

ReBuMat Symposium



ReBuMat Symposium German-Vietnamese Cooperative Project on **Resource-efficient Building Using Sustainable Building Materials**

06 September 2024 Neumünster, Germany
NordBau Convention

Symposium

ReBuMat



Agenda

10:00 Visit to the exhibition

12:30 Lunch

13:30 Session I

1. Monitoring the behaviour of some bio-based materials exposed in Ho Chi Minh City (Dr Bui Bao, TDTU)
2. Research on using foam glass to produce light weight insulation materials – Outdoor test stand in Ho Chi Minh city (Dr Le Thi Song, VIBM)
3. Regional building material innovations in Vietnam (Dr Ravi Jayaweera, THL)
4. Soil clay brick houses in mountainous Vietnam (Dr Dung Nguyen, HUCE)

15:00 Break

15:15 Session II

1. ReBuMat Strawbale pilot project (Virko Kade, one straw revolution)
2. Bio-based materials: Experiences from Western Europe (Michael Burchert, Bauwende e.V)
3. Isopterra Project (Marvin Martin, Isopterra)
4. Sustainable moisture protection of timber structures and bio-based insulation materials (Dr Simon Schmidt, IBP Fraunhofer)

16.45 Closing

17:00 End

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Regional preconditions and diverse
building material innovations: Plural
sustainability transition pathways in
uneven Southern contexts

