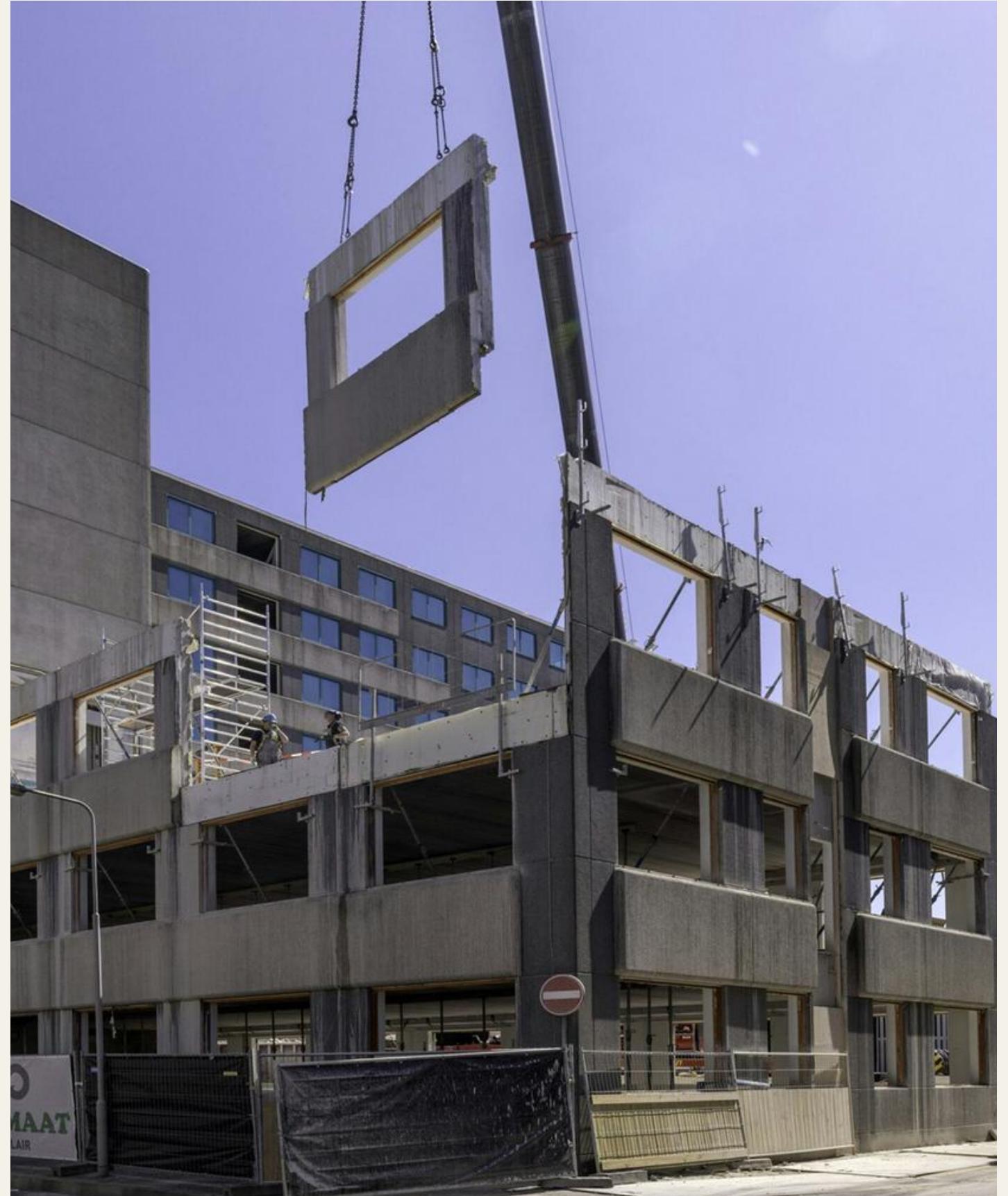


Enabling the reuse of structural components through collaboration

P5 presentation – Milan Bezem

30-06-2025



Linear construction project



Initiation

Design

Pre-
construction

Construction

Demolition

Demolition



Incineration or landfill



Recylcing

Waste management strategies

The R-ladder



(VCI, 2024)

Re-use



Recycle



Facts

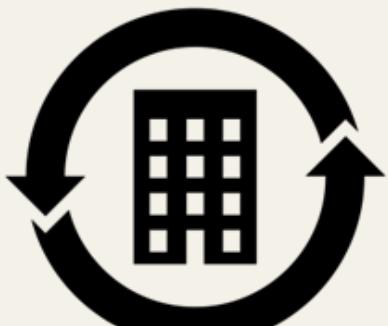
The Netherlands:

88%



Recycle

8%

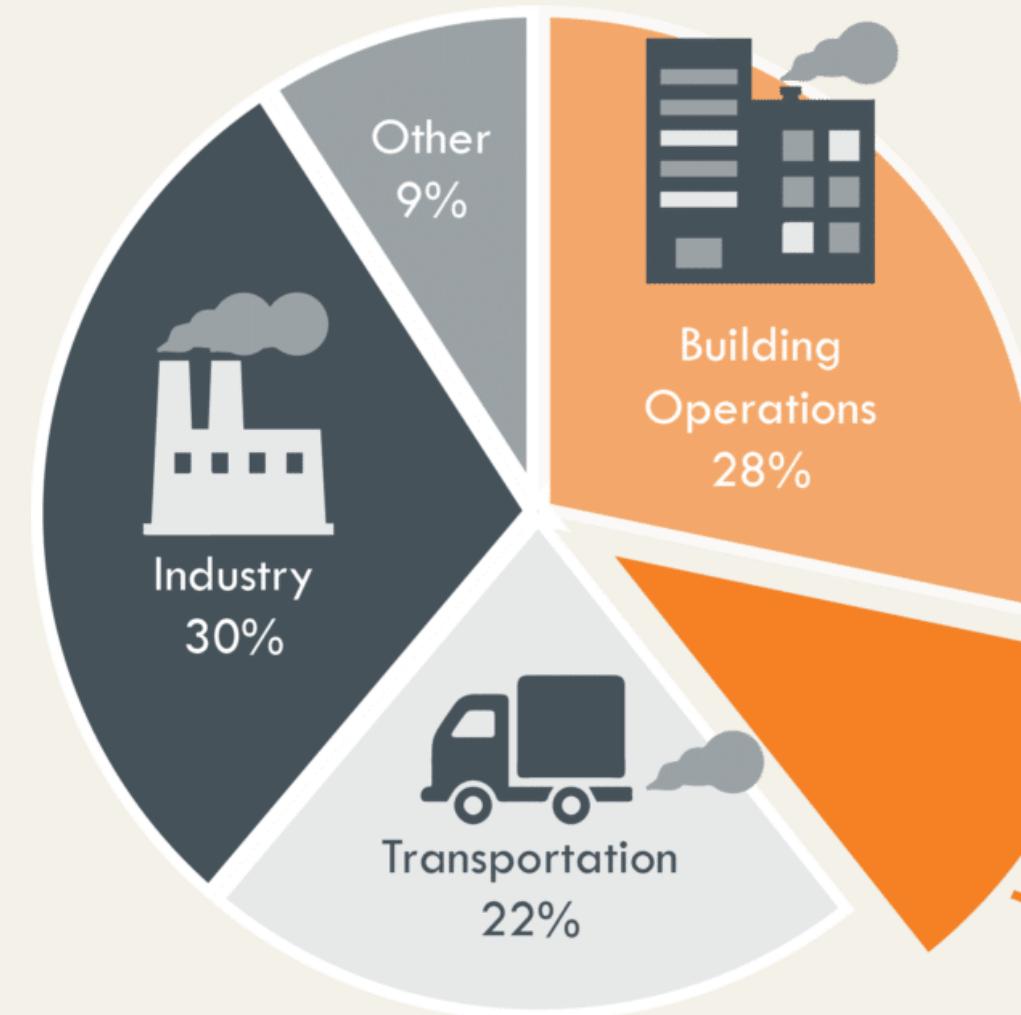


Re-use



(Circle Economy, 2022)

Global:



