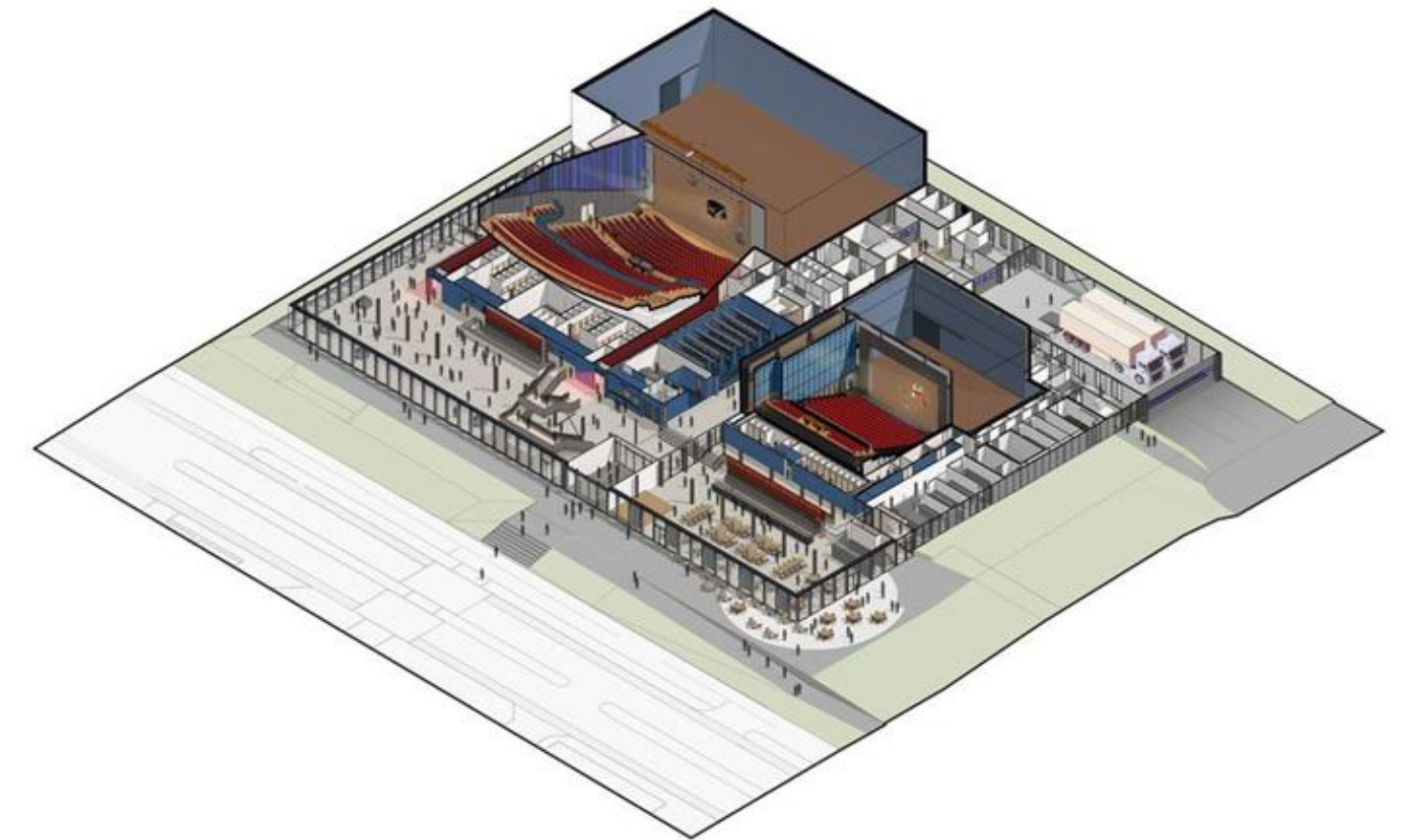
Enschede





# Cultureel Centrum Lievekamp

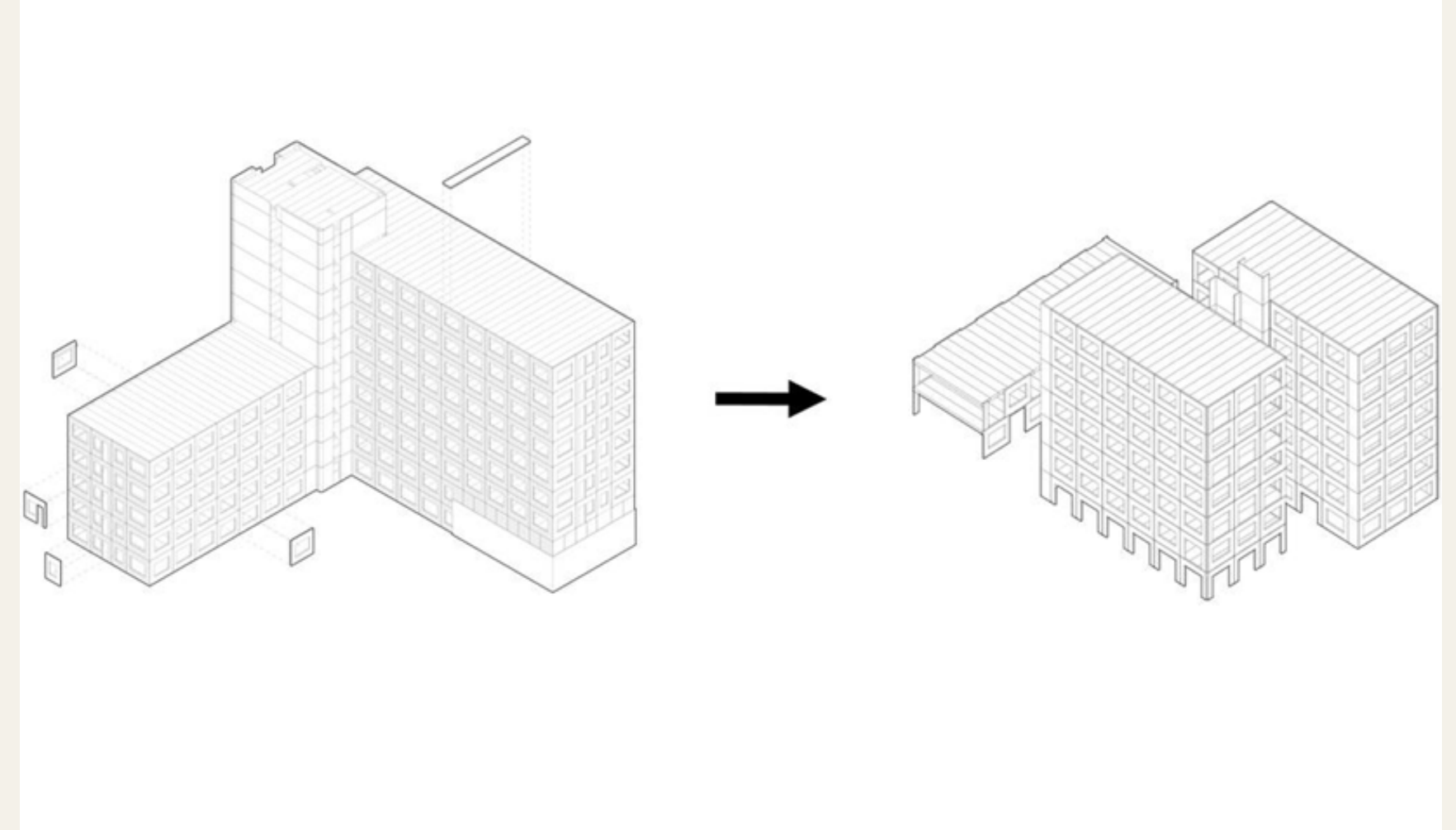
- Theatre
- Structural steel and concrete slabs
- 80% reuserate





# Circulair Centrum Nederland

- Office building
- Precast concrete components
- 92% reuse-rate







?