Ravi Jayaweera

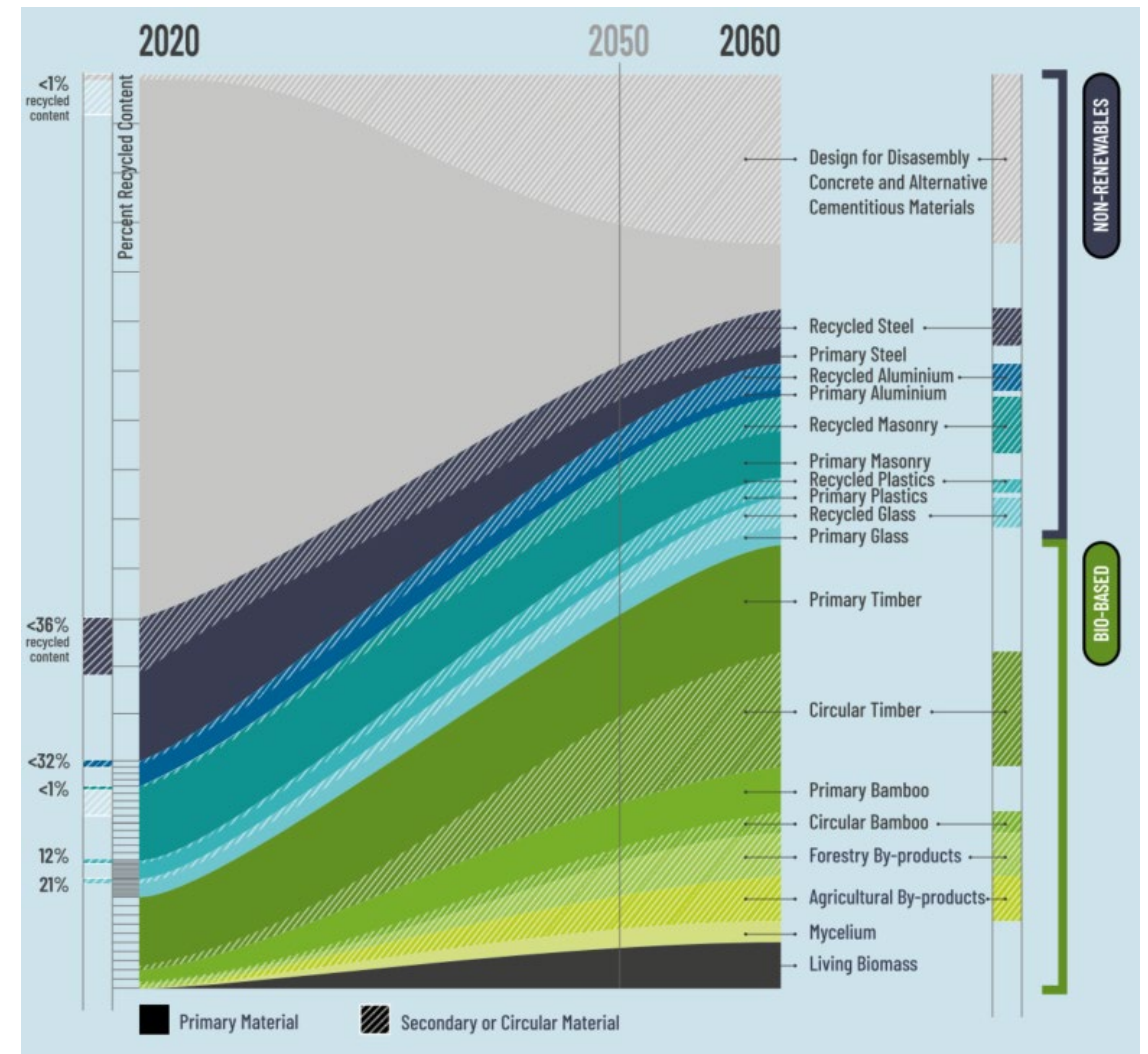
Rebumat Symposium @ Nordbau

September 2024, Neumünster, Germany



Background: Unsustainability of urban built environment

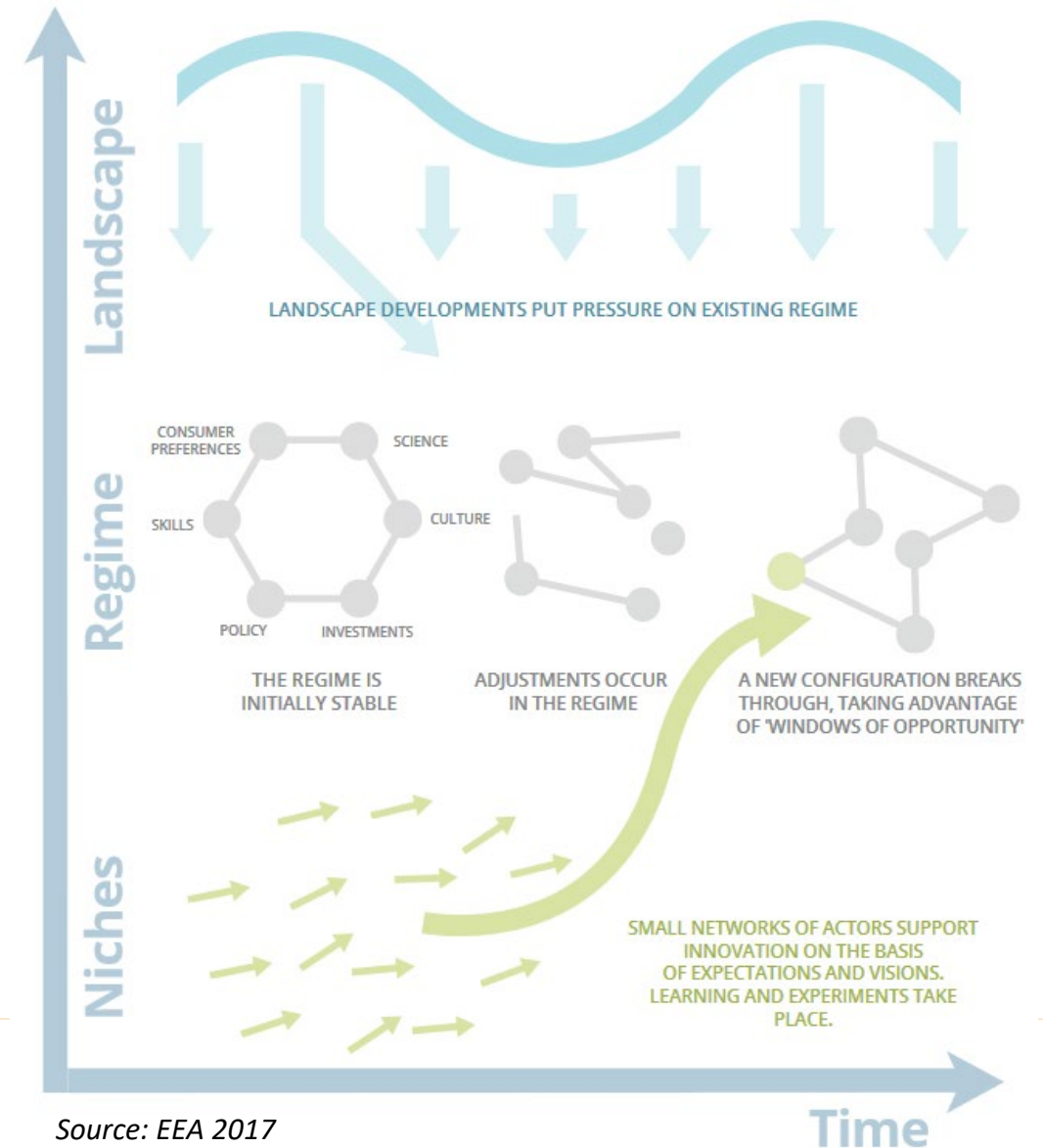
- Cities account for 75% of global resource consumption and 60-80% of global greenhouse gas emissions (Nagendra et al., 2018).
- Cities of the Global South particularly relevant as they see the strongest recent, current and projected urban growth (Kang et al., 2018).
- 85% of growth in building energy use demand will be from urban areas and 70% from cities in “developing countries” (Ürge-Vorsatz et al., 2015, p. 87).
- Progress primarily in terms of operational carbon, while lagging in embodied carbon:
 - “Building materials are set to dominate climate change” (UNEP 2023: ix)
 - Transition urgently needed towards building materials with low embodied carbon → locally sourced, circular and bio-based



Transition towards circular and bio-based building materials
(Source: UNEP, 2023, p. 15).

Background: Transitions Research

- **Sustainability Transitions Research** (Loorbach et al 2017, Köhler et al 2019)
 - Sustainability transitions: **Fundamental, non-linear and long-term change processes of socio-technical systems towards sustainability**
 - Involves systemic innovations, incl. technologies, markets, practices, infrastructures, discourses, policies, institutions, skills.
- Analytical and normative dimensions of transitions research
- Key analytical heuristic: Multi-Level Perspective (Geels 2004)



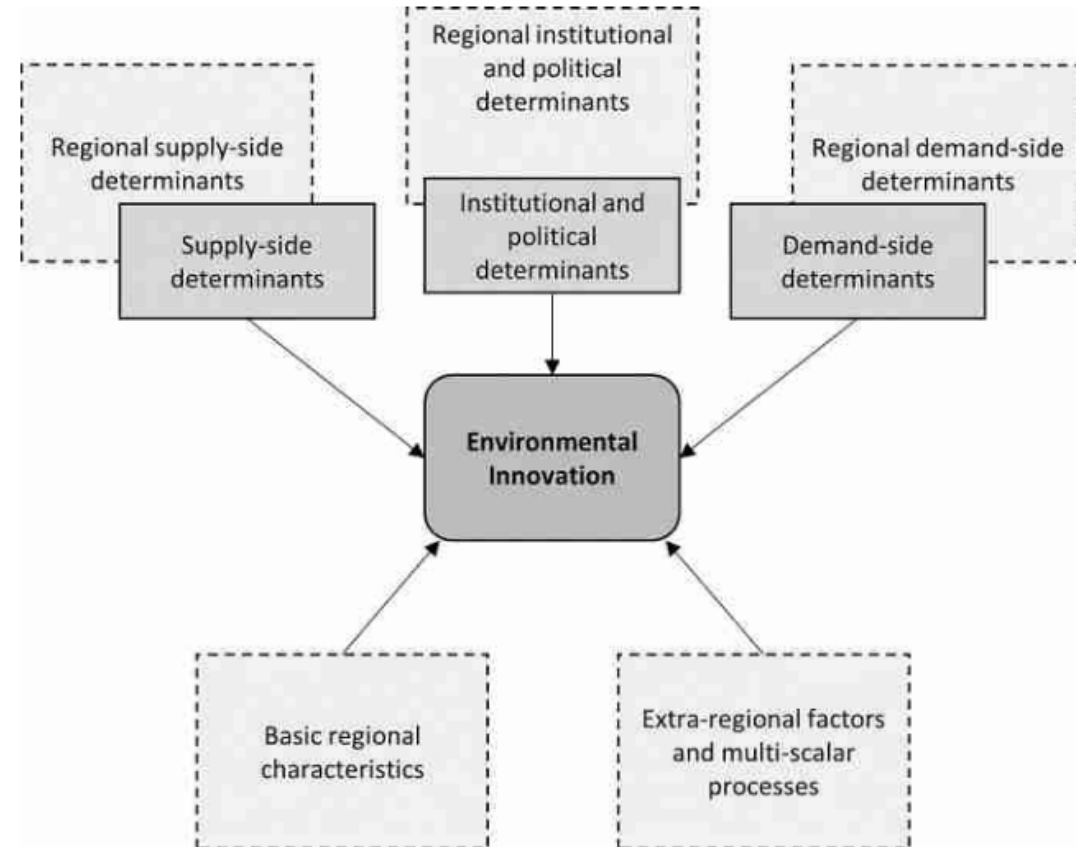
- **Place, space and scale** in transition processes
 - Sustainability transitions = spatial processes, unfolding unequally across space
 - **Place-specificity** of socio-technical regime configurations (Hansen & Coenen 2015, Jayaweera et al 2023) → place-specific configurations require place-specific transition strategies
 - Spatial factors influence the **diffusion of environmental innovations** to drive large-scale socio-technical change
→ **Regional transition paths** (Losacker 2023, Binz et al 2020)
 - Transitions as **multi-scalar processes**: interactions of processes and factors on multiple scales , strategic use of scale jumping