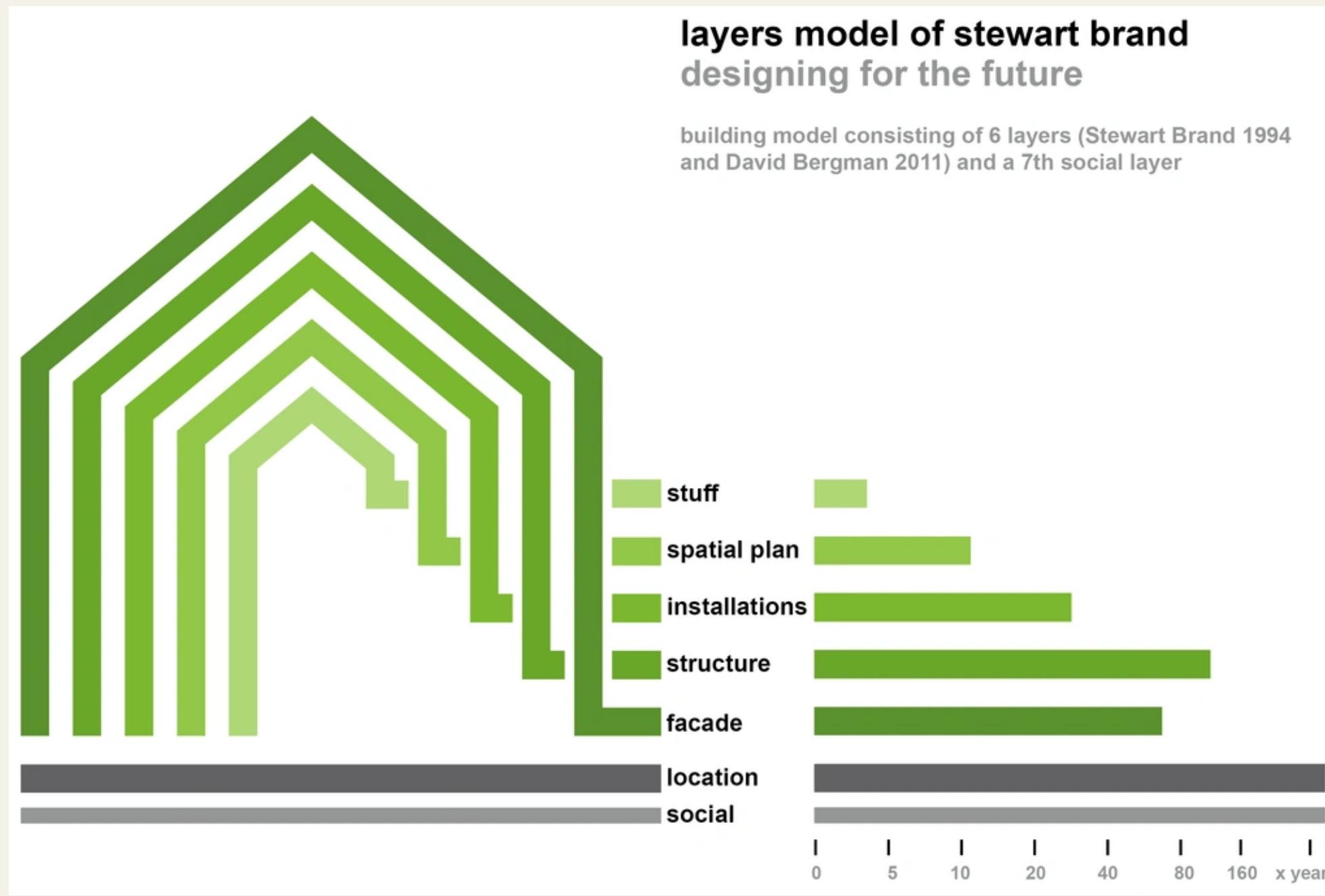
Global CO2 Emissions
by Sector



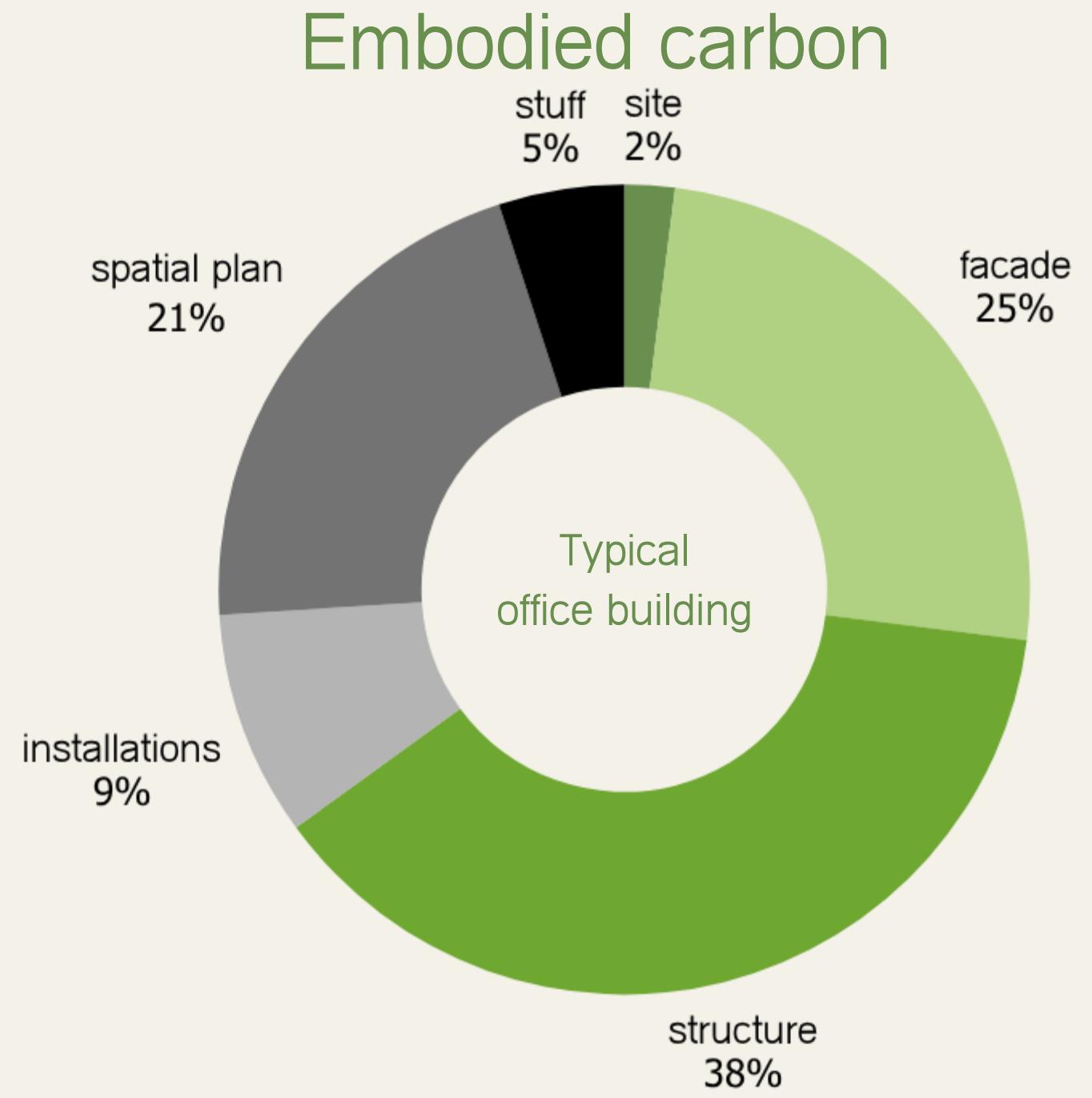
Building Materials and
Construction
11%

(nbi, 2020)

Building layers



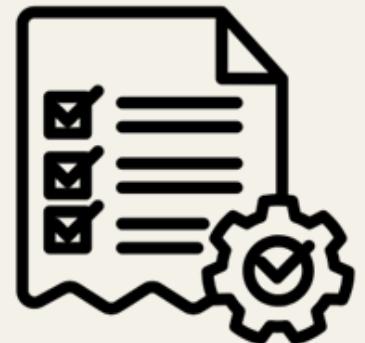
(Cepezed, 2022)



(STOK, 2021)

Why not more often?

Barriers:



Technical



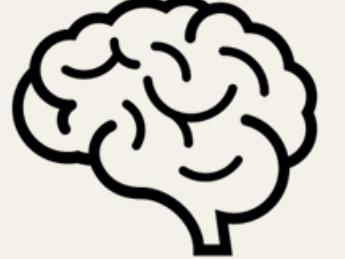
Regulatory



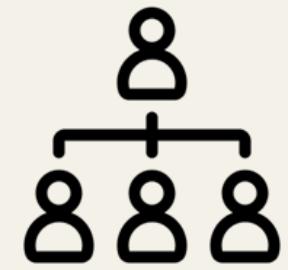
Environmental



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

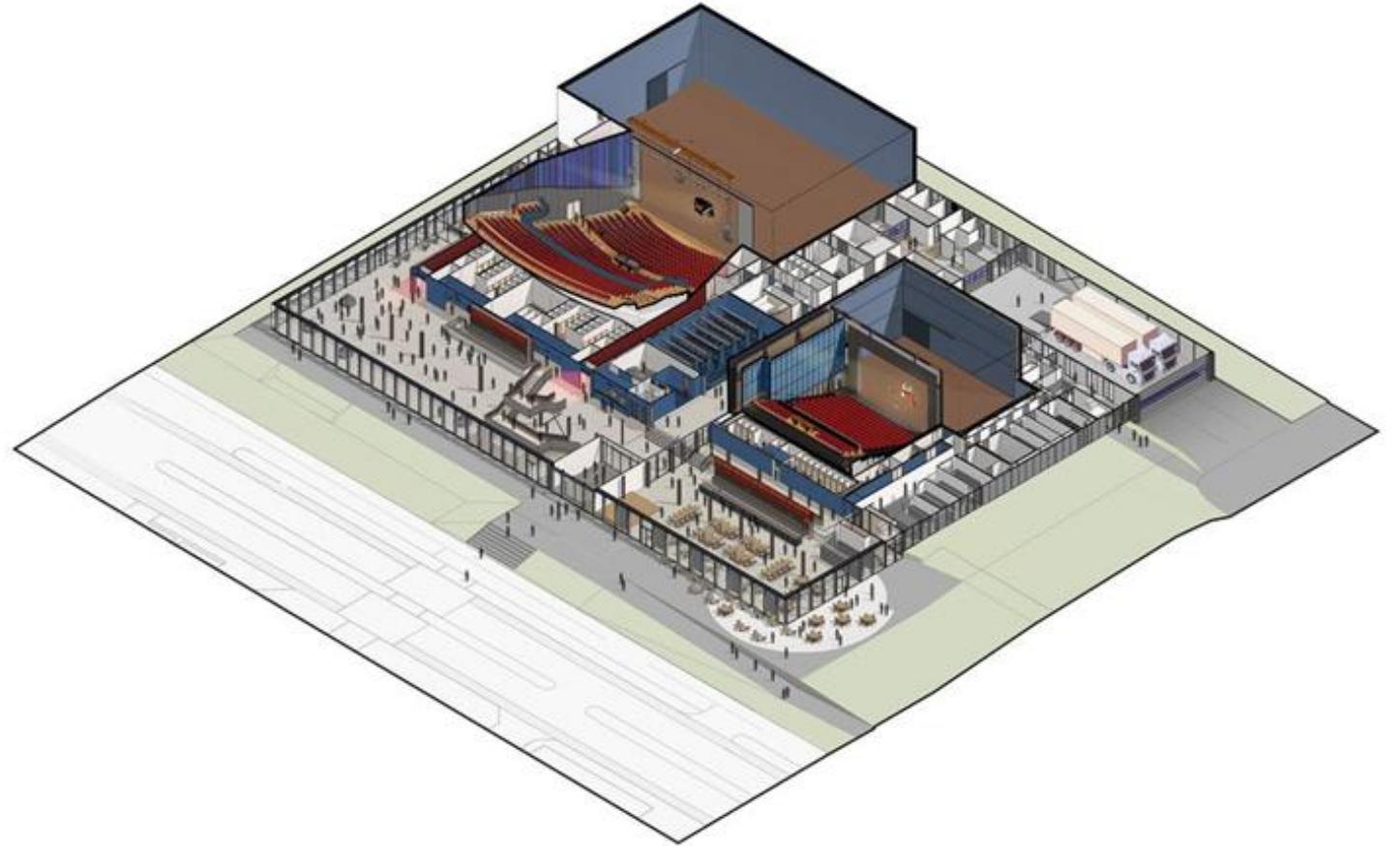


Enschede



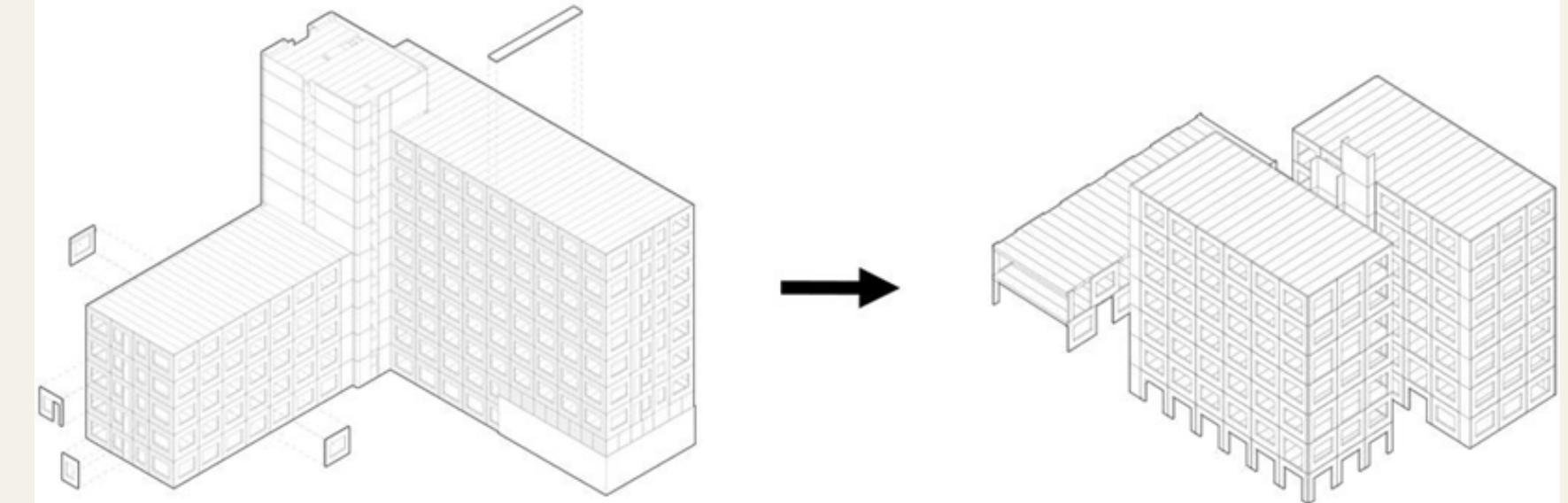
Cultureel Centrum Lievekamp

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



Circulair Centrum Nederland

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



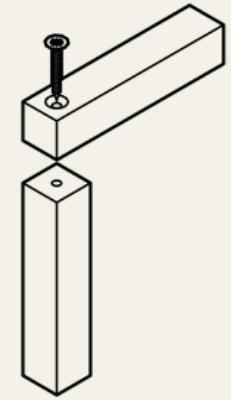
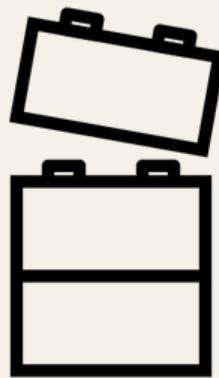


Subquestion 1

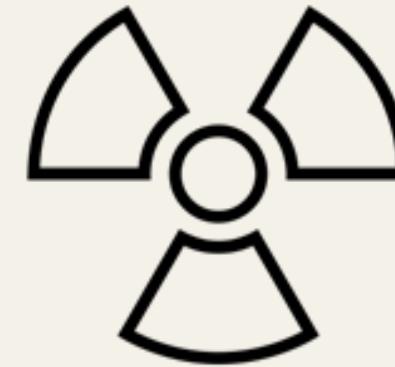
*“What **technical, design and process-related factors** influence the **reusability** of existing structural components from existing buildings reaching the end of their lifecycle?”*

Results Q1.

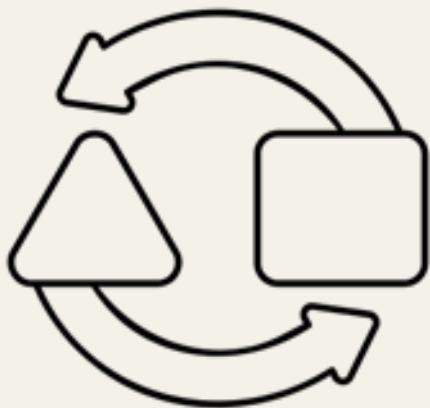
Independence & exchangeability



Toxicity



Adaptability



Quality assurance process



Barriers



Technical



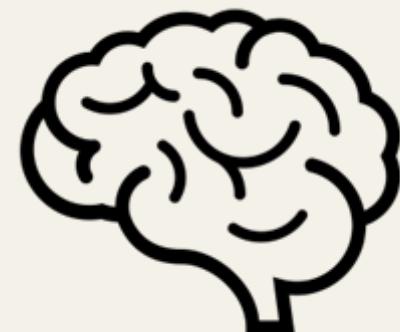
Regulatory



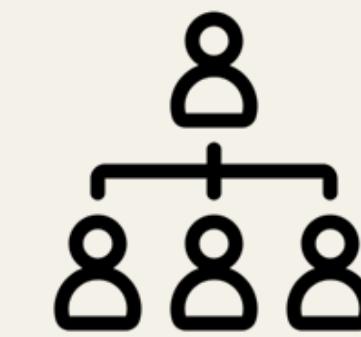
Environmental



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



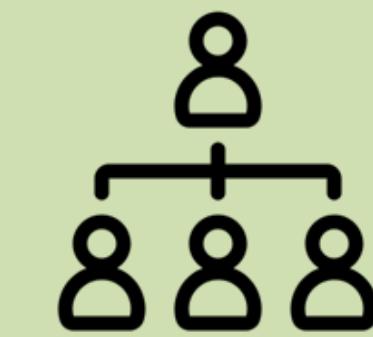
Environmental



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.