# Subquestion 1

*“What **technical, design and process-related factors** influence the **reusability** of existing structural components from existing buildings reaching the end of their lifecycle?”*

# Results Q1.

Independence & exchangeability



Toxicity



Adaptability



Quality assurance process



# Barriers



Technical



Regulatory



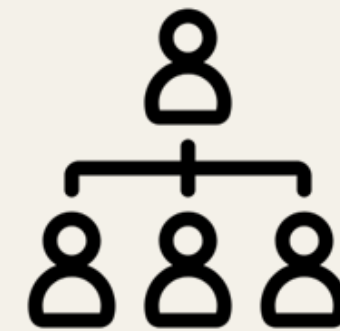
Environmental



Economic



Social



Organizational



# Subquestion 2

*'What are the key **barriers and enablers** influencing the reuse of structural components from existing buildings reaching the end of their lifecycle?'*

# Results Q2.



Technical



Regulatory



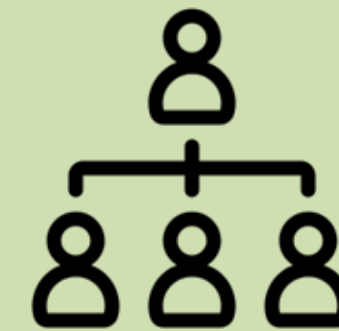
Environmental



Economic



Social



Organizational

# Subquestion 3

*“What **roles, knowledge and processes** are essential for key actors to **successfully collaborate** and **enable** the reuse of structural components?”*



# Results Q3.

## Factors for successful collaboration

- 1.Shared vision
- 2.Mutual benefits
- 3.Shared risks
- 4.Compromise ability
- 5.Trust
- 6.Inclusive partnerships
- 7.Transparent communication
- 8.Joint decisions
- 9.Time and resources

## Collaboration domains



Tools and resources



Roles and responsibilities



Communication and information



Decision-making



Economic and market structures

# Theoretical framework 1.0



# Interviews

9



5

Architects

Developers

Advisors

Deconstruction

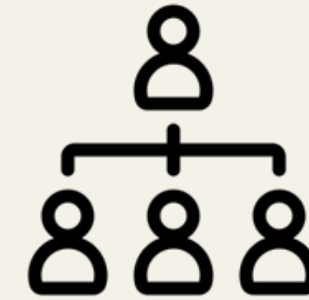
Contractor



# Results Q2.



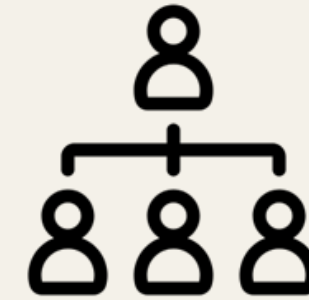
Social



Organizational

- Extra costs: testing, coordination, and labour
- Lack of financial models (residual value)

# Results Q2.



- Thinking in terms of long-term value (residual value & Co2 savings)
- Single actor ownership

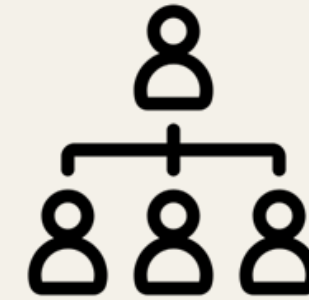
# Results Q2.



Economic



Social



Organizational

- A hesitant sectoral culture
- Lack of knowledge, awareness and engagement

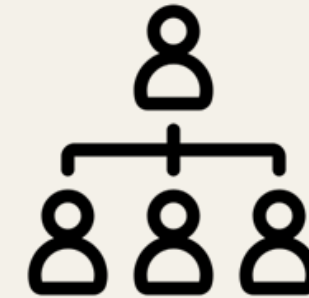
# Results Q2.



Economic



Social



Organizational

- Practical examples convince hesitant actors
- Enthusiastic team and committed client



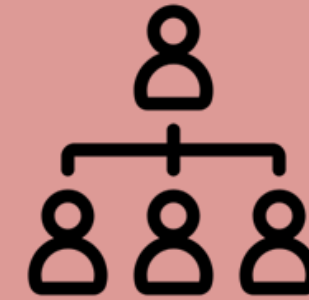
# Results Q2.



Economic



Social



Organizational

- Complexity: accountability, matching supply and demand
- Different level of information needs

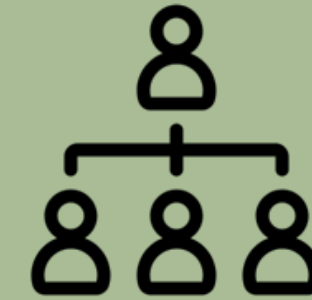
# Results Q2.



Economic



Social



Organizational

- Early actor involvement
- Early and structured documentation

# Results Q3.



## Tools and resources



## Roles and responsibilities



## Communication and information



## Decision-making



## Economic and market structures

- Digital tools (BIM) supports design, logistics, and inventory management
- Early coding and labelling improve traceability
- Lack of shared databases and reuse platforms

# Results Q3.



Tools and resources



Roles and responsibilities



Communication and information



Decision-making



Economic and market structures

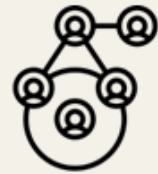
- Shifting roles: Reuse and BIM coordinators
- Cultural shift needed: curiosity and collective responsibility



# Results Q3.



Tools and resources



Roles and responsibilities



Communication and information



Decision-making



Economic and market structures

- Fragmented information and mismatched needs
- Structured feedback and evaluation sessions align expectations

# Results Q3.



Tools and resources



Roles and responsibilities



Communication and information



Decision-making



Economic and market structures

- Reuse goals must be defined and measurable early on
- Flexibility needed across non-linear design phases

# Results Q3.



Tools and resources



Roles and responsibilities



Communication and information



Decision-making



Economic and market structures

- Clients hesitant due to cost, storage, and risk uncertainty
- Residual value and lifecycle models remain underused



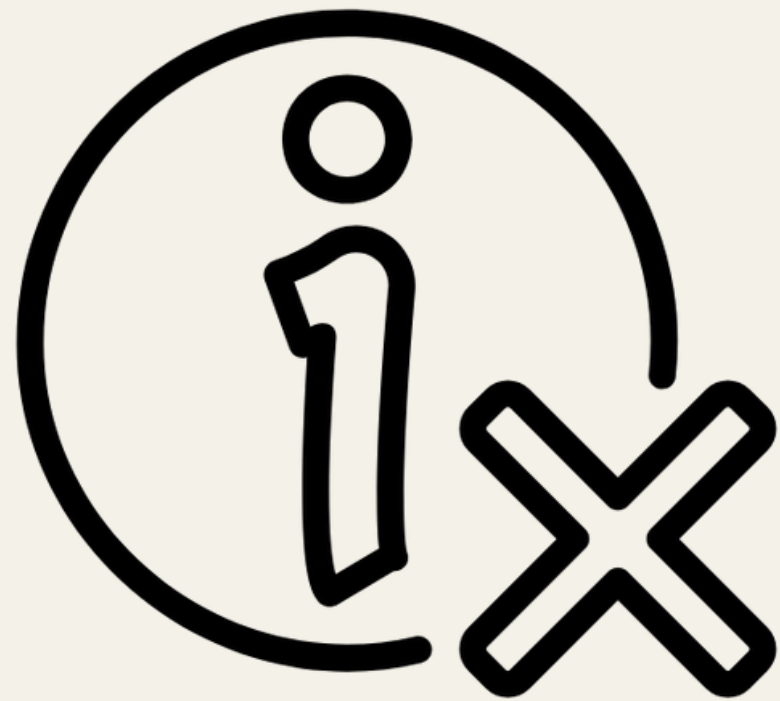
# Theoretical framework 1.0



# Empirical framework 2.0



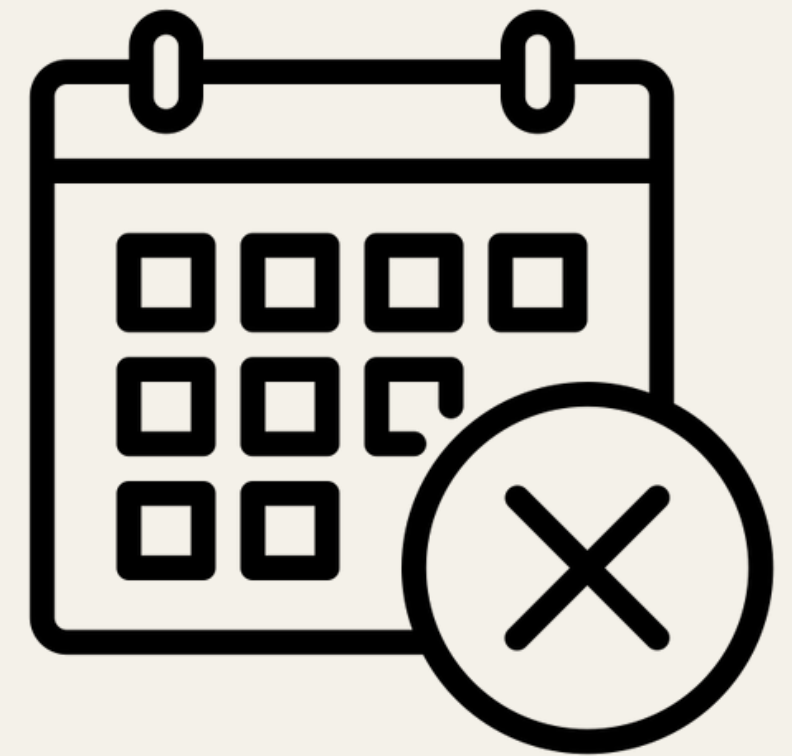
# 3 Key Challenges



Mismatch of information



Unclear roles, responsibilities  
and ownership



Mismatch material supply  
and project planning



# Challenge 1: Mismatch of information



- Unaligned info needs and detail levels
- Gaps after handovers and missing data
- No shared BIM model or database