Based on Hansen & Coenen 2015



- Eco-innovation as “*new or improved product or practice of a unit that generates lower environmental impacts, compared to the unit’s previous products or practices, and that has been made available to potential users or brought into use by the unit*” (Kemp et al. 2019, p. 35).
- Based on geography of innovation studies: Spatially unequal conditions for eco-innovation.
- Variety of regional „determinants“/factors of eco-innovation considered (Pacheco et al 2018, Losacker 2023).
- Main categories of “determinants”/factors:
 - demand side, supply side, institutional and political drivers of eco-innovation (Horbach 2008).
- HOWEVER: Focus on “green” or “eco” innovations as such, without studying particular innovations

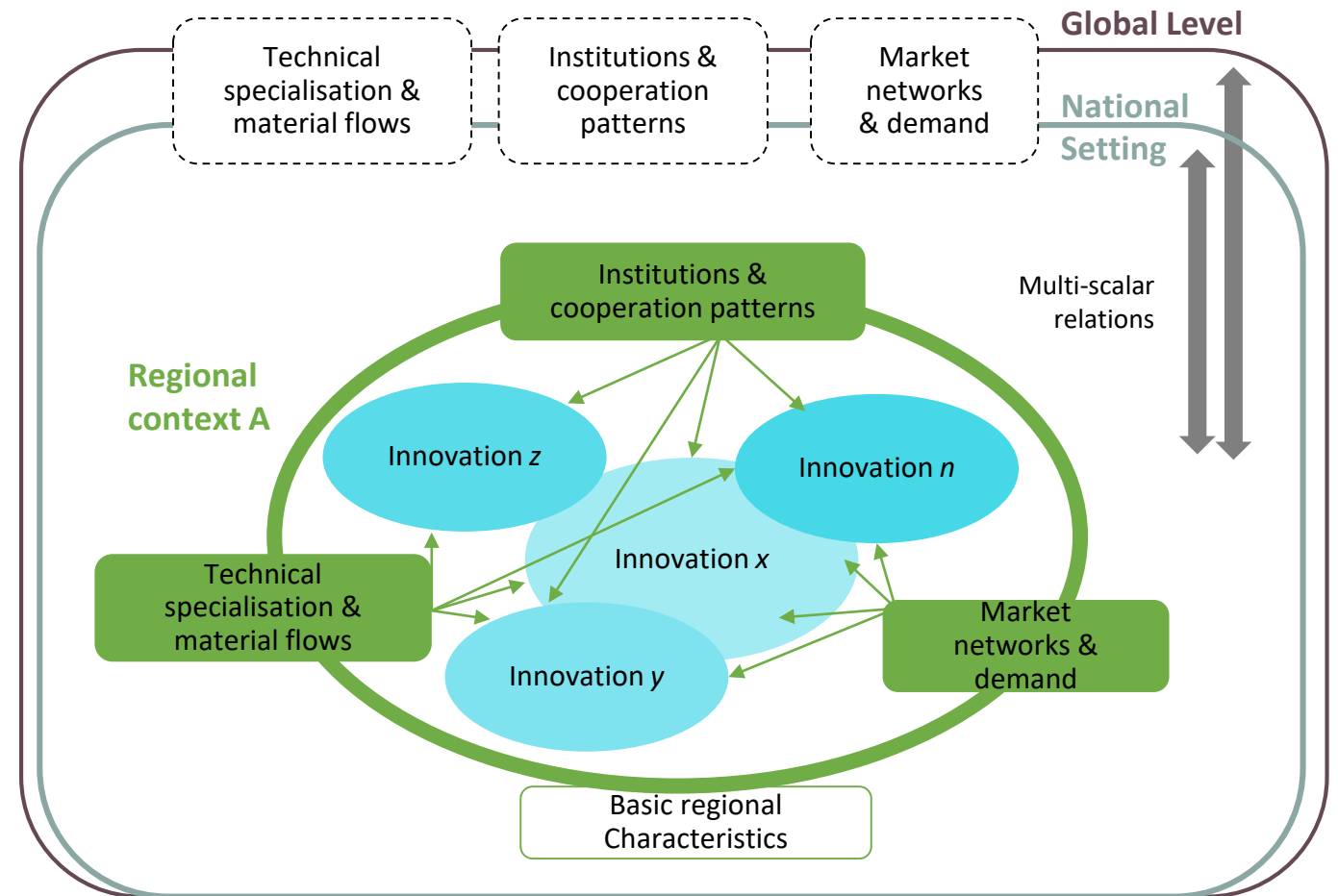


Regional factors for eco-innovation (Losacker et al 2023: 8)