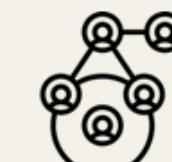
Factors for successful collaboration

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



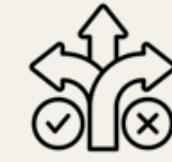
Tools and resources



Roles and responsibilities



Communication and information



Decision-making



Economic and market structures

Theoretical framework 1.0



Interviews

9



5

Architects

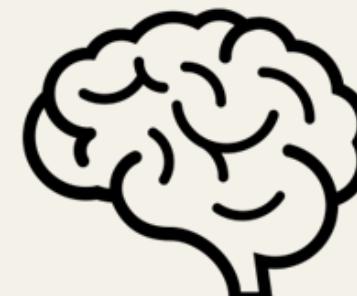
Developers

Advisors

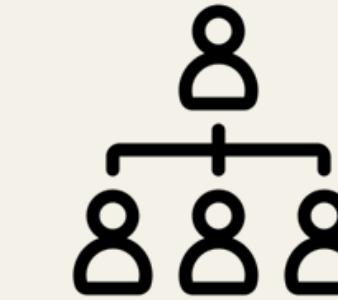
Deconstruction

Contractor

Results Q2.



Social



Organizational

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

Results Q2.

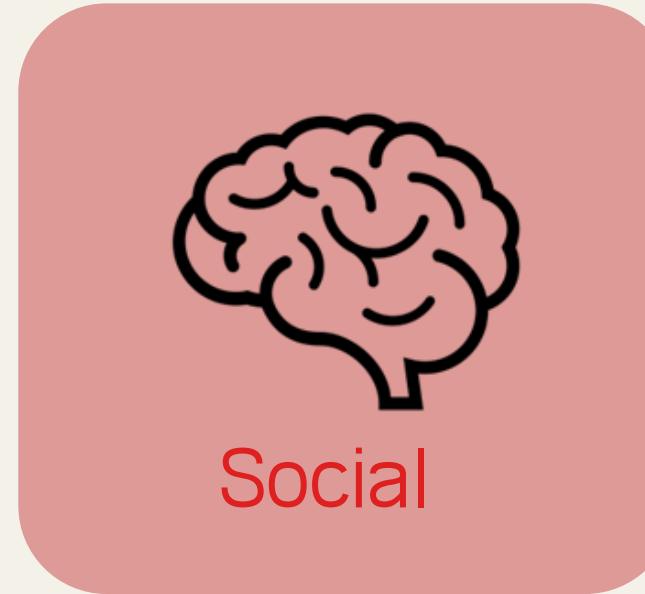


- Thinking in terms of long-term value (residual value & Co2 savings)
- Single actor ownership

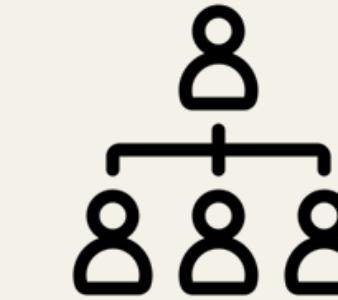
Results Q2.



Economic



Social



Organizational

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

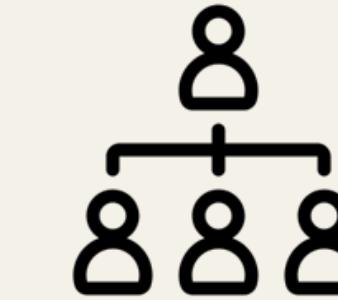
Results Q2.



Economic



Social



Organizational

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

Results Q2.



Economic



Social

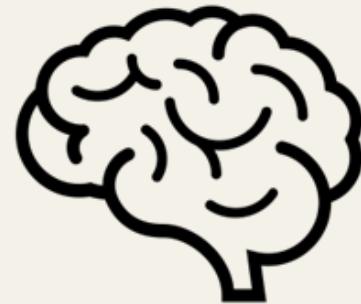


- Complexity: accountability, matching supply and demand
- Different level of information needs

Results Q2.



Economic



Social



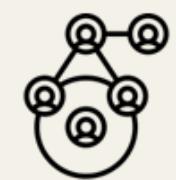
Organizational

- Early actor involvement
- Early and structured documentation

Results Q3.