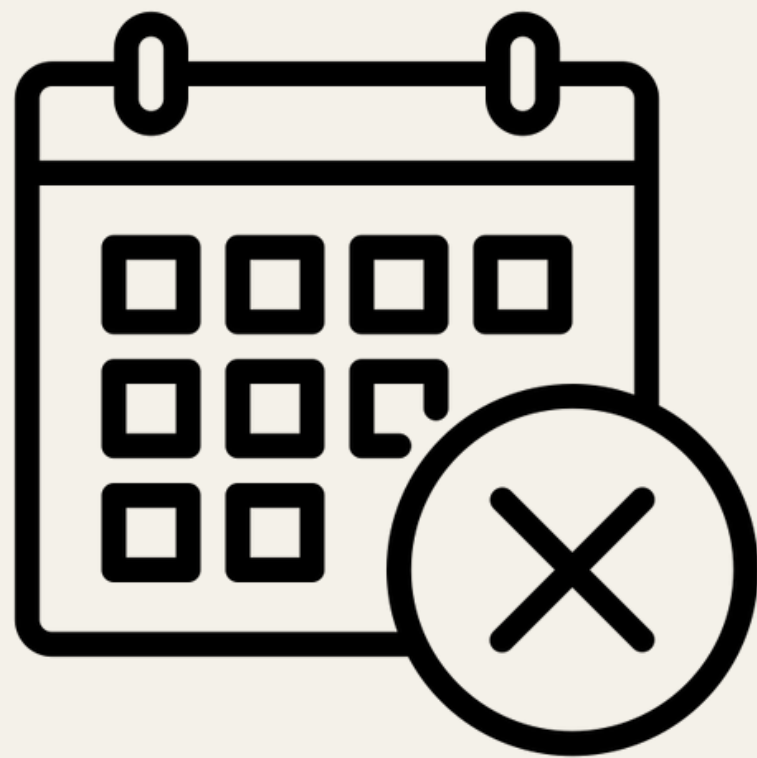
## Challenge 2: Unclear Roles, Responsibilities and Ownership



- Unclear responsibilities and risk ownership
- Reuse not embedded in contracts or tenders
- Hesitant culture and weak commitment

# Challenge 3:

## Mismatch material supply and project planning



- Donor material availability misaligned with design
- Storage, testing, and logistics not planned or budgeted
- No structured market to match supply and demand



# Subquestion 4

*“What **strategy guide** can be developed for key actors to successfully collaborate and **address key barriers** to **enable** the reuse of structural components from buildings reaching the end of their lifecycle”*