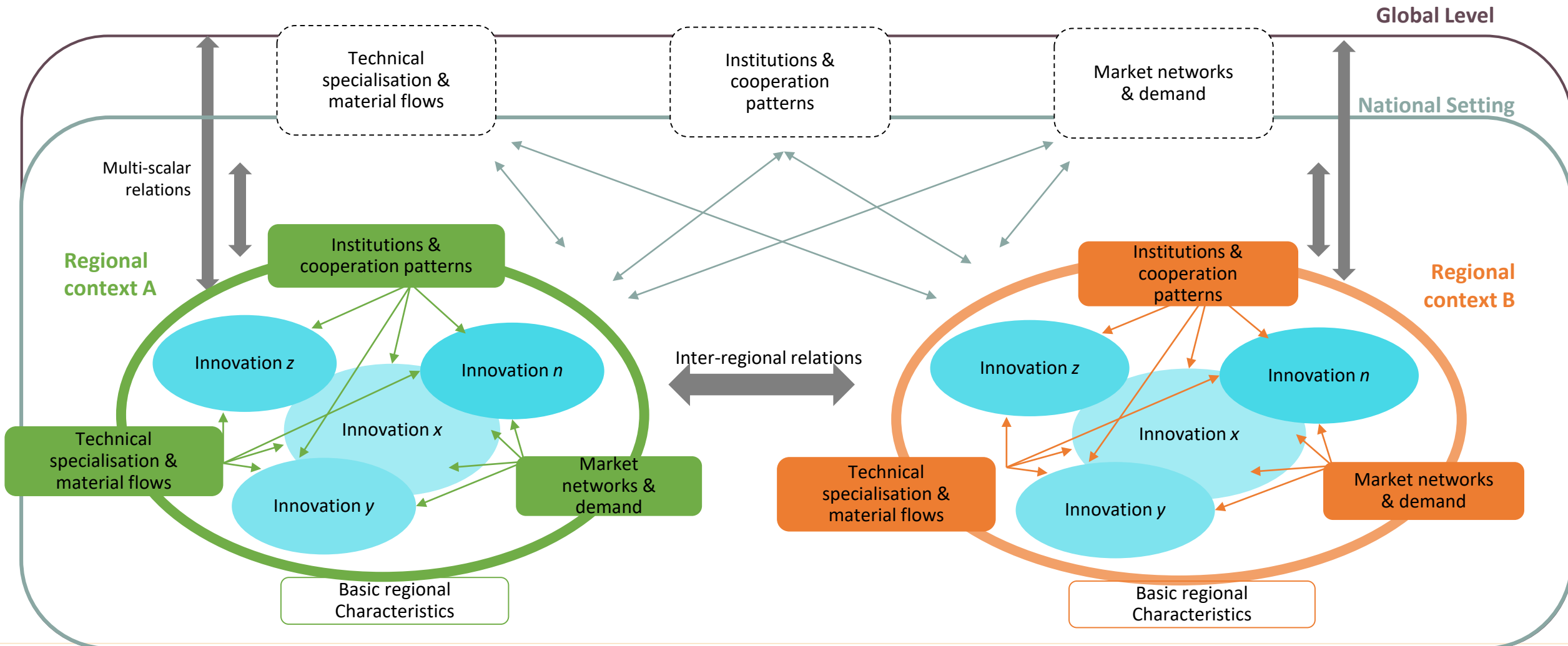
Need to study regional (incl. multi-scalar) preconditions for different innovations across contexts

Research Question & Conceptual Framework

How do *regional preconditions* influence the innovation and diffusion dynamics of different “green” building material technologies & transition pathways in different regional settings in Vietnam?



Conceptual Framework



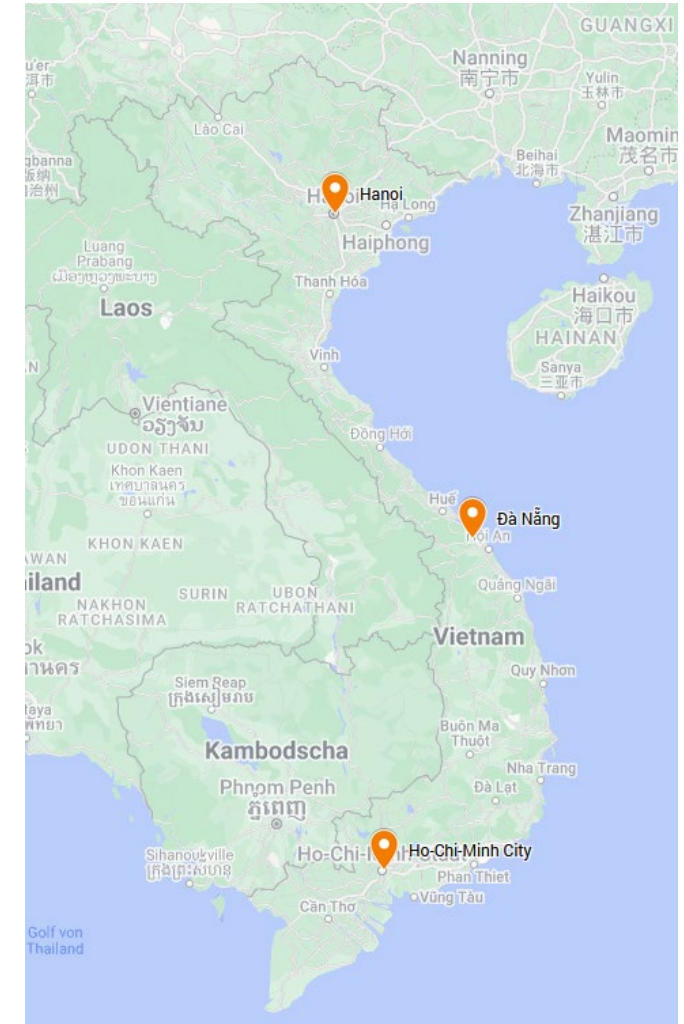
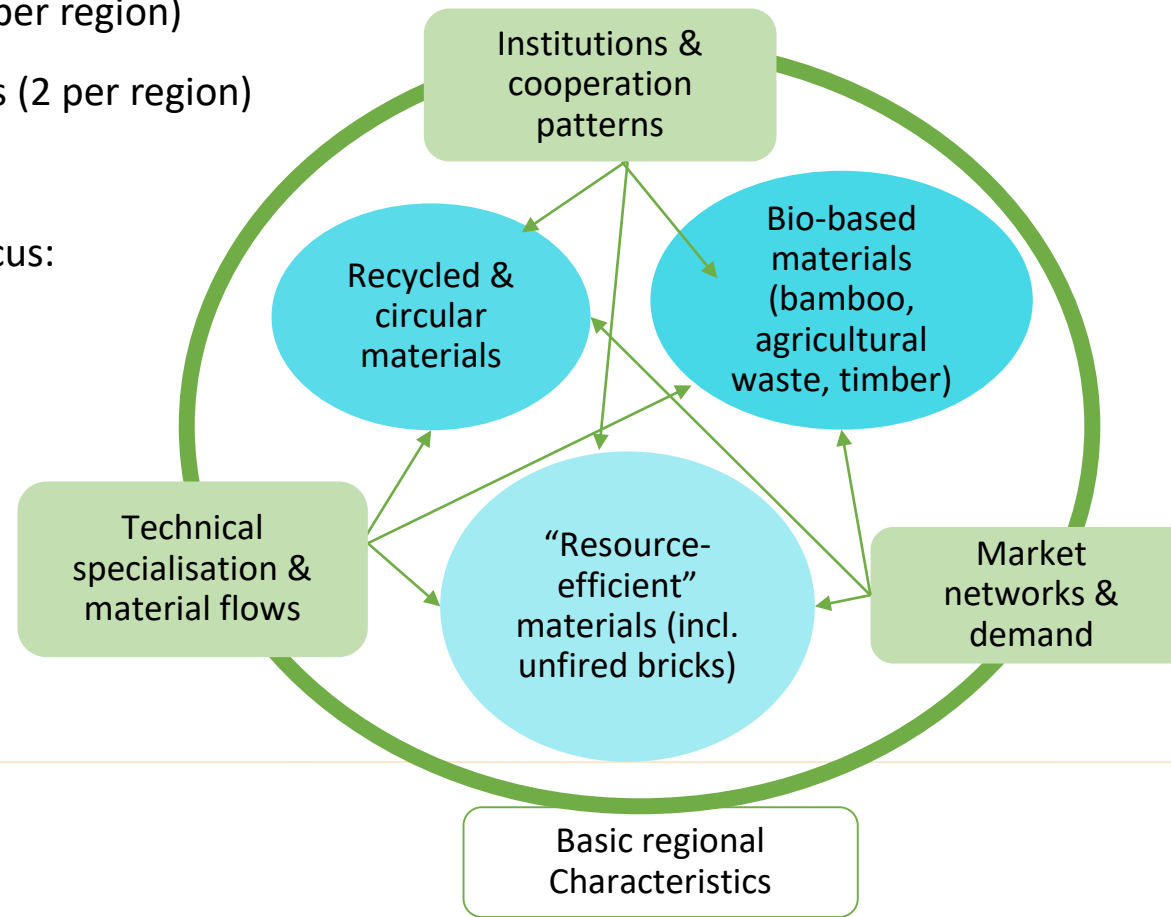
Own graph, building on Henrysson & Nuur 2021