Tools and resources



Roles and responsibilities



Communication and information



Decision-making



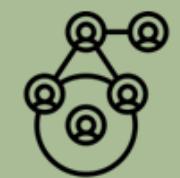
Economic and market structures

- 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



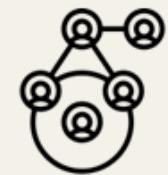
Economic and market structures

- 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



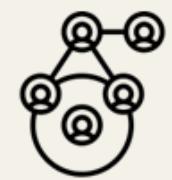
Economic and market structures

- 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



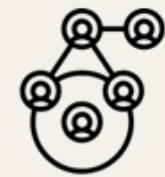
Economic and market structures

- 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



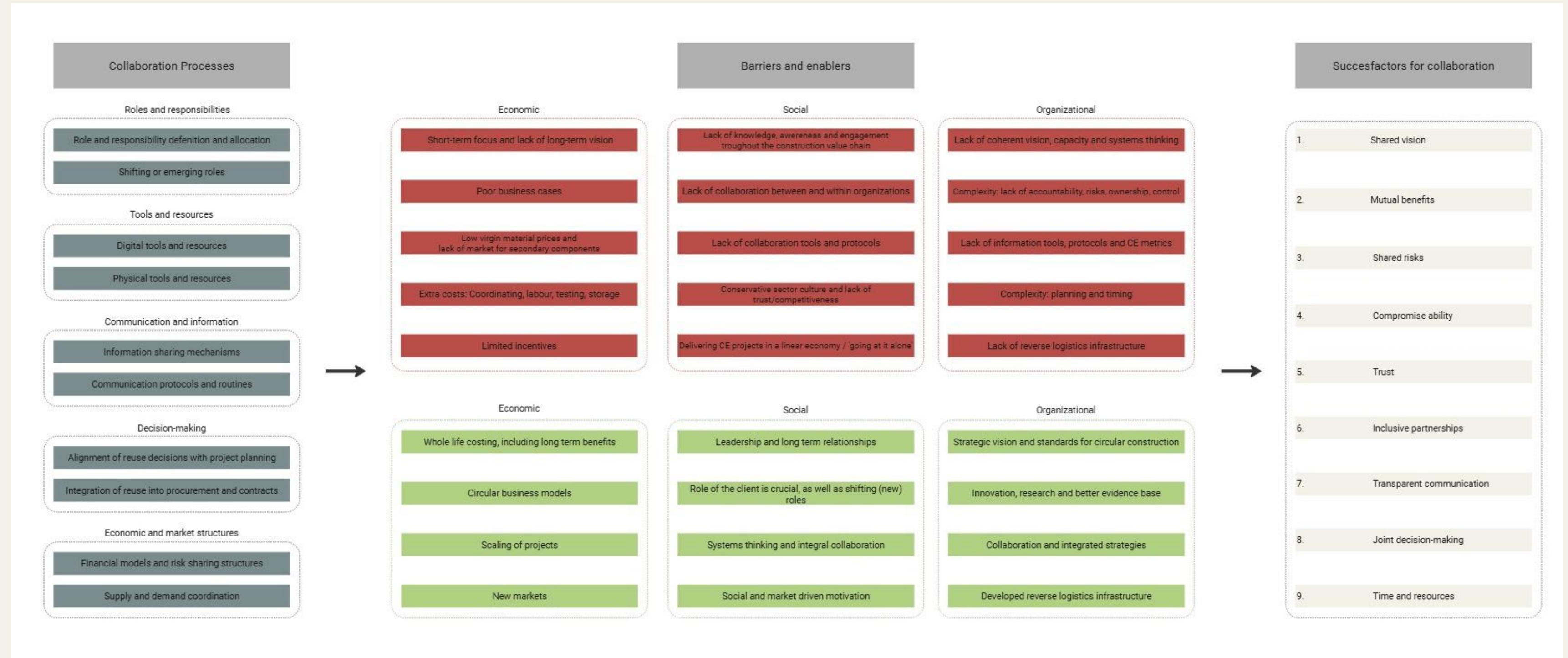
Decision-making



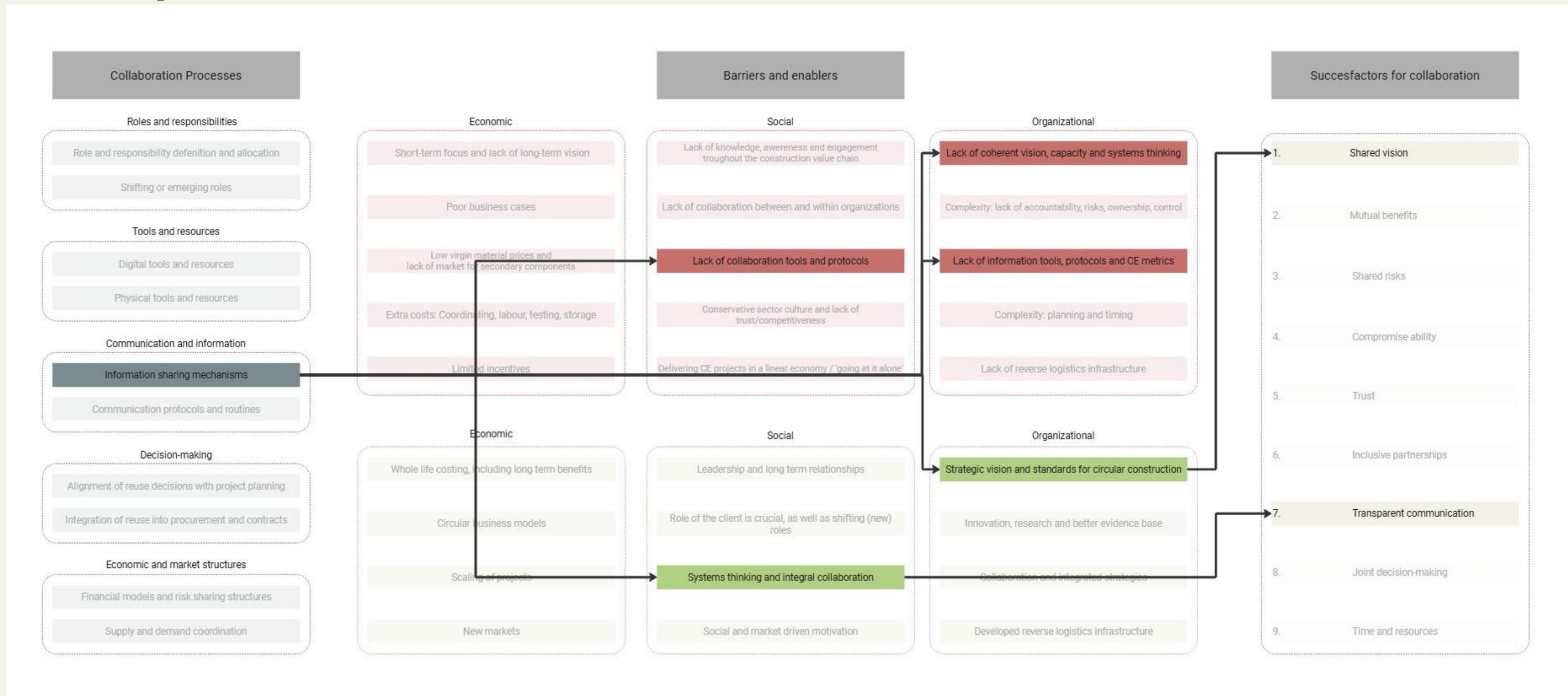
Economic and market structures

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

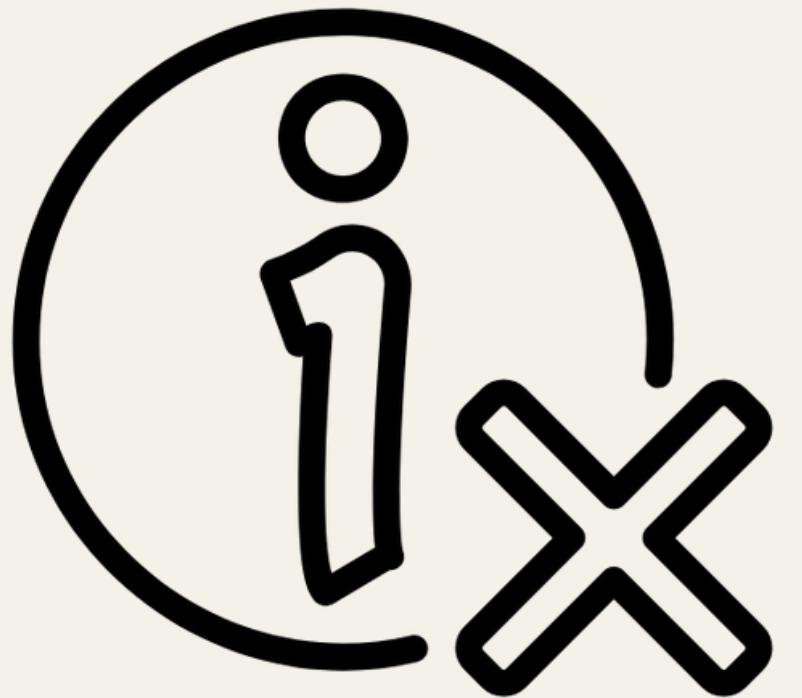
Theoretical framework 1.0



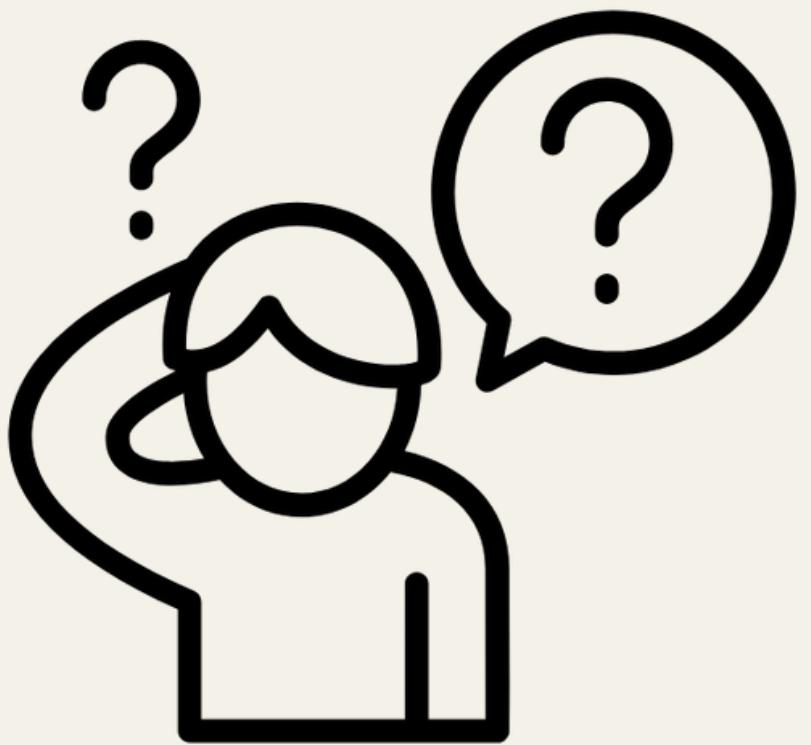
Empirical framework 2.0



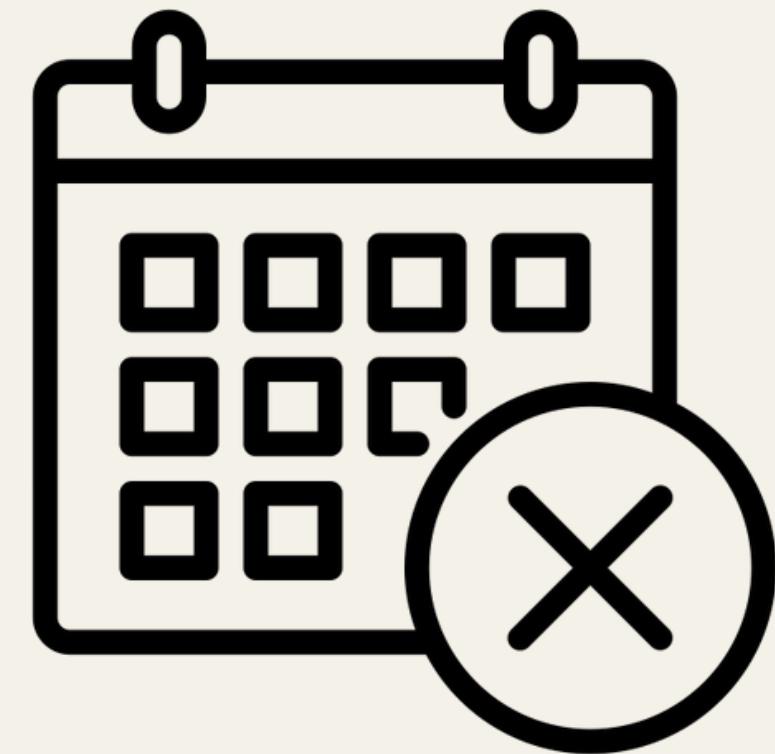
3 Key Challenges



Mismatch of information



Unclear roles, responsibilities
and ownership



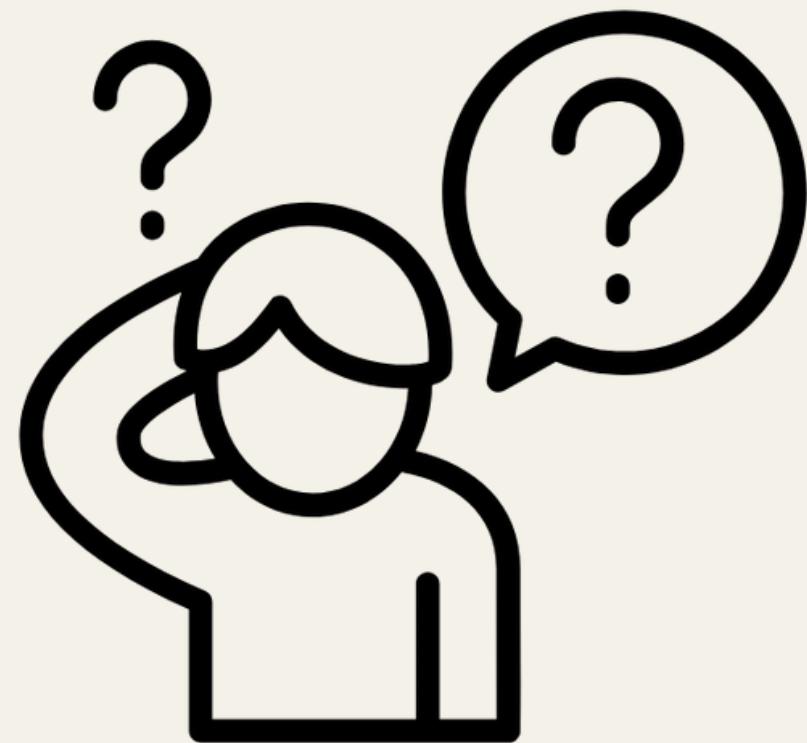
Mismatch material supply
and project planning

Challenge 1: Mismatch of information



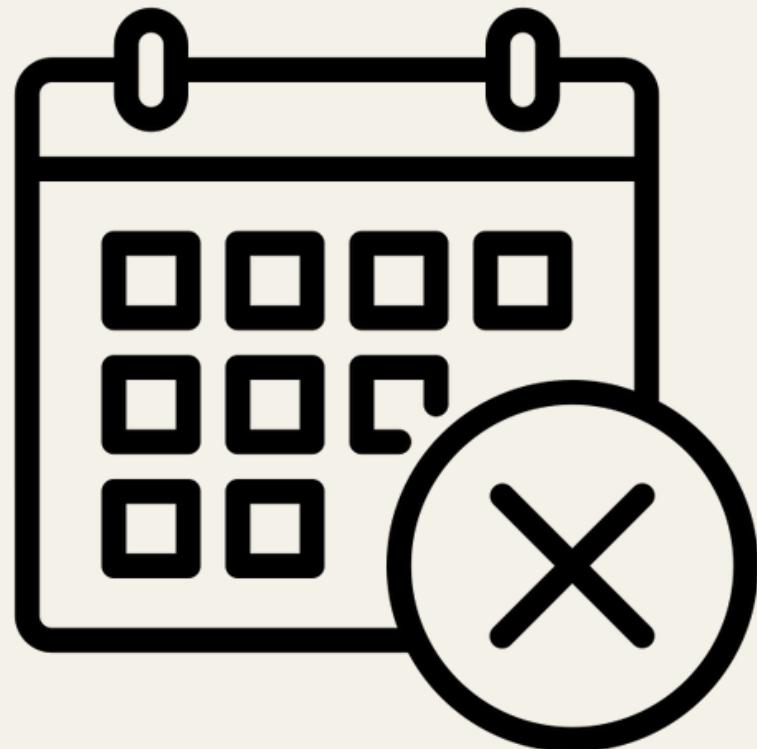
- Unaligned info needs and detail levels
- Gaps after handovers and missing data
- No shared BIM model or database

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



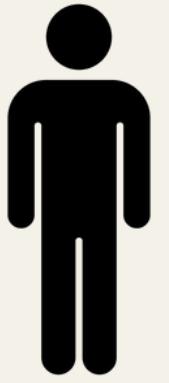
- Donor material availability misaligned with design
- Storage, testing, and logistics not planned or budgeted
- No structured market to match supply and demand