# Workshop

3



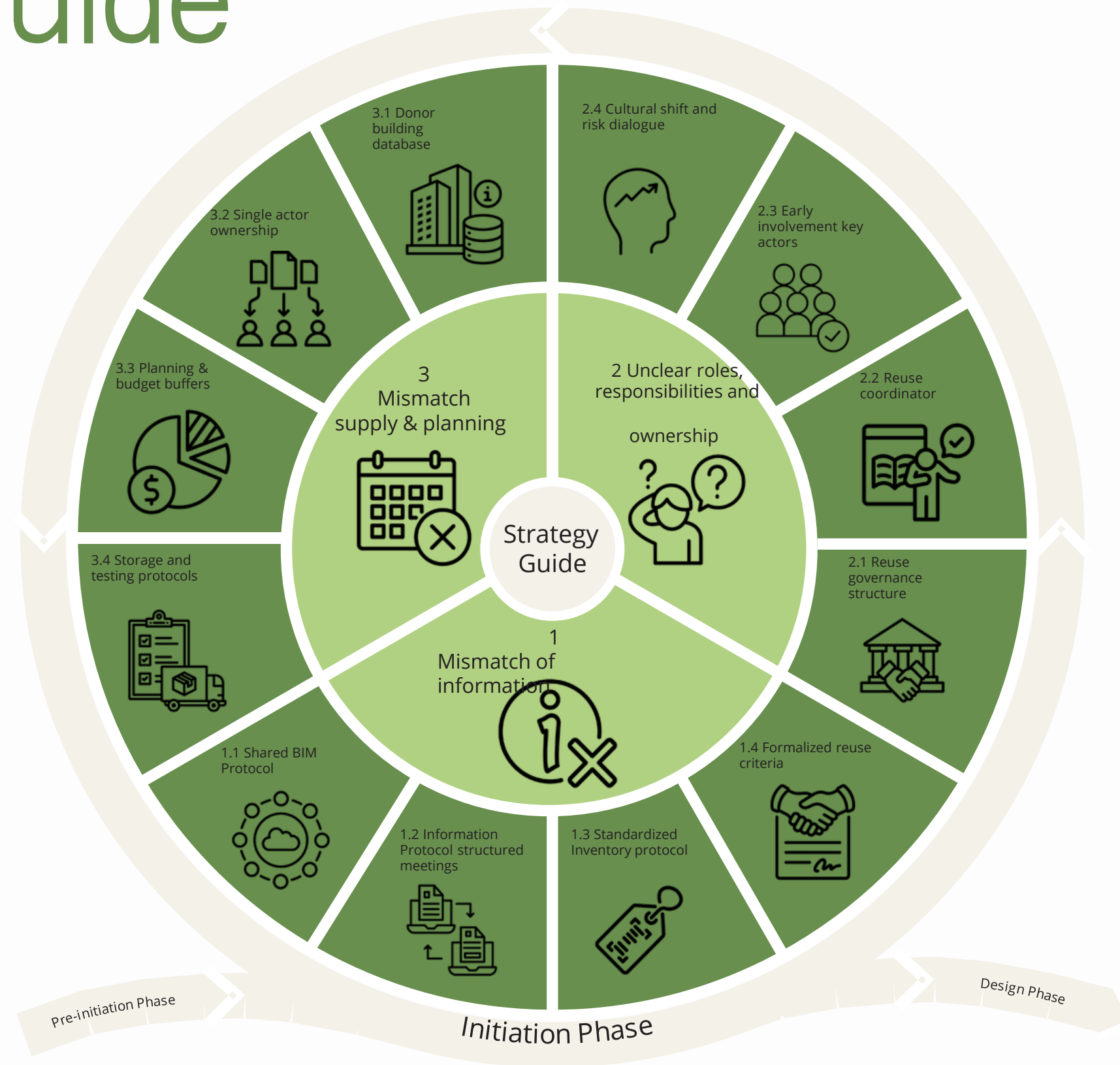
3

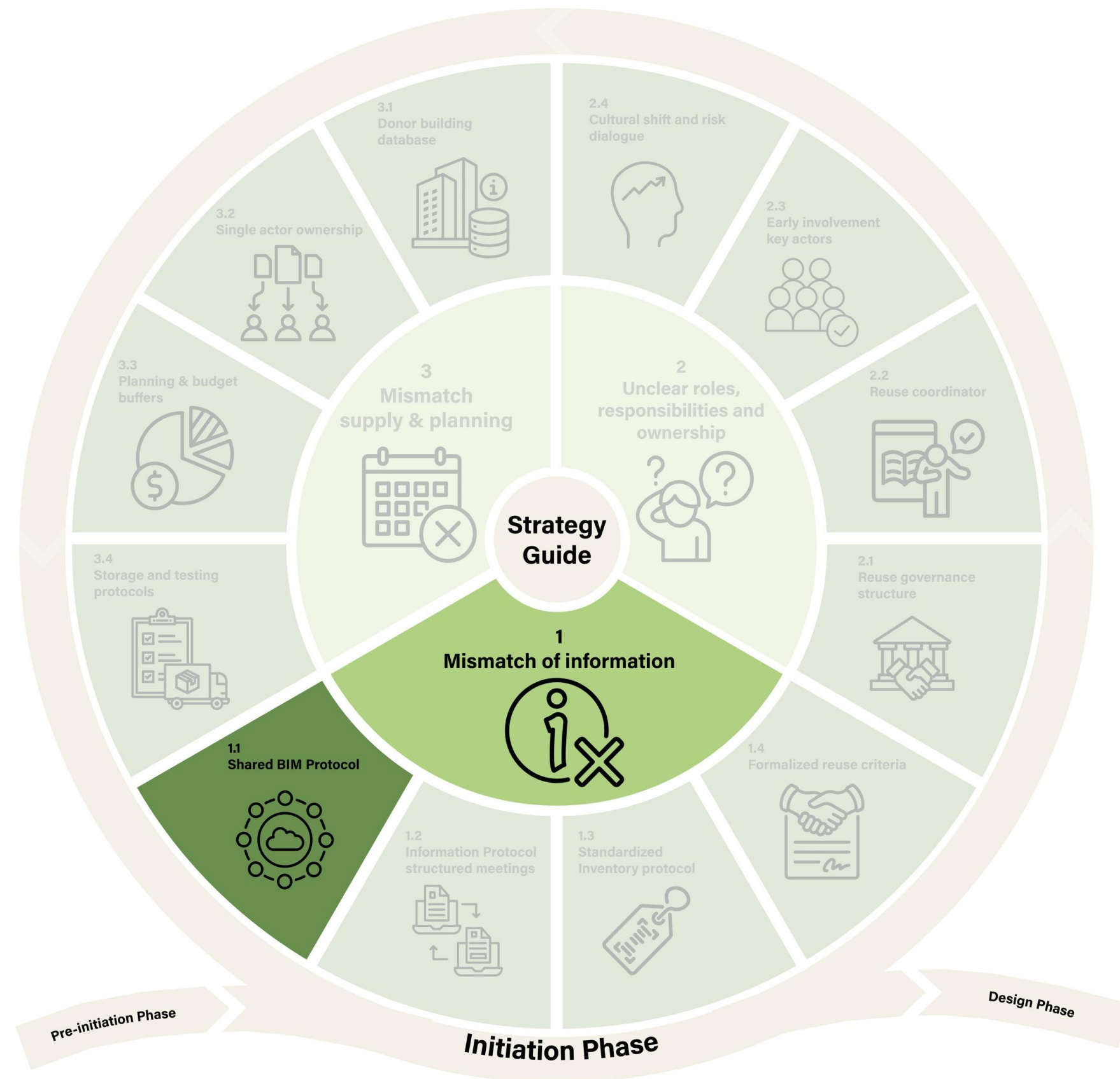
Architects

Developers

Deconstruction

# Strategy guide

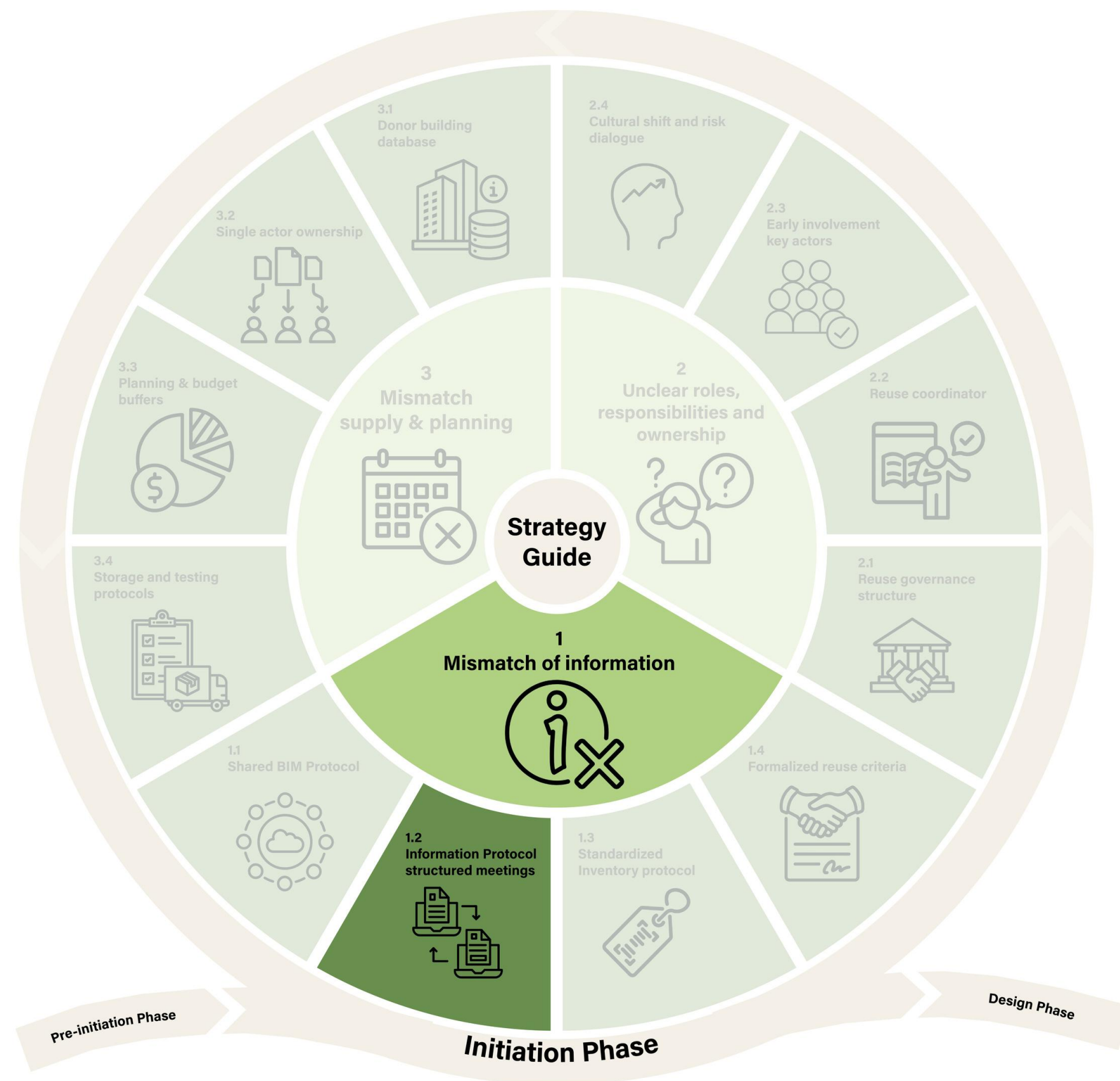




## 1.1 Shared BIM protocol

- Co-create BIM protocol with all actors