Methodology

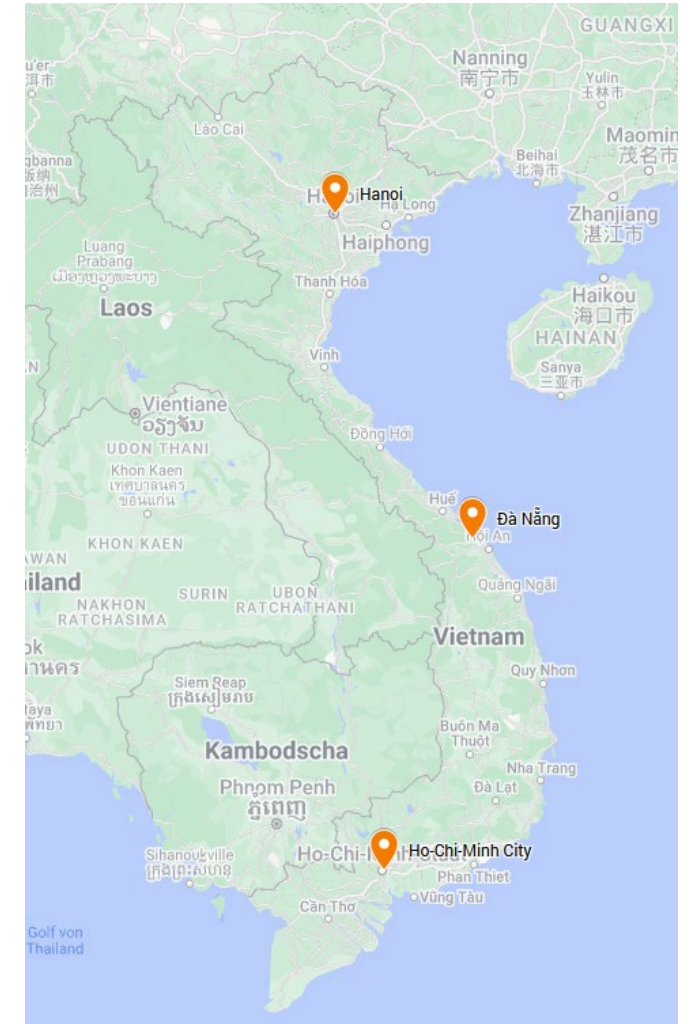
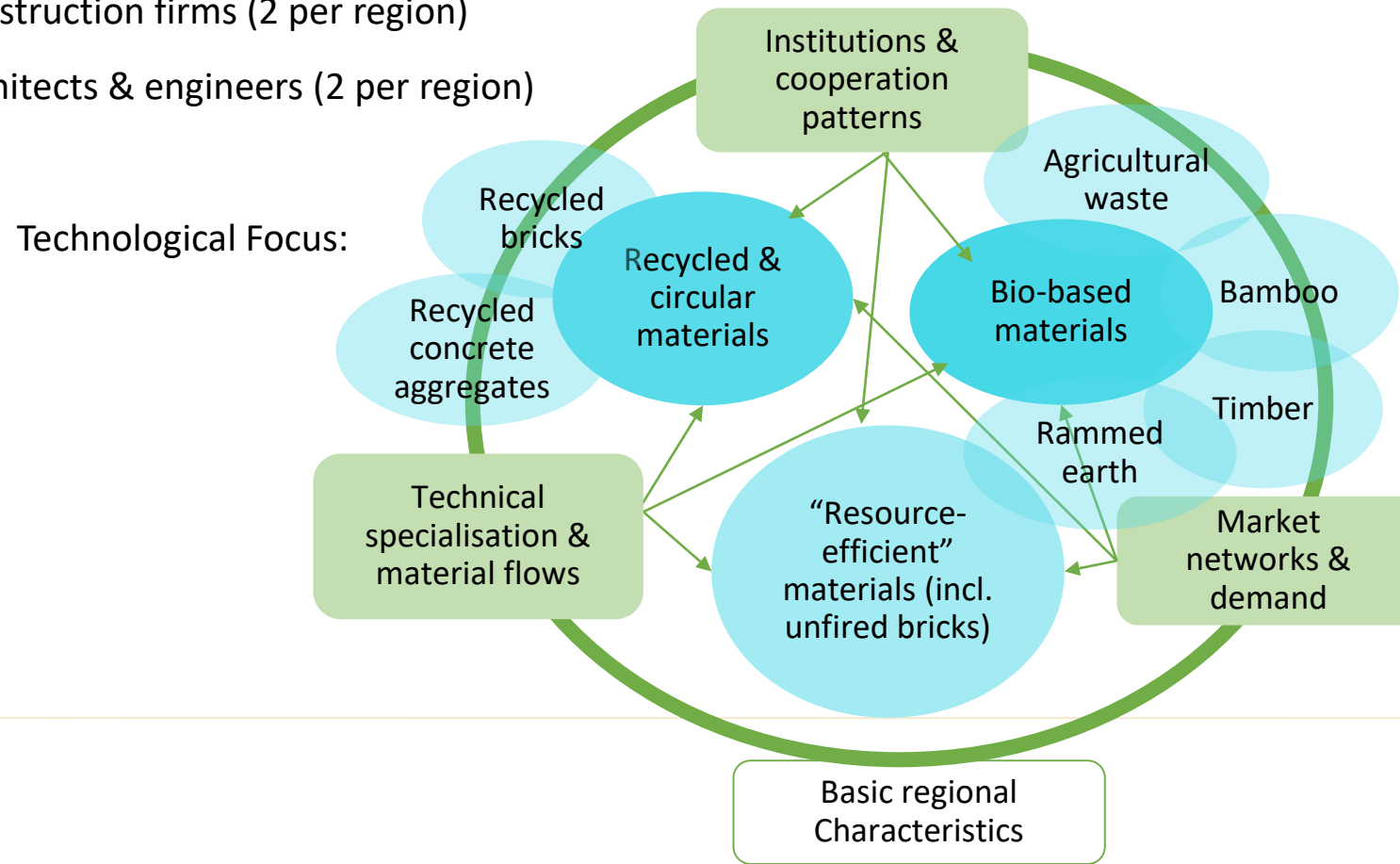
- 3 case study regions: HCMC, Hanoi, Da Nang
- 24 Semi-structured expert interviews (8 per region)
 - Building material producers (4 per region)
 - Construction firms (2 per region)
 - Architects & engineers (2 per region)