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



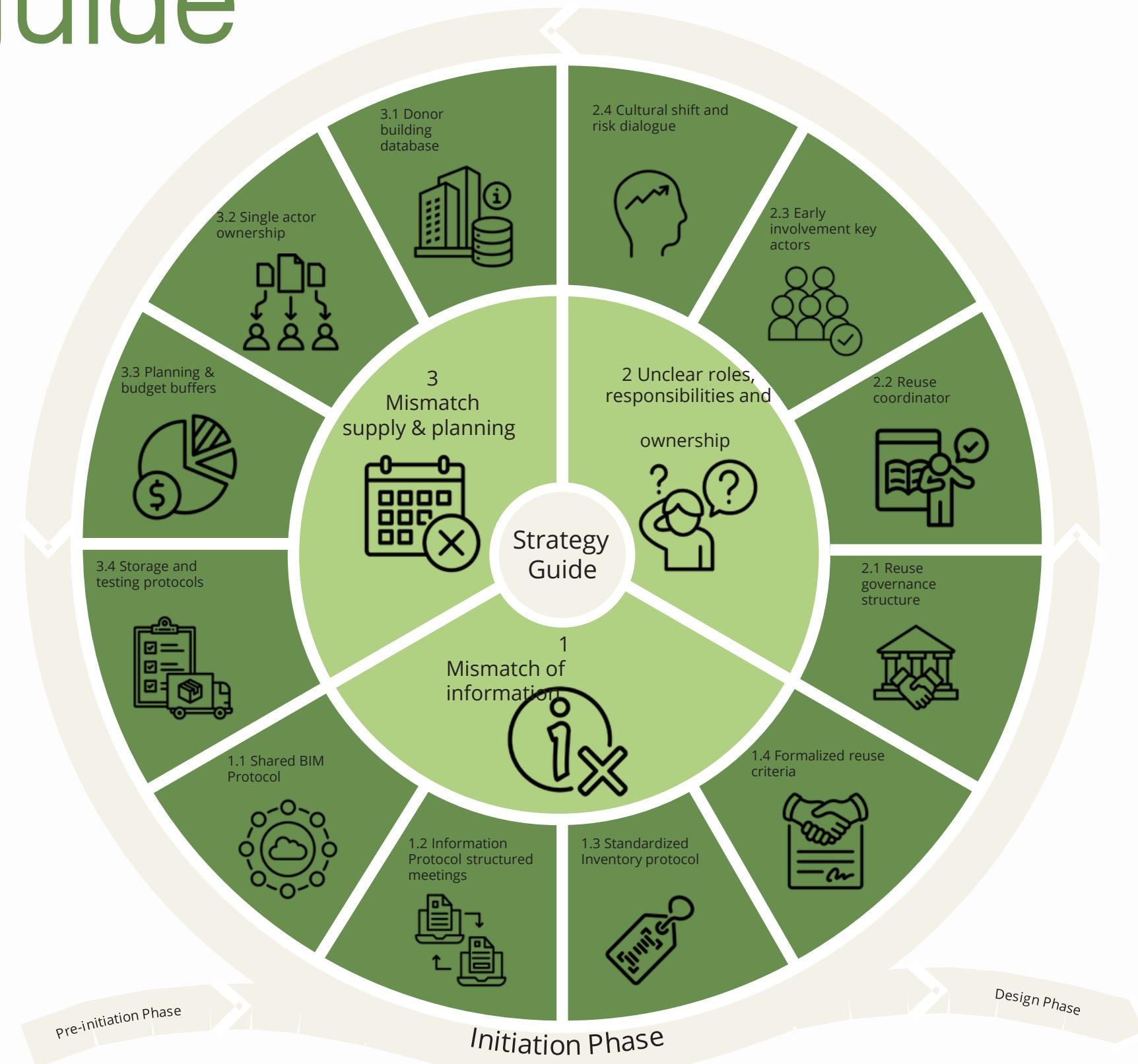
3

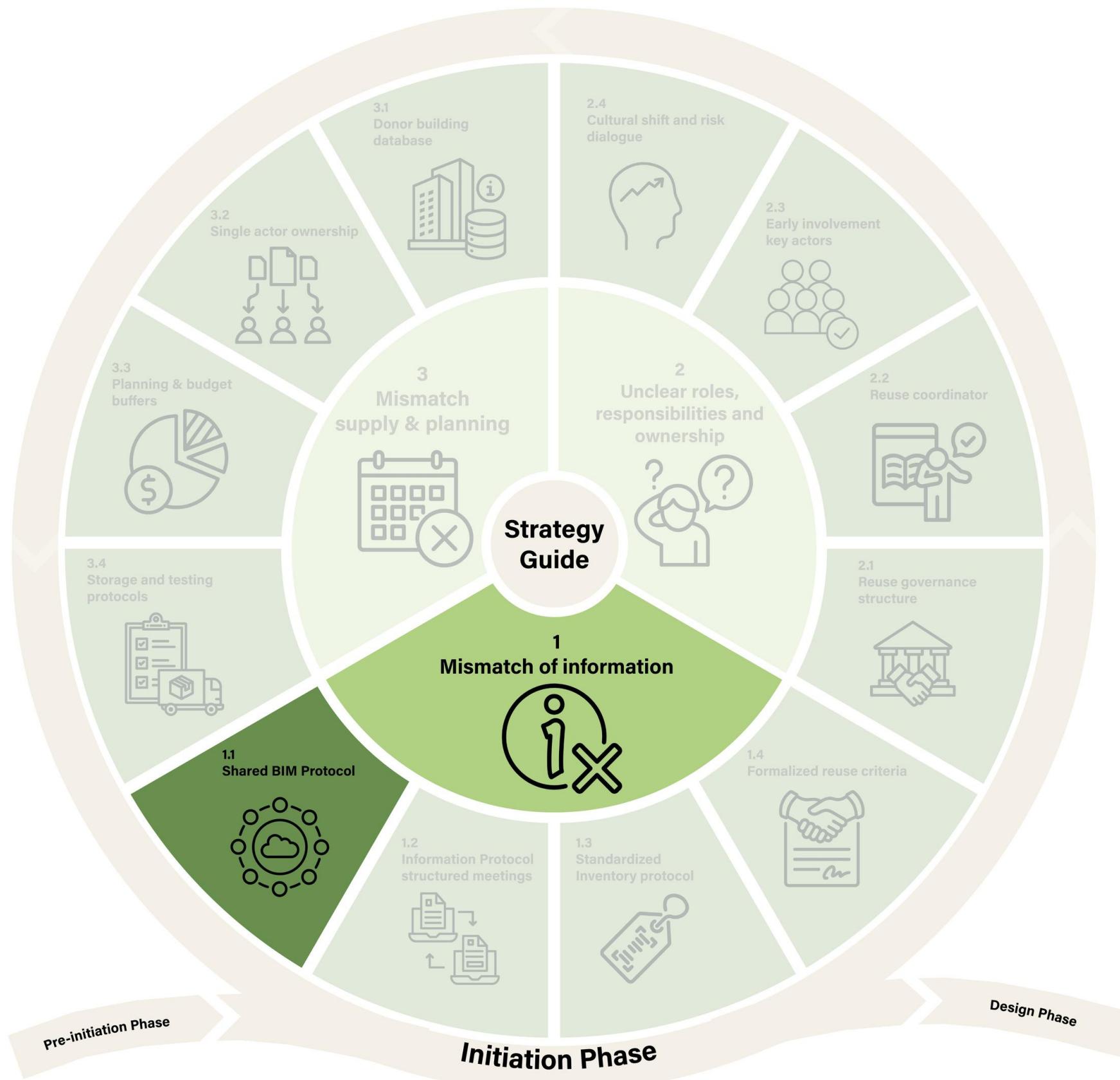
Architects

Developers

Deconstruction

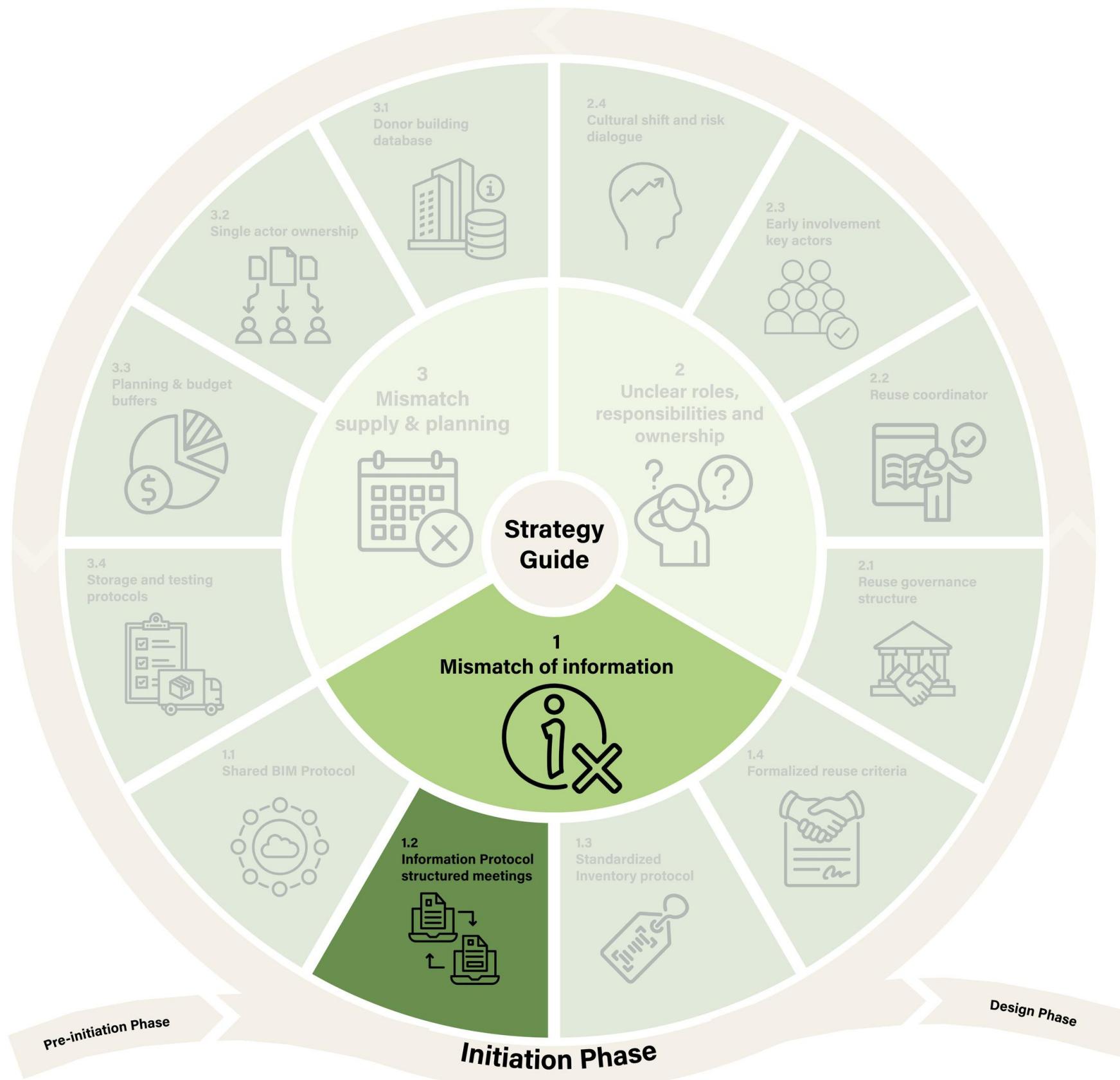
Strategy guide





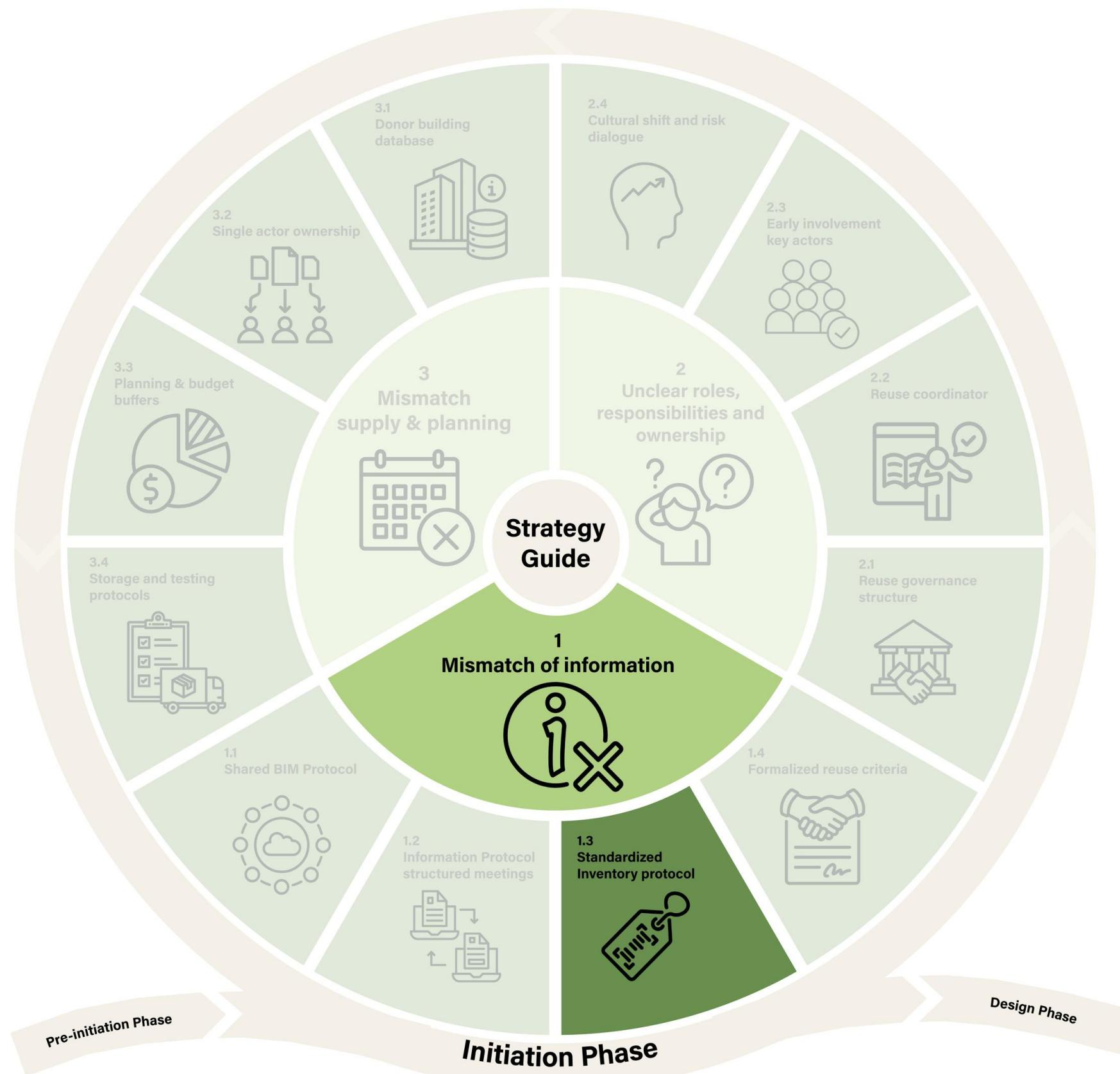
1.1 Shared BIM protocol

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



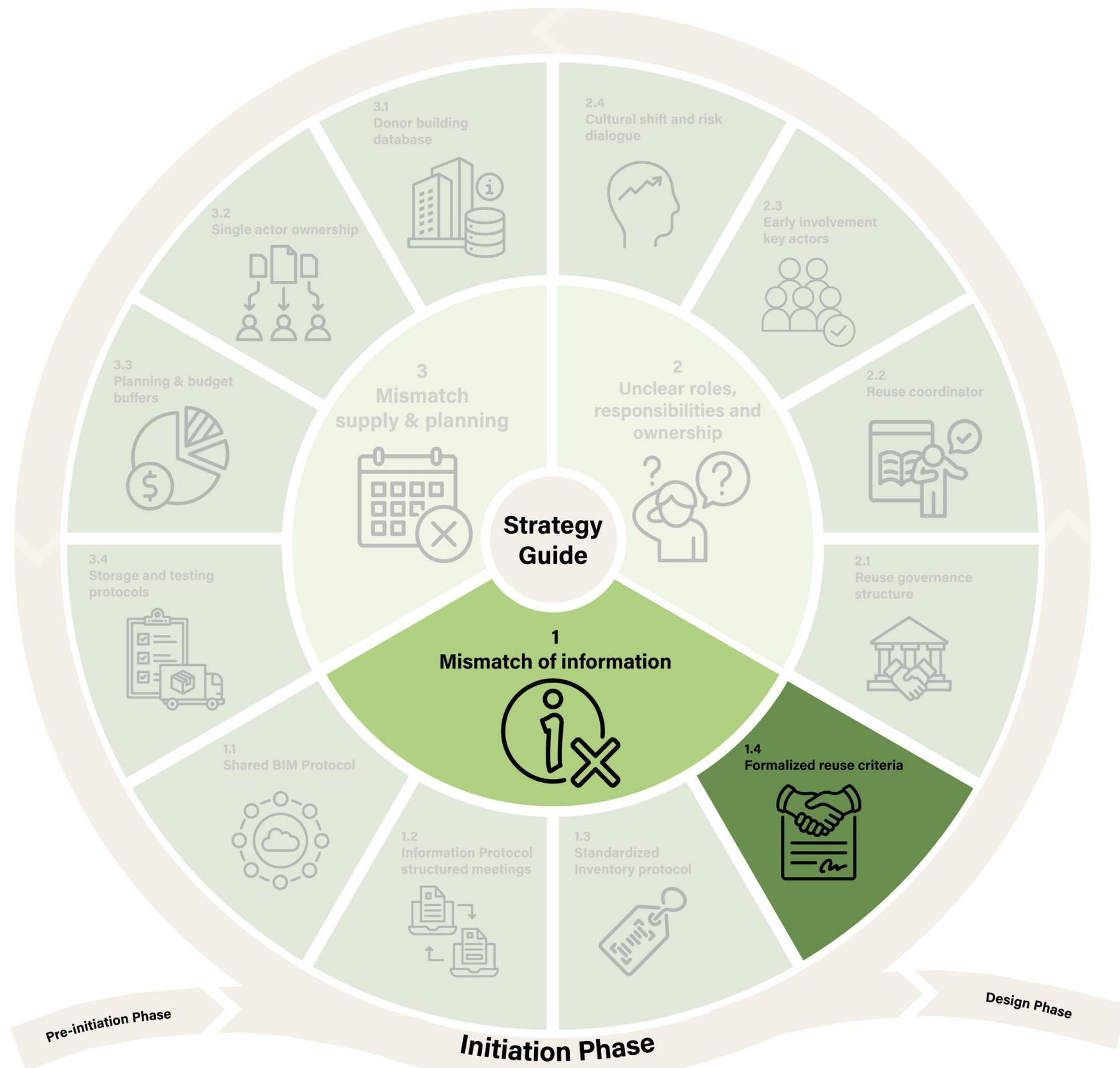
1.2 Information protocol

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



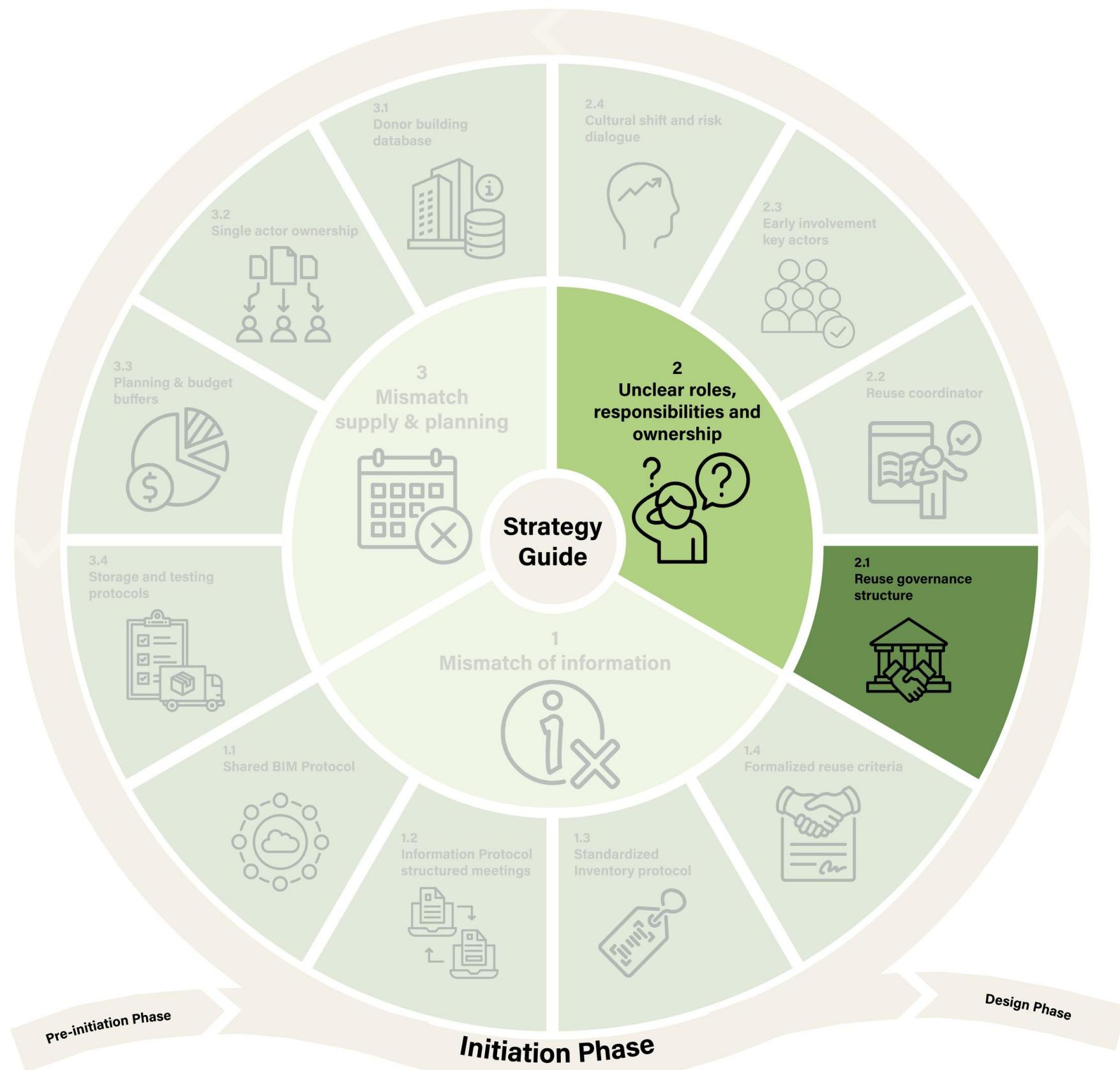