- Keep one shared, updated BIM model



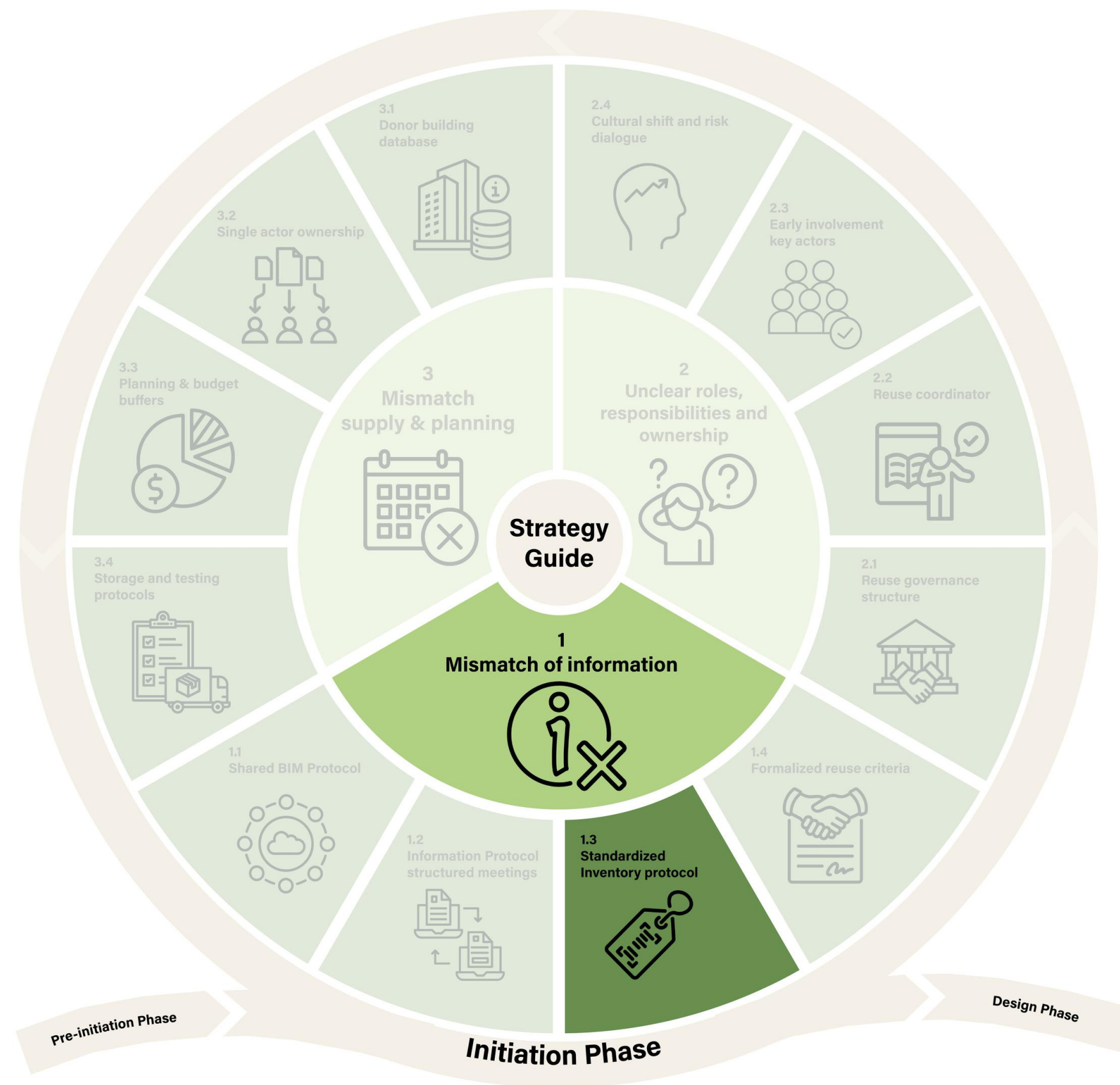


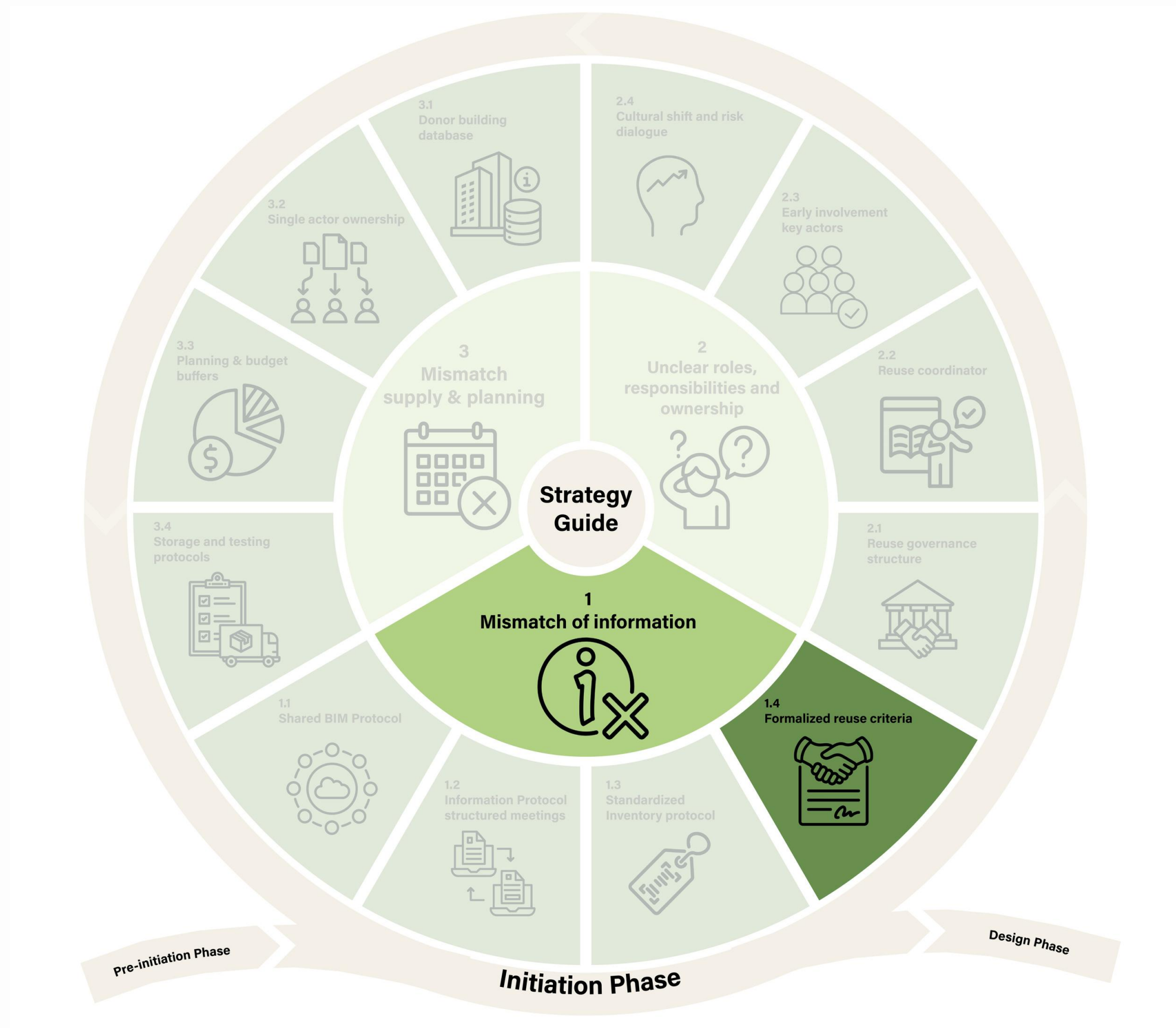
## 1.2 Information protocol

- Align reuse goals and info needs early
- Create a reuse action plan or protocol