Technological Focus:

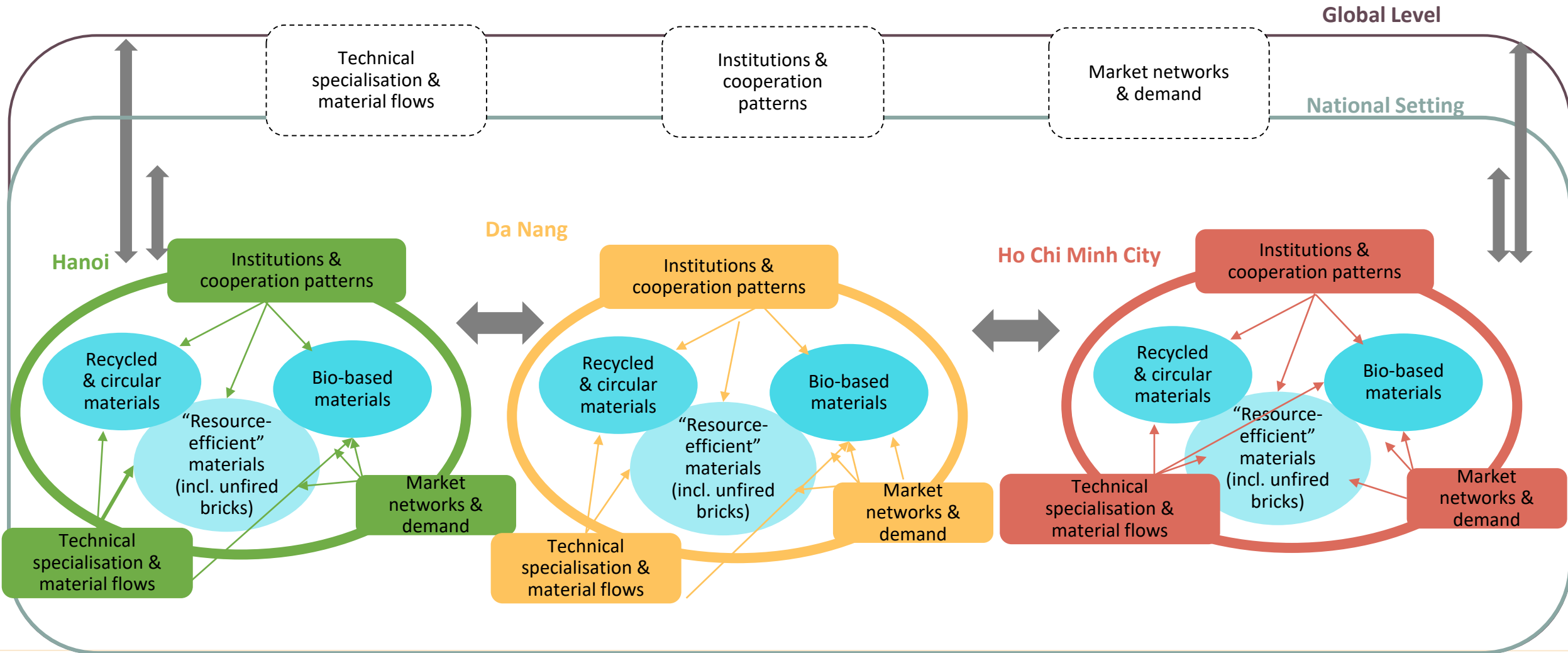


Methodology

- 3 case study regions: HCMC, Hanoi, Da Nang (North, Central, South)
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Preliminary Results