1.3 Standardized inventory protocol

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



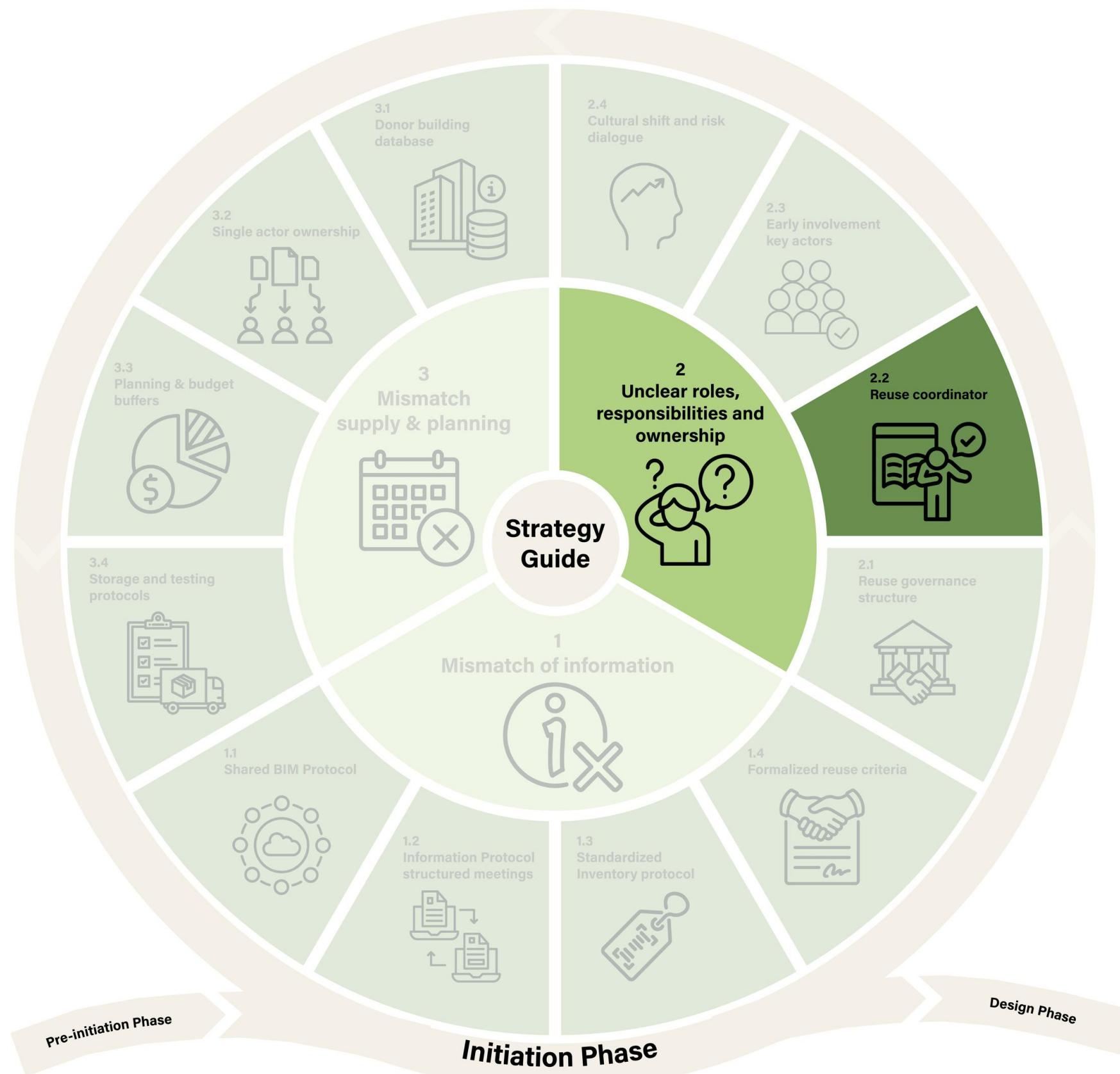
1.4 Formalized reuse criteria

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



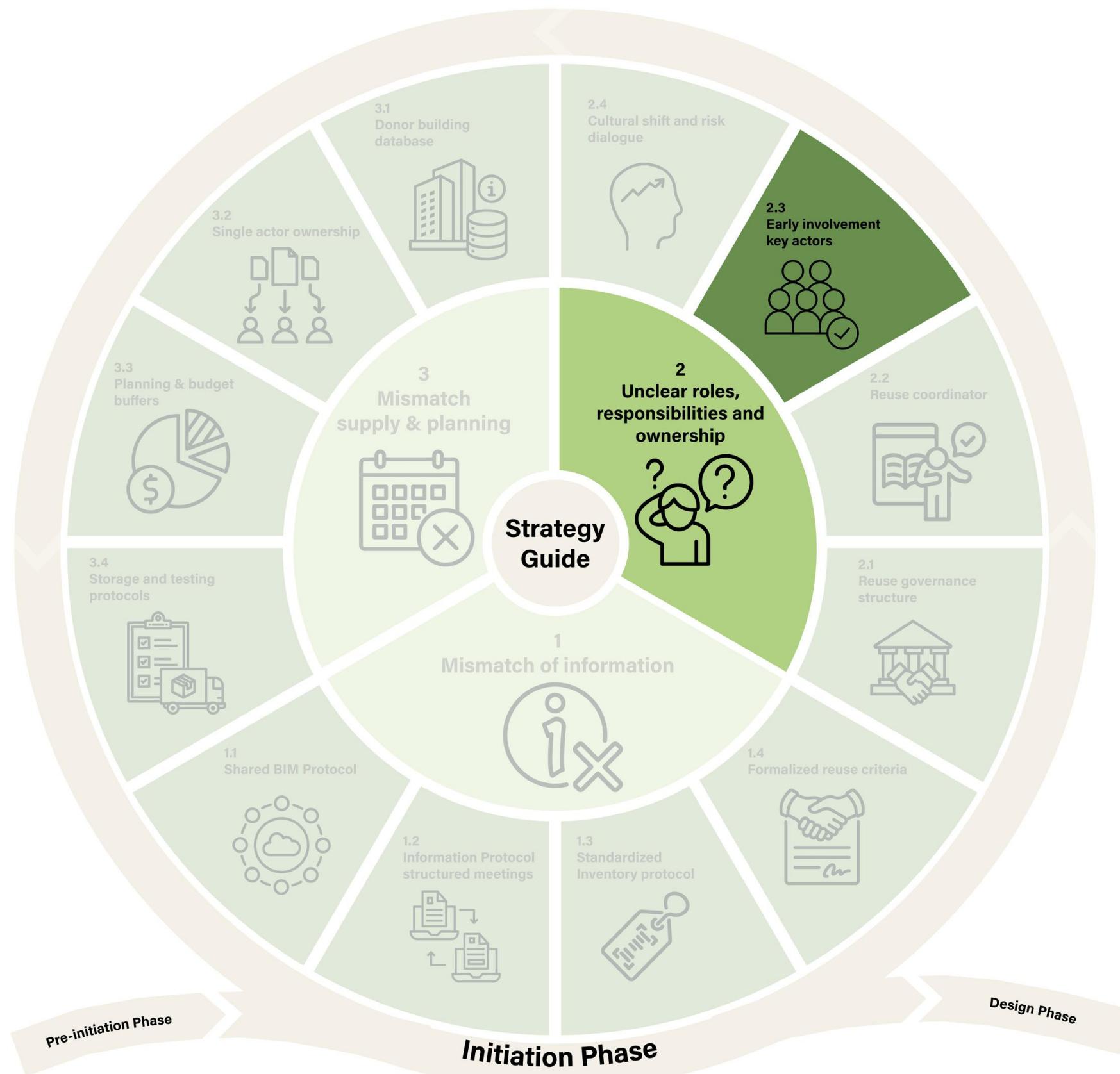
2.1 Reuse governance structure

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



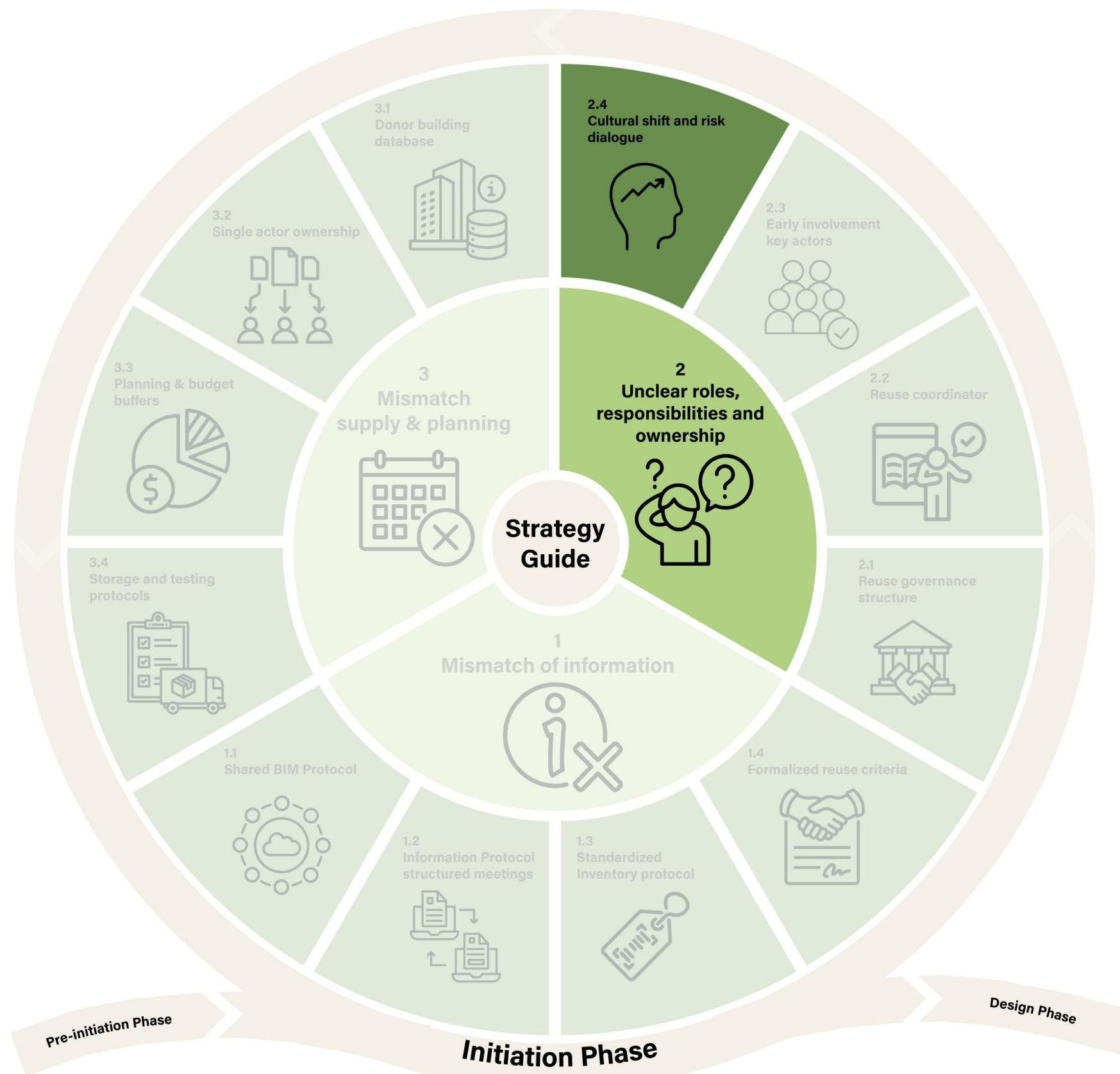
2.2 Reuse coordinator

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