## 1.3 Standardized inventory protocol

- Standard Scan & label protocol
- Link documentation to BIM model

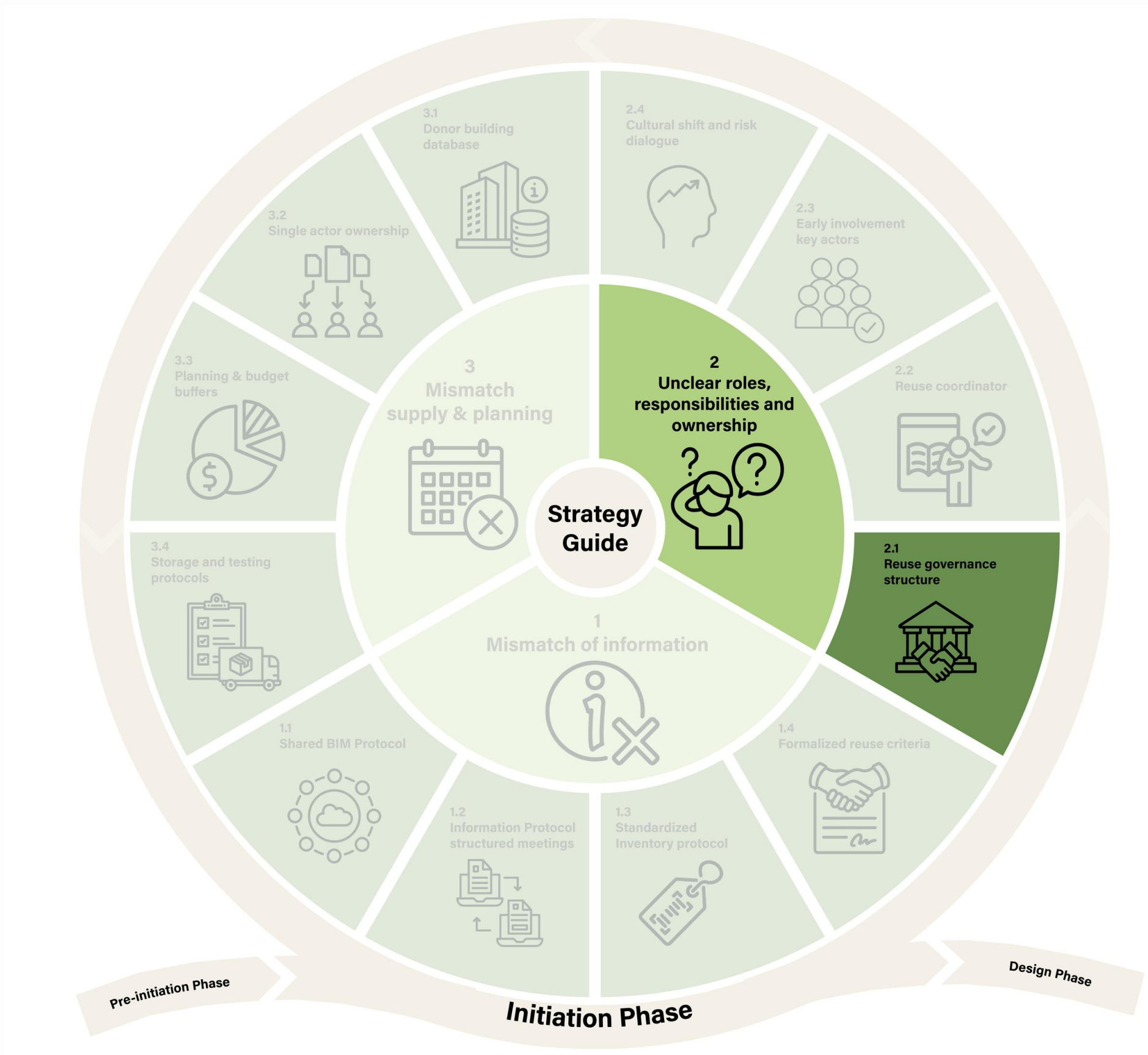




## 1.4 Formalized reuse criteria

- Include reuse goals in contracts
- Reward reuse in tenders & handovers

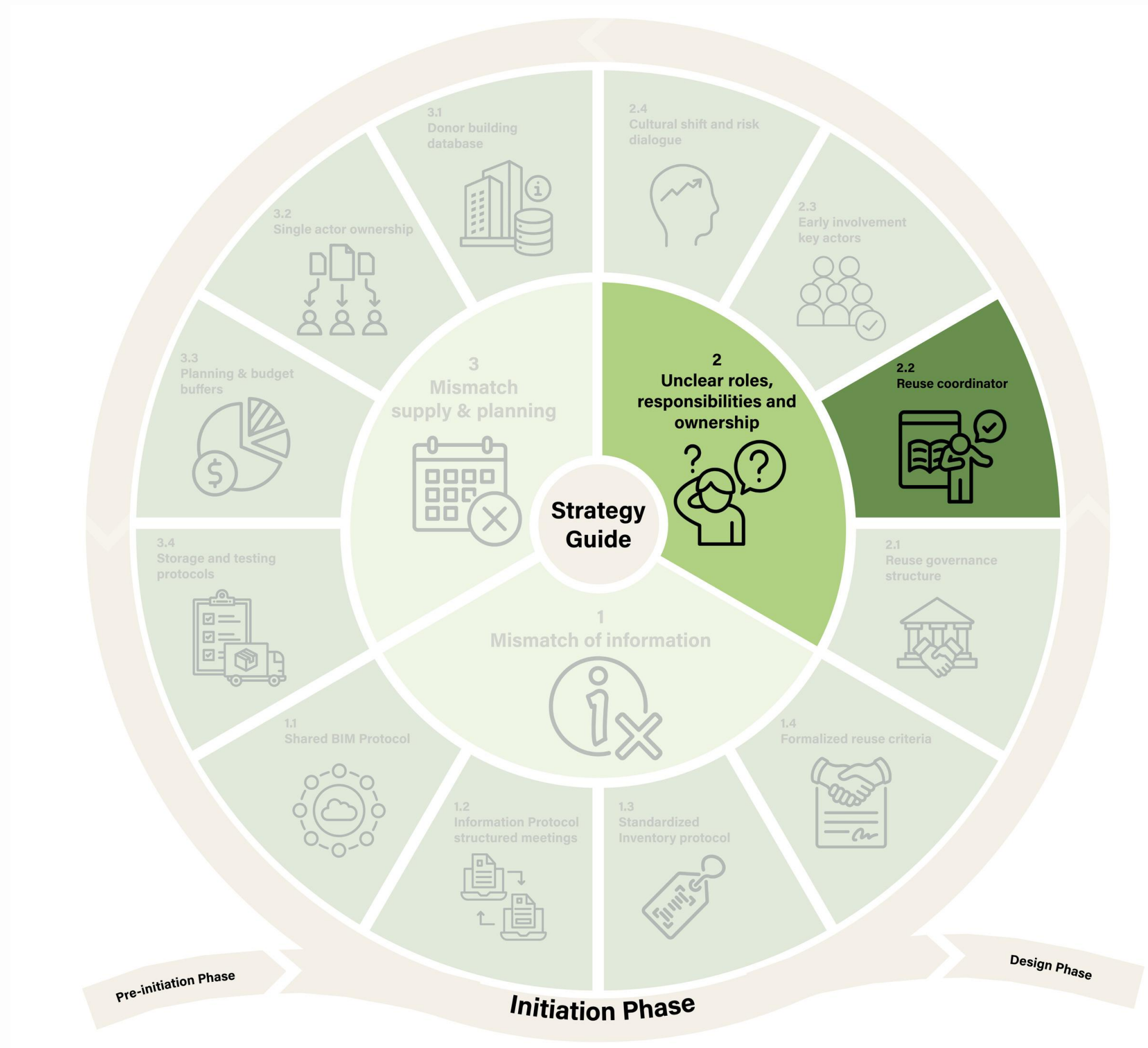




## 2.1 Reuse governance structure

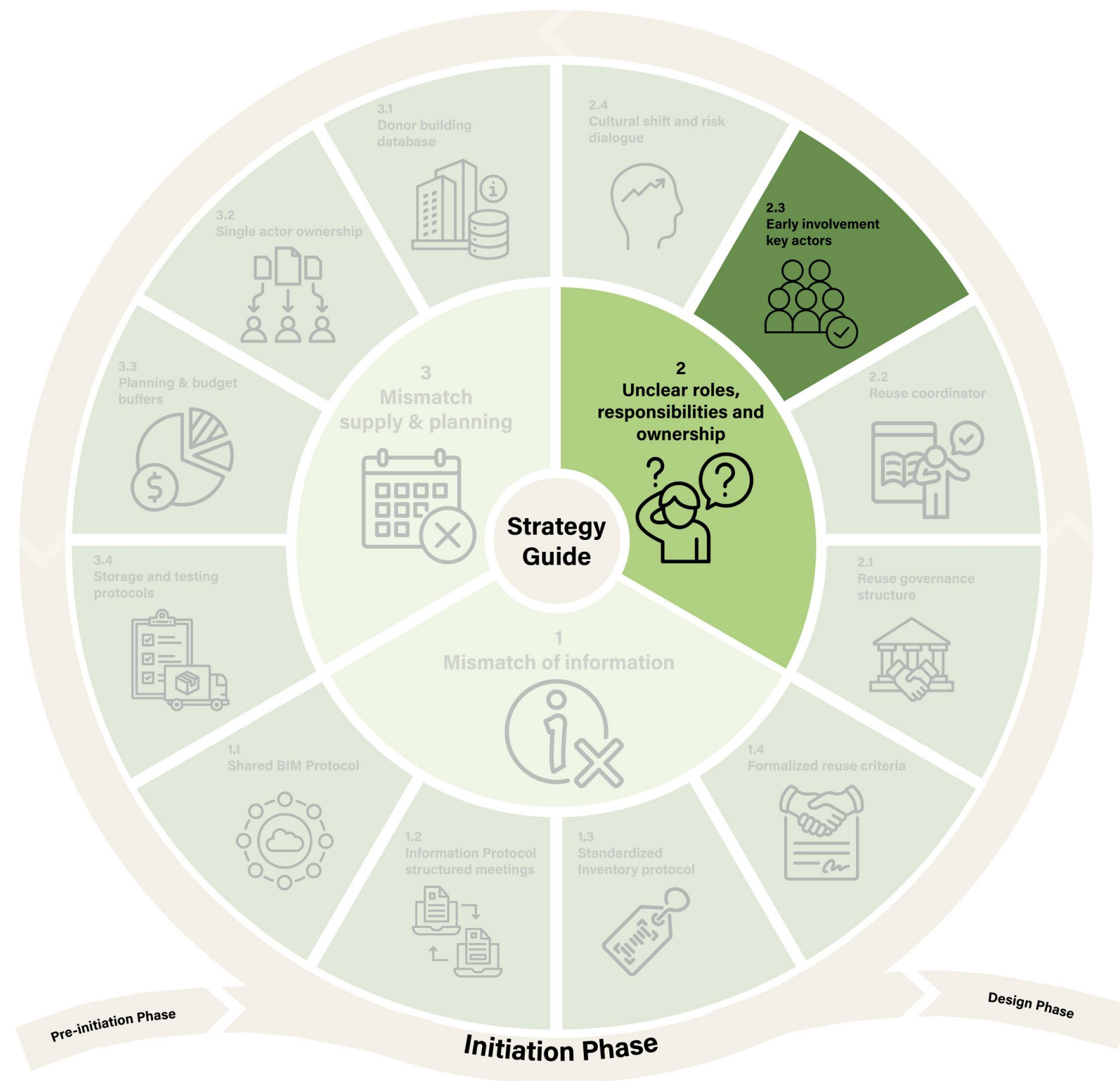
- Create a reuse roles matrix
- Add reuse tasks to project risk plans