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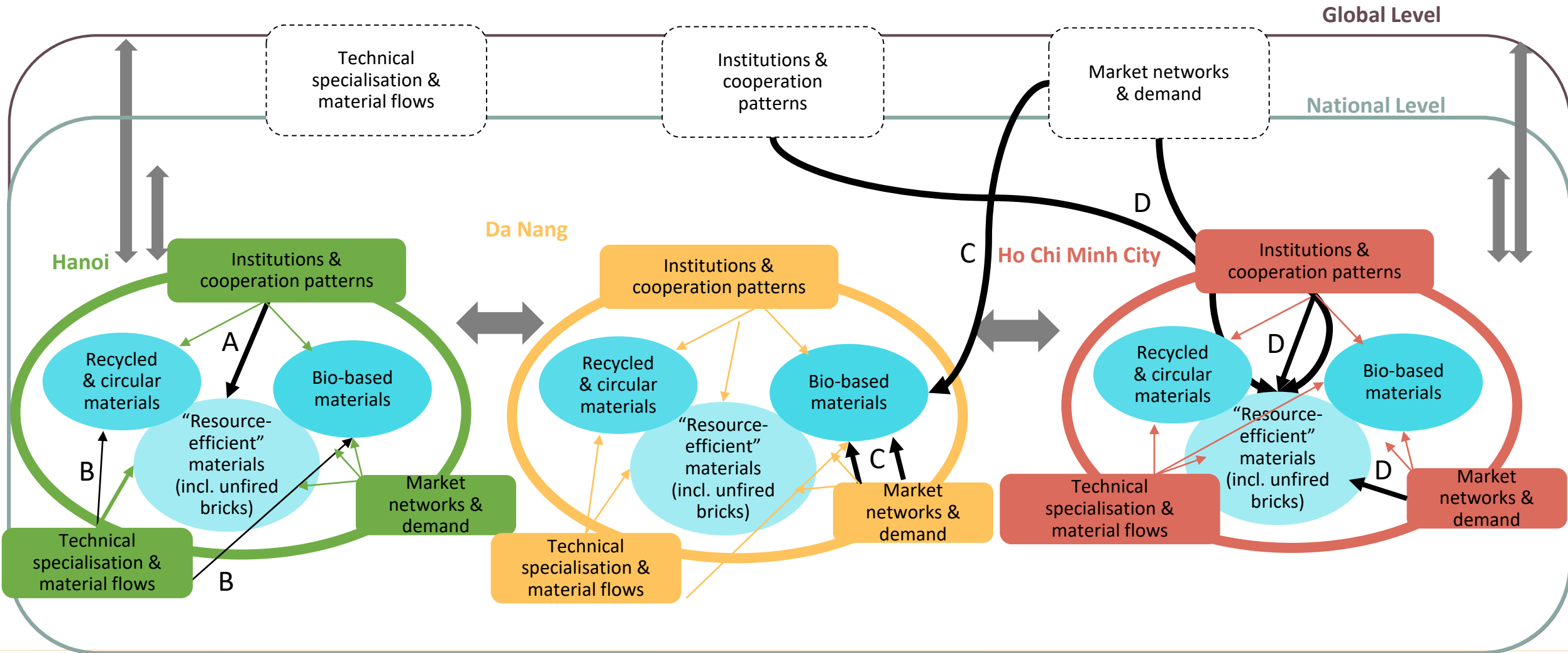
Extra-regional		Hanoi (North)	Da Nang (Centre)	Ho Chi Minh City (South)		
Bio-based materials	Circular & recycling materials	Technical Specialisation & Material Flows				
		Extra-regional		Hanoi (North)	Da Nang (Centre)	Ho Chi Minh City (South)
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		Technical Specialisation & Material Flows		Technical Specialisation & Material Flows	Technical Specialisation & Material Flows	Technical Specialisation & Material Flows
		Technical Specialisation & Material Flows <ul style="list-style-type: none"> - Production with imported production lines - High number of unused production facilities 		Technical Specialisation & Material Flows <ul style="list-style-type: none"> - High overall building material production capacity 	Technical Specialisation & Material Flows <ul style="list-style-type: none"> - Higher availability of conventional raw material 	Technical Specialisation & Material Flows <ul style="list-style-type: none"> - High overall building material production capacity
		Market Networks & Demand <ul style="list-style-type: none"> - Delegitimization of unfired materials after technological problems with products of one firm, recently going through a “comeback”, legitimation increased, better products, quality proven to the public - Quality improved drastically, however still more maintenance required - Demand driven by particular project and client types: Large projects, government-financed projects, projects seeking certification, especially factories; little demand for small scale, private or residential projects. - Factories also profit from quick construction, soundproofing and fire protection qualities 		Market Networks & Demand <ul style="list-style-type: none"> - Industrial investments of TNCs 	Market Networks & Demand <ul style="list-style-type: none"> - Demand for new products that withstand climate extremes 	Market Networks & Demand <ul style="list-style-type: none"> • High presence of international investors/TNCs leads to higher demand for green materials, higher awareness on the local level and learning for local firms
		Institutions & Cooperation Patterns <ul style="list-style-type: none"> - Government-led market making through Circular 13 (2017): Mandatory use for state-sponsored projects - Introduction of unfired bricks effortless for architects, as no aesthetic difference (no raw walls) 		Institutions & Cooperation Patterns <ul style="list-style-type: none"> • Construction works funded by state capital, or >30% state loans must use 100% unburnt materials • Widespread use of non-baked bricks due to legal requirements → use in mandatory projects • Higher level of enforcement 	Institutions & Cooperation Patterns <ul style="list-style-type: none"> • Construction works funded by state capital, or >30% state loans must be completed with 70% unburnt materials • Lower enforcement levels and use of non-baked bricks • New products can better withstand changing weather extremes 	Institutions & Cooperation Patterns <ul style="list-style-type: none"> • High demand for green certified factories of TNCs • Actors more open to innovation than in Hanoi
		international), waste collection & treatment firms on circular innovation		<ul style="list-style-type: none"> - Actors are more change- and risk-averse and less innovation-friendly - Higher enforcement of regulation 		<ul style="list-style-type: none"> - Municipal green building incentives - High presence of TNCs & certified green building projects - “House-building mentality” reportedly “not as solid and long-term-oriented as Northerners”

Preliminary Results: Multi-scalar

Technical Specialisation & Material Flows	<ul style="list-style-type: none"> - Regionally unequal availabilities of different resources and material inputs - Building materials usually produced and used locally due to high transport costs 		
	<table border="1"> <tr> <td data-bbox="359 354 606 525"> Institutions & Cooperation Patterns </td> <td data-bbox="606 354 2517 525"> <ul style="list-style-type: none"> - Material selection is the result of a cooperation between (A) project owner and (B) architects/consultants to define project (incl. material) and issue tender, a (C) contractor that follows the tender and needs to find (D) suppliers; (B) might suggest suppliers directly or through considerations in tender, while (C) might propose other/cheaper materials. Producers work with these actors groups - Producers present products to architects/consultants to have their products considered in upcoming tenders; collaboration can involve kickback payments ; exchange informs producers about emerging demand from developers, allowing firms to innovate accordingly; consultants support material certification processes </td> </tr> </table>	Institutions & Cooperation Patterns	<ul style="list-style-type: none"> - Material selection is the result of a cooperation between (A) project owner and (B) architects/consultants to define project (incl. material) and issue tender, a (C) contractor that follows the tender and needs to find (D) suppliers; (B) might suggest suppliers directly or through considerations in tender, while (C) might propose other/cheaper materials. Producers work with these actors groups - Producers present products to architects/consultants to have their products considered in upcoming tenders; collaboration can involve kickback payments ; exchange informs producers about emerging demand from developers, allowing firms to innovate accordingly; consultants support material certification processes
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Market Networks & Demand	<ul style="list-style-type: none"> - Contractors primarily follow demands of investors/developers - Linkage between architects/consultants and producers through internal green building material experts and internal product databases → material database as key institution - Key role for green building consultants as intermediaries between producers and project owners: guide developers through building certification, advise developers on how to realize certification for the least costs; building materials one of many categories to be considered depending on relative costs and implementation complexity; consideration of materials depending on certification programme - Architects/consultants seek long-term suppliers that can be trusted; government projects often have one regional supplier for all projects - Architects/consultants & producers meet at seminars, in associations on national level & across regions - Low-level cooperation of firms with national building material research institutes (VIBM, IBST) and developers to develop new materials - Material innovators struggle to establish trust for new products: Material selection involves long-term commitment and risk; established materials considered as safe - Prioritisation of short-term costs in material selection process - Innovation “mindset” of different actors in Vietnam: more open and progressive: large, international and private firms, rather conservative: smaller, local and state-owned firms - Spillover effects from TNC-induced green building demand <ul style="list-style-type: none"> o Though buildings often realised with international architectural and design offices, spillover effects to local building sector actors: “all of the international companies who are investing into Vietnam [...] they have the minimum standards in their country and they have to apply that into the factories in Vietnam, and that is driving the industry because we, the Vietnamese contractors have to learn to adapt to their requirements. So that plays a really big role in the overall construction industry in Vietnam right now [...] Normally, they have their own consultants regarding of those aspects like sustainability design, architecture. However, the contractors, the one who actually builds the building, are the Vietnamese laborers, itself, the laborers have to learn to adapt to the new materials as well as the construction method ” - Inter-regional organisation of Vietnamese firms - Many Vietnamese firms (incl. consultants/architects and producers) have offices/factories in multiple regions of Vietnam, commonly in Hanoi and HCMC → inter-regional learning and knowledge networks - International cooperation of Vietnamese firms <ul style="list-style-type: none"> o Use of foreign technology as claim to legitimacy: “It seems like everybody's like: ‘We have European technology’” o Firms cooperate with local and international universities and institutions for innovation and certification o Firms participate in workshops and seminars with international organisations to learn about international best practices (incl. Japanese construction waste treatment and recycling technology) - Vietnamese subsidiaries of international firms profit from transnational innovation setting within the firm and global sustainability ambitions <ul style="list-style-type: none"> o “We have strategic partners on the Malaysian side, experts from that side regularly guide the Vietnamese market towards green production and sustainable production [...] the main influence is on the parent company in Malaysia. Every year, there must be reports and enforcement according to the group's regulations. Every year they set goals for the Vietnamese market and we must achieve those ” - Producers use international certifications to increase international market access and create legitimacy 		