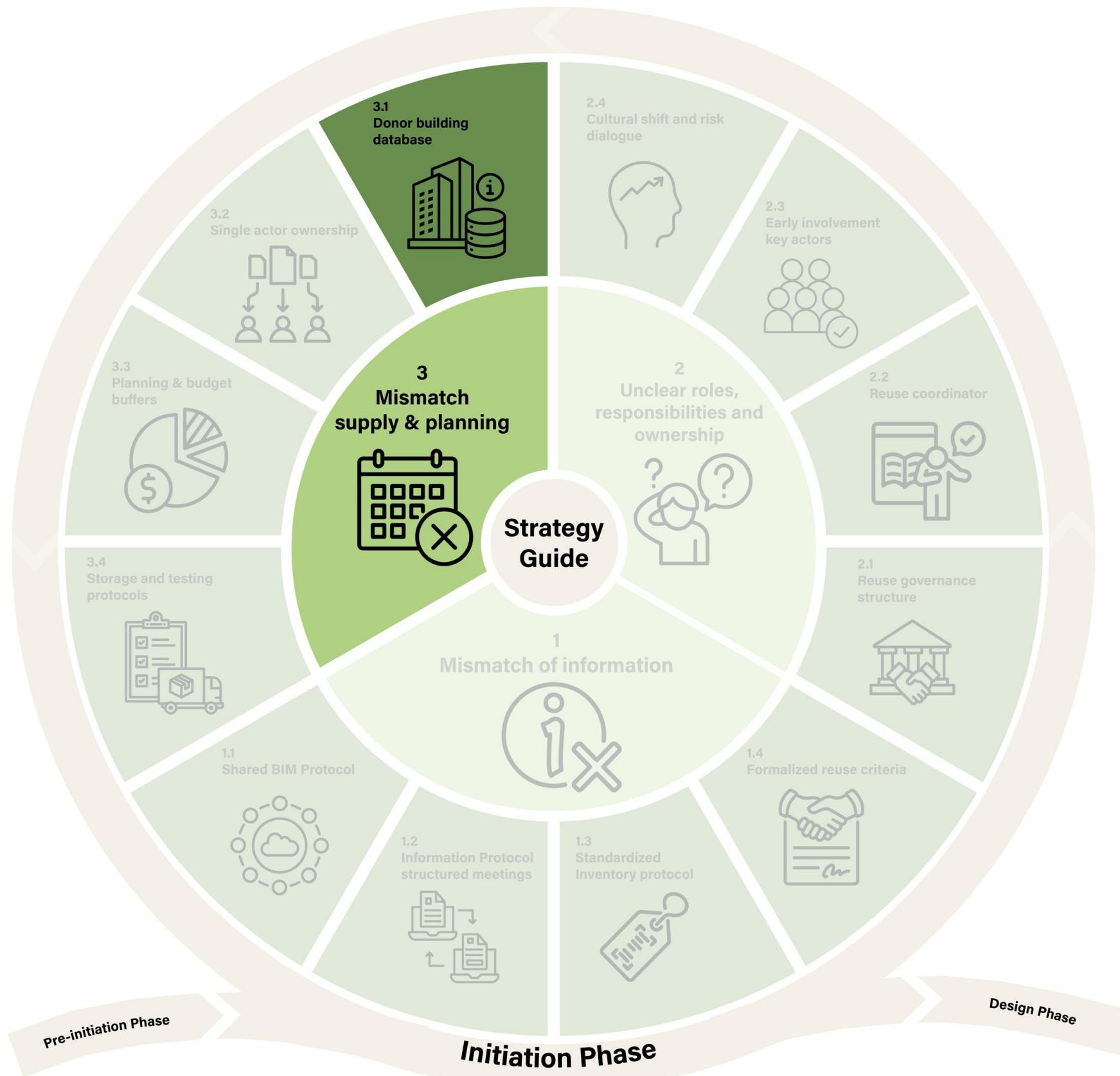
2.3 Early involvement key actors

- Invite execution partners early
- Align reuse plans with logistics



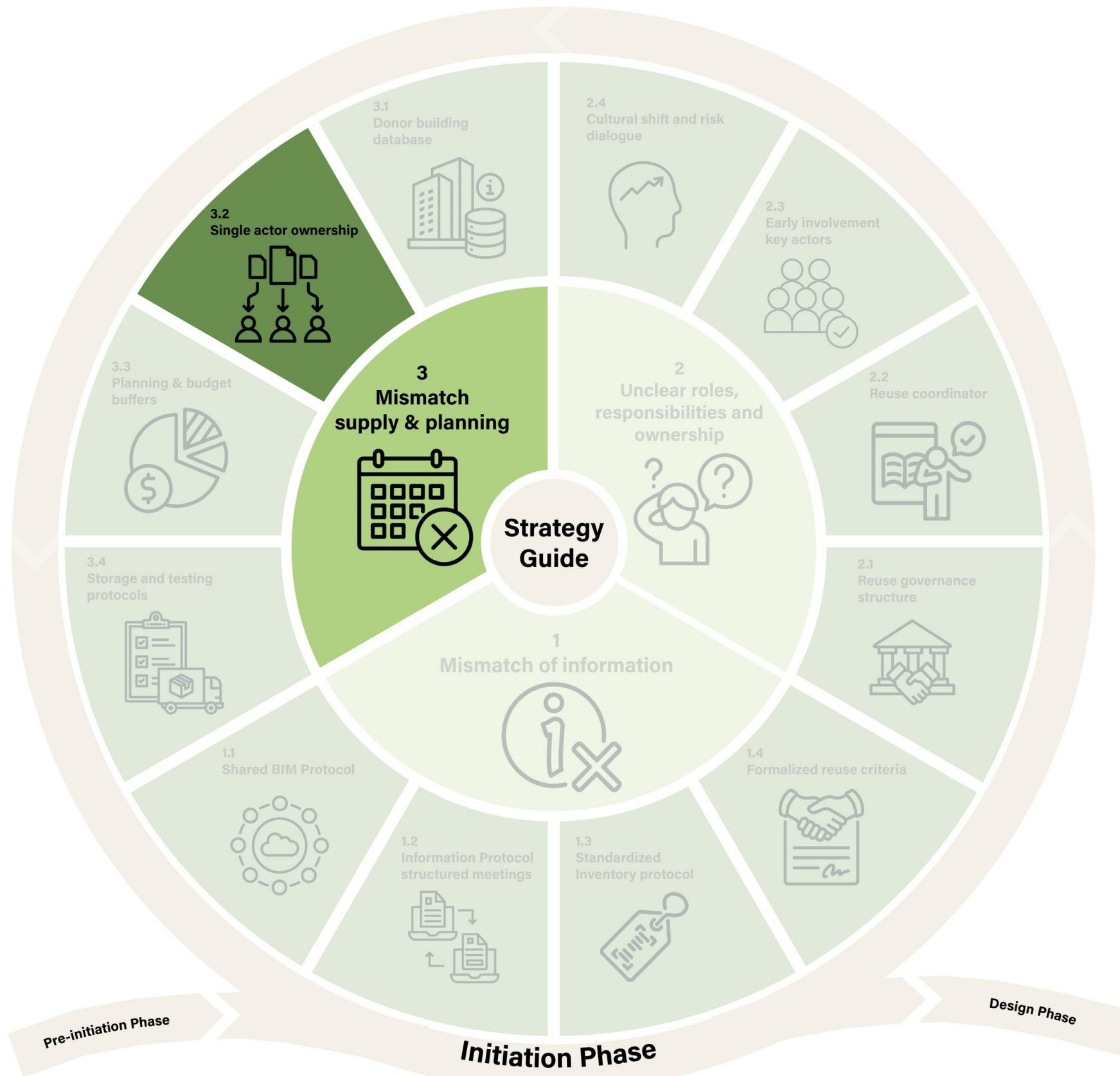
2.4 Cultural shift and risk dialogue

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



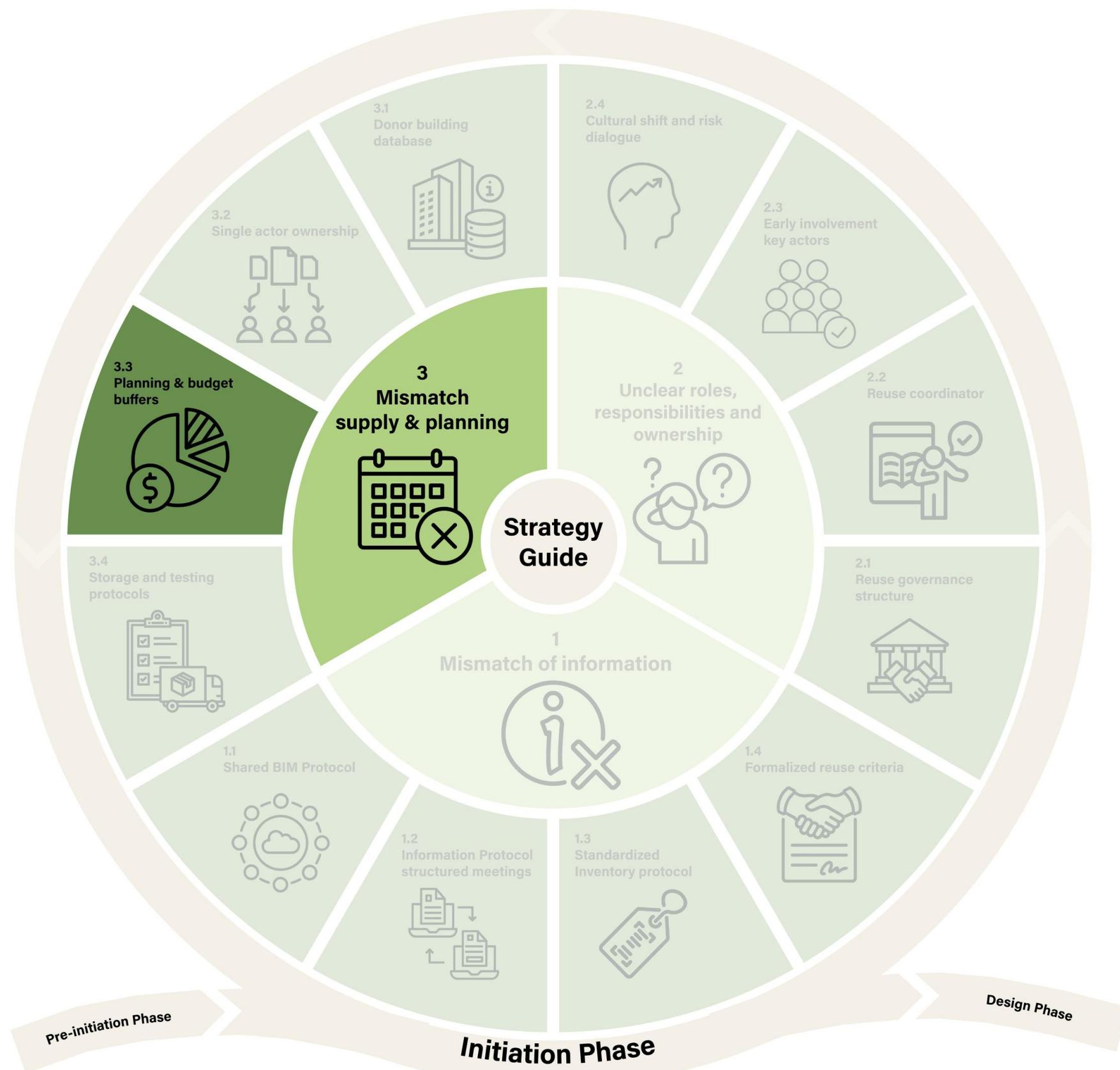
3.1 Donor building database

- Development of demolition databases
- Design based on available components



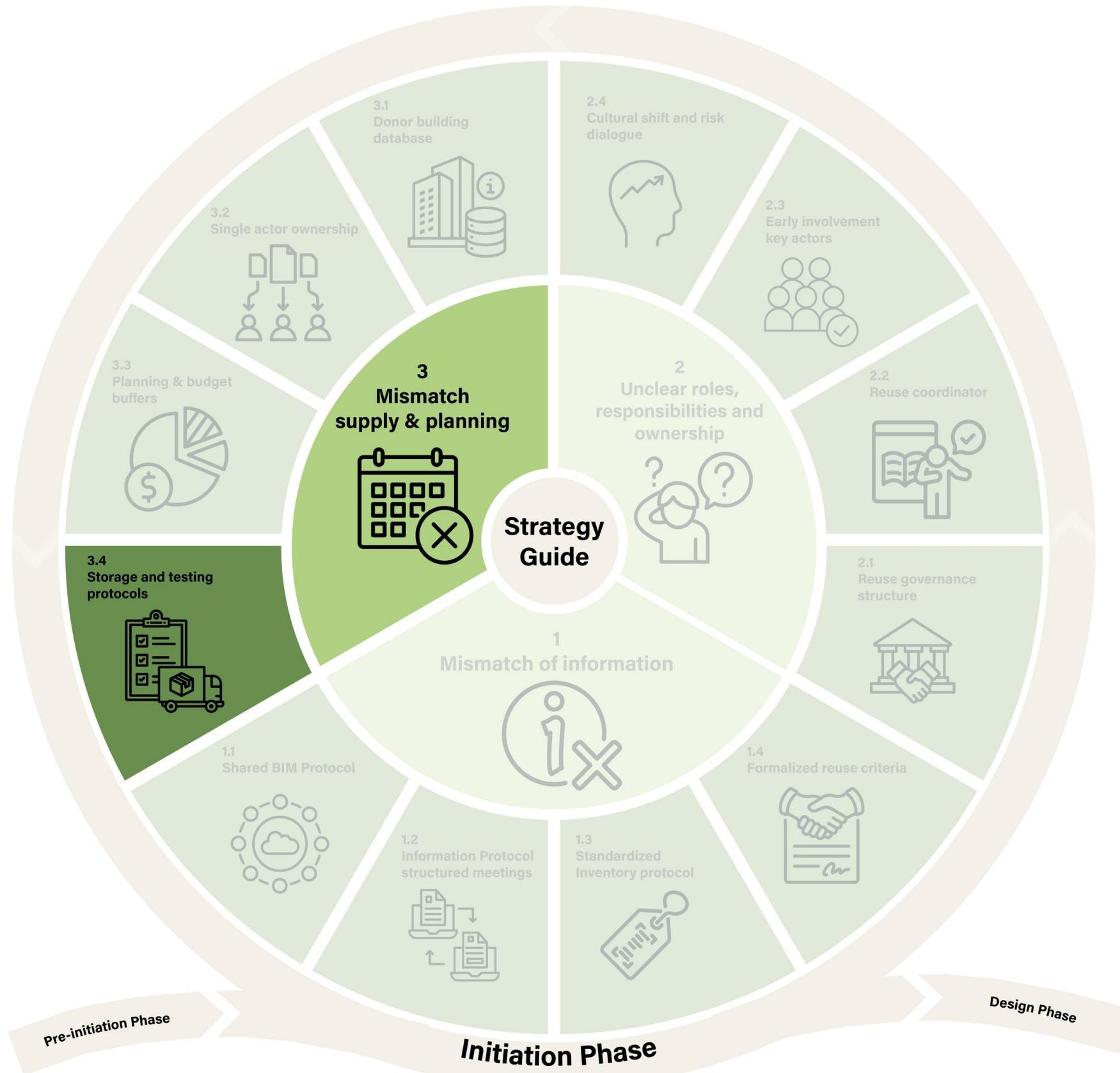
3.2 Single actor ownership