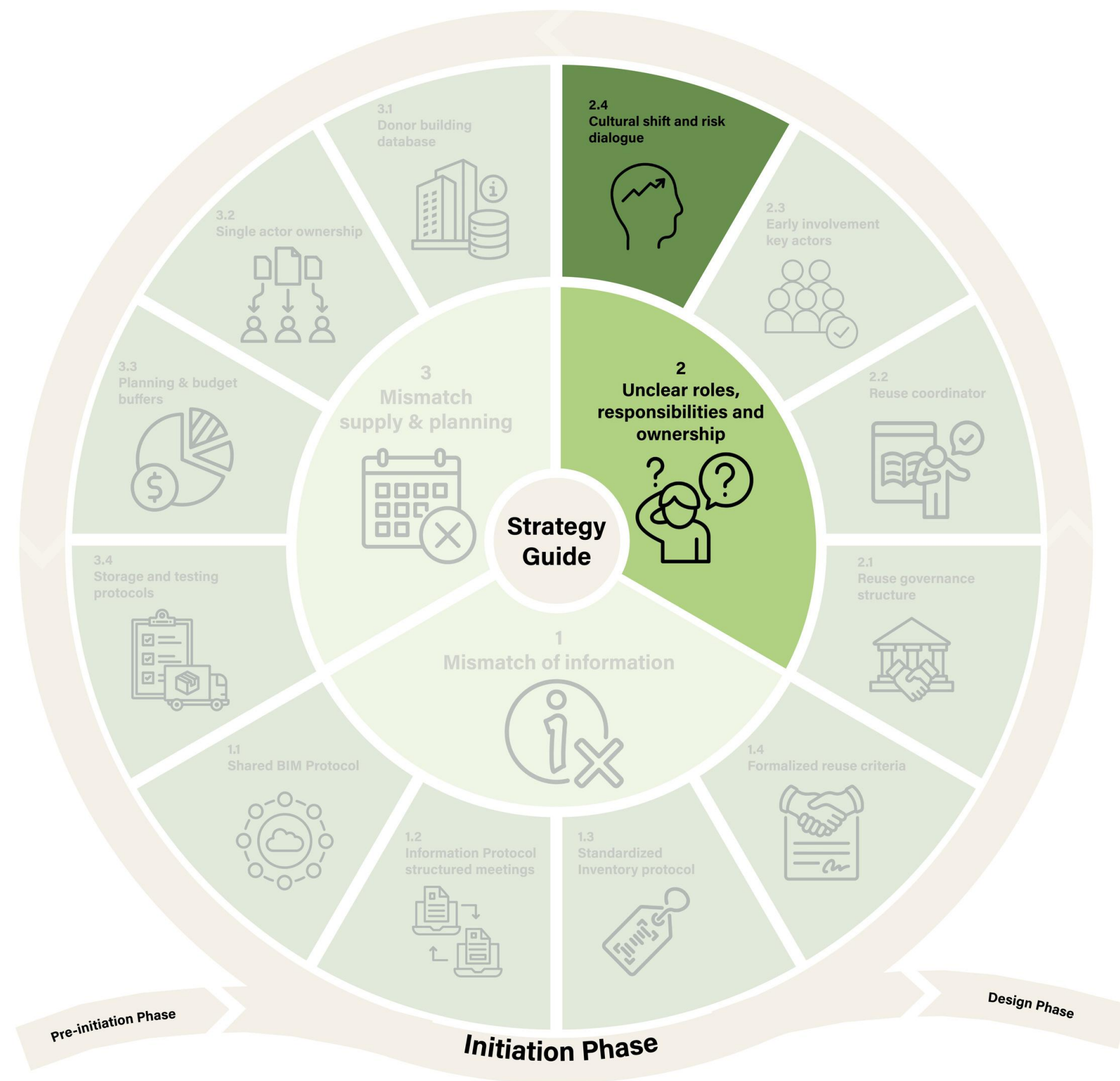
## 2.2 Reuse coordinator

- Appoint one actor for reuse tracking
- Ensure reuse stays a project priority



## 2.3 Early involvement key actors

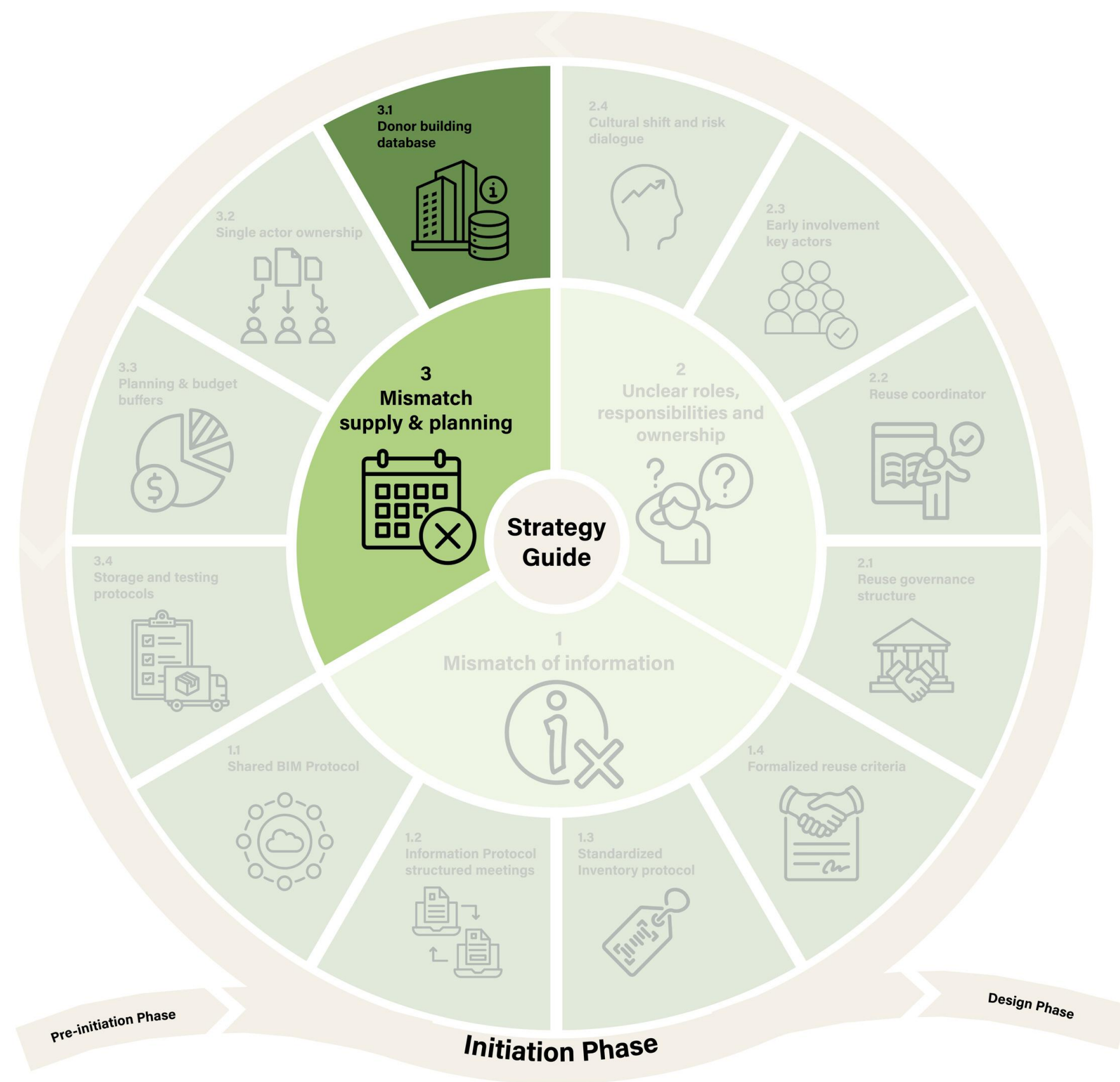
- Invite execution partners early
- Align reuse plans with logistics