Preliminary Results



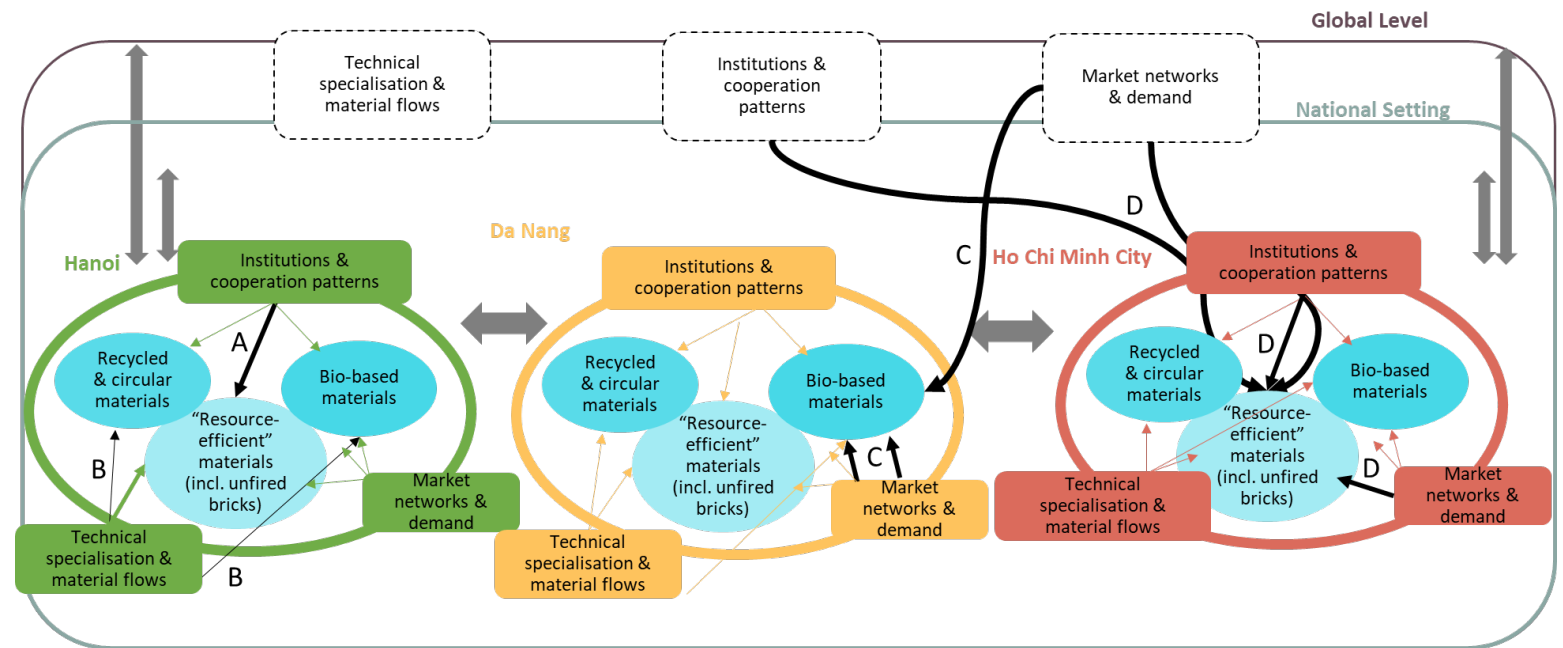
- **Raise enforcement levels of mandatory unburnt materials** to support resource-efficient materials in Da Nang and HCMC.
- **Leverage high-enforcement setting of Hanoi to experiment with more demanding regulations.**
- **Lower the barriers for small innovative firms to have innovations certified** (supported by donors or revolving funds of innovation agencies).
 - overcome certification challenges, gain trust, enter markets and scale operations.
- **Support communities of practice within and across the study regions.**
 - bridging the temporary project structure and the permanent organisational structure of the firm.
 - increase knowledge spillovers and support the diffusion of sustainable building materials.

- **Support challenge-oriented communities that are inter-sectoral fora (i.e. include firms with industrial or agricultural waste or by-products and building material producers).**
 - strengthen or create new partnerships, linking actors across socio-technical systems and sectors.
- **Create networks and clusters as platforms for knowledge exchange, co-production of products and discussions on the monetization of waste streams.**
 - Overcome sectoral silos and make use of the relatedness of knowledge.
 - Establish regional data hubs on the flow of waste and by-product streams.
- **Strengthening local green building intermediaries to increase the share of local design and consultancy work for TNC projects, especially in HCMC.**
 - enhance spillover and learning effects.

- Encourage inter-regional transfer of knowledge (e.g. from bio-based material experimentation in Da Nang to other regions).
 - Raise awareness and share knowledge about innovative and sustainable products, but focus on their qualitative aspects, longevity, stability, costs, etc, instead of their sustainability.
 - **Incentivise material producers to shift their use of biomass from short term energy to longer life forms, i.e. building materials.**
- **leverage market relationships of biomass suppliers and buyers to develop products.**
- Support intersectoral collaborations with financial incentives.
 - Support the establishment of markets for used building materials, especially in Hanoi and HCMC (large waste streams).
 - **Reduce administrative barriers to reuse these materials.**
 - Supporting firms to flexibly switch between local and international markets.
 - Leverage the real estate market slowdown to experiment with sufficiency strategies.

Conclusion and way forward

- Regionally distinct and multi-scalar preconditions affecting different technological innovations unequally
- Need for transition strategies that consider regional and technology specific preconditions



Thank you for your attention

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REBUMAT – German-Vietnamese cooperative project on resource-efficient building using sustainable building materials



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