- 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:

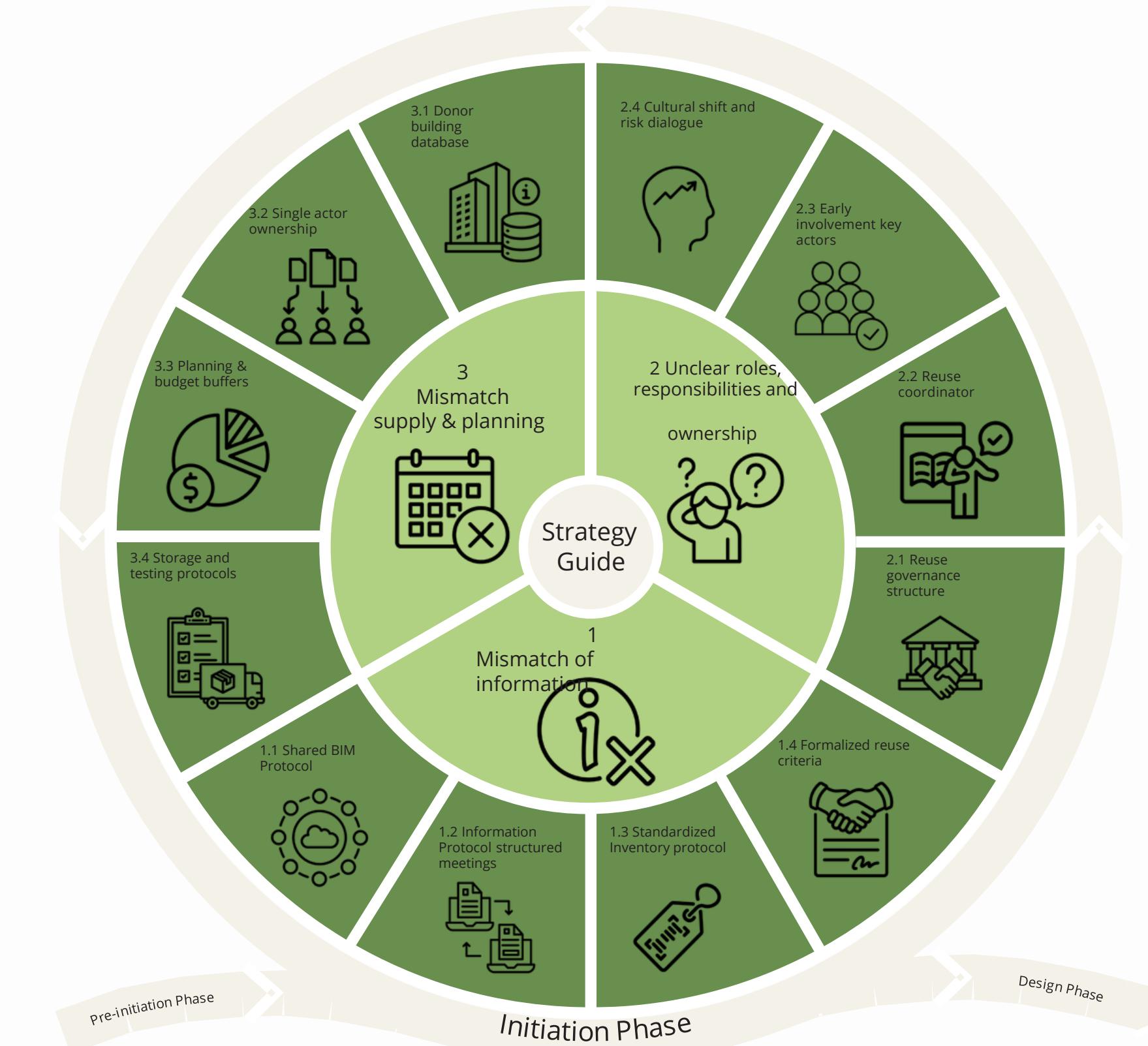
- Identifying key barriers > developing strategies
- Small sample size
- Team experience and context
- Strong foundation for further research

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:



Conclusion

Recommendations for future research:

- Develop and test strategies across more projects & contexts
- Research into develop reuse databases & platforms
- Link reuse to CO₂ 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!