## 2.4 Cultural shift and risk dialogue

- Host feedback and risk sessions
- Engage client to commit to reuse

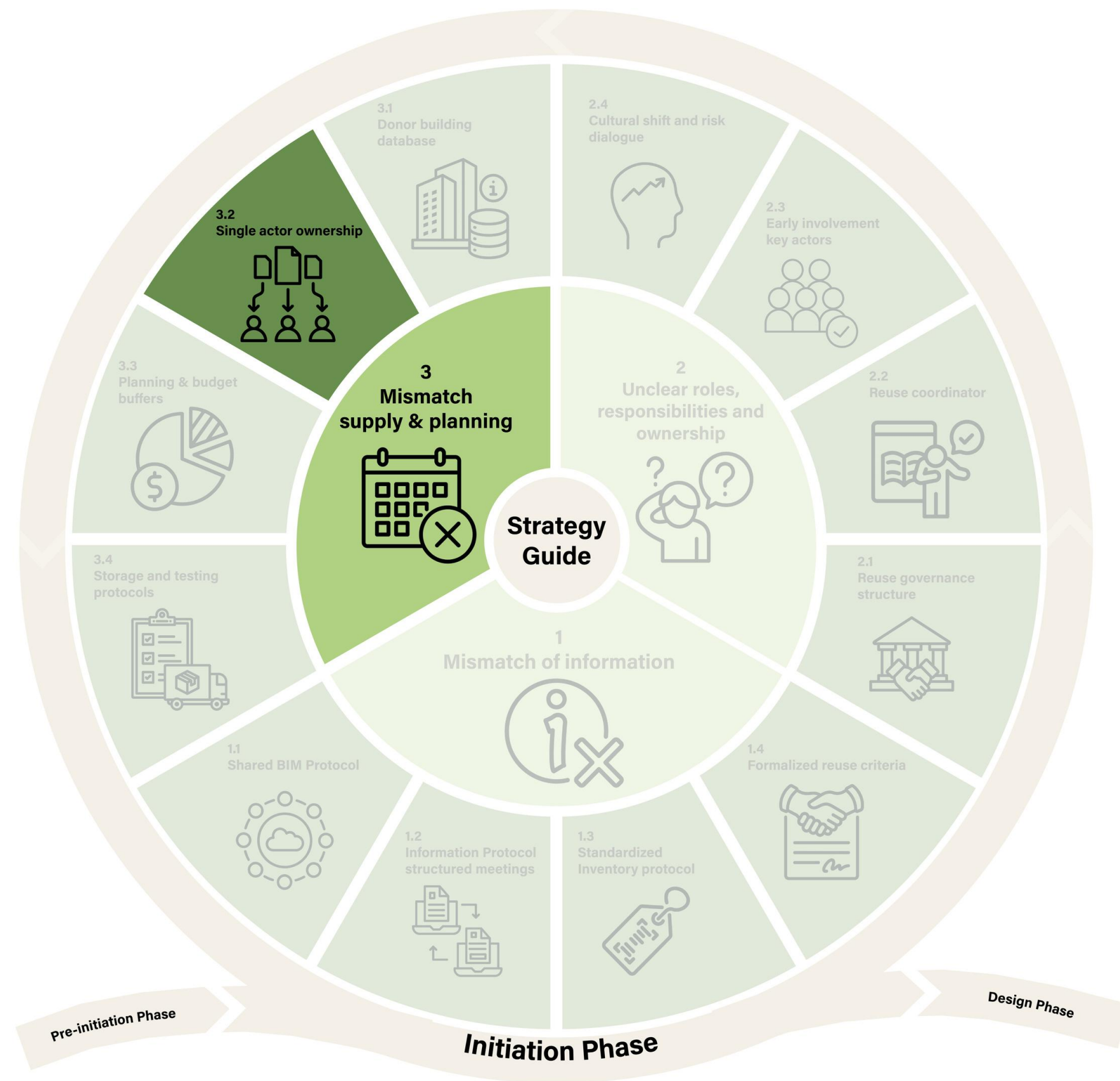




## 3.1 Donor building database

- Development of demolition databases
- Design based on available components





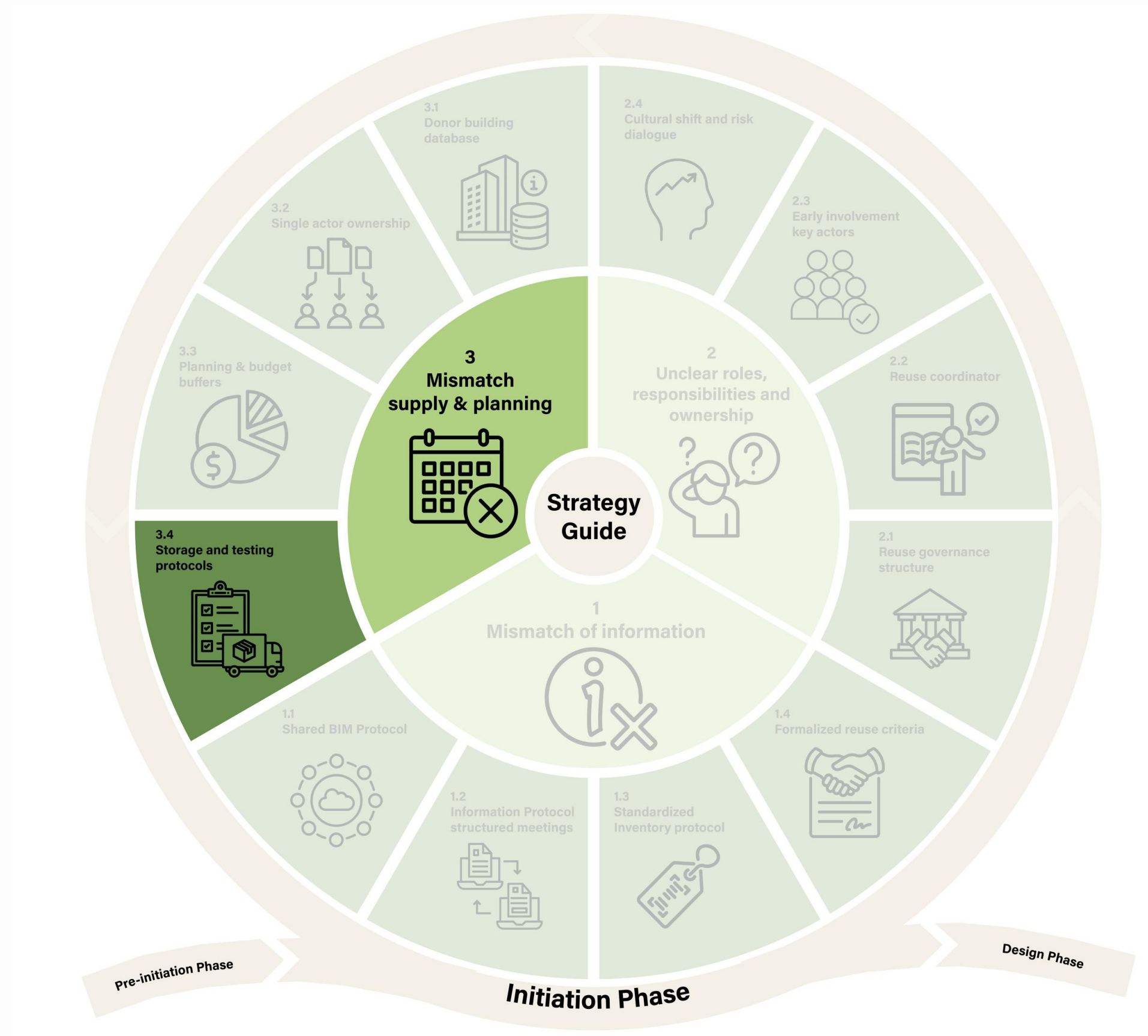
## 3.2 Single actor ownership

- One actor owns process end-to-end
- Improves planning and accountability



## 3.3 Planning & budget buffers

- Add reuse costs & time in planning
- Use whole-life costing tools



## 3.4 Storage and testing protocols

- Standardize storage & testing steps
- Avoid that reuse plans are dropped

# Discussion

## Limitations:

- Identifying key barriers > developing strategies
- Small sample size
- Team experience and context
- Strong foundation for further research

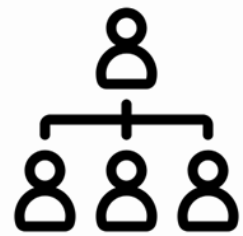


# Conclusion

*“How can **collaboration** between key actors in the construction value chain address key reuse barriers to **enable** the reuse of structural building components from existing buildings reaching the end of their lifecycle?”*

# Conclusion

Barriers:



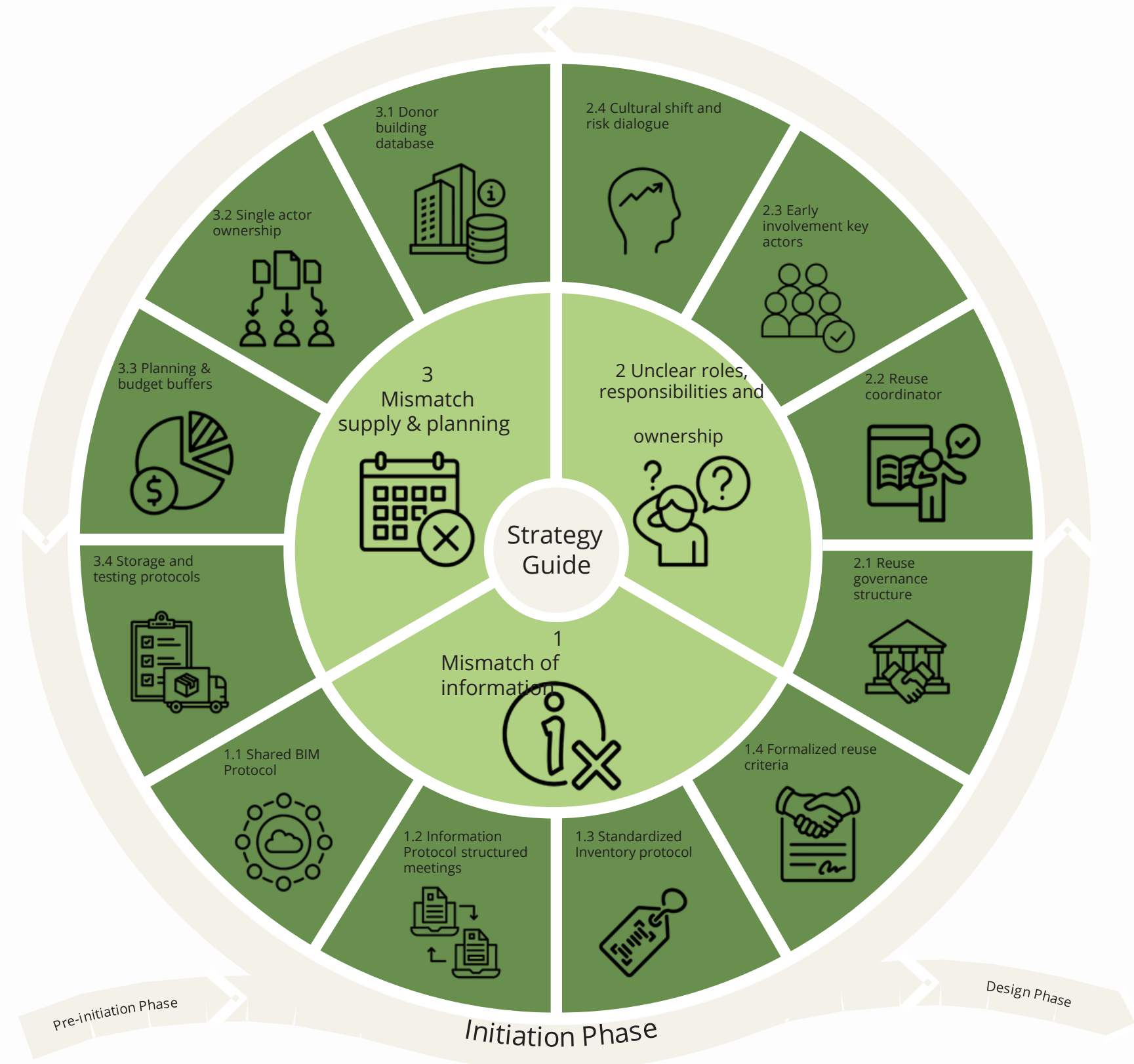
Organizational



Economic



Social



# Conclusion

## Recommendations for future research:

- Develop and test strategies across more projects & contexts
- Research into develop reuse databases & platforms
- Link reuse to CO<sub>2</sub> and cost savings
- Study client roles in long-term reuse adoption

# Reflection

*“You don't have to see the whole staircase,  
just take the first step”* Martin Luther king JR.





Thank you!