



# PROJECT 23: WHEN PREFAB HITS THE GROUND

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FINAL REPORT



Australian Government  
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Science and Resources

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**CONFIDENTIAL:**

☐ Yes ☒ No

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# EXECUTIVE SUMMARY

## FINAL REPORT

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Build-to-rent shifts the housing profit model from capital gains to one based on ongoing rental income, with viability tied to minimising ongoing expenditure. However traditional construction practices in Australia have been criticised for their focus on the reduction of upfront construction costs at the expense of quality, performance and flexibility. Current and emerging prefabrication processes could provide the efficiency and quality of construction necessary for built-to-rent. This scoping study sought to examine the intersection of build-to-rent assets and prefabrication processes to identify opportunities for the housing and construction sector to reduce ongoing greenhouse gas emissions and increase the quality of stock.

The housing market and viability for prefabricated construction in Australia is multifaceted. No one single housing model, building typology, tax concession or regulatory change alone can facilitate greater uptake. However, identifying and understanding the implications of constellations of related factors, and how they may collectively offset the risk of expansion or innovation, can assist prefabricators in making decisions regarding market infiltration and expansion.

In lieu of available information about the operational factors influencing business models and development decisions, this scoping study developed a series of mapping techniques to attempt to document and understand the possible relationships between contextual factors. This report speculates as to some of the factors that may have created a more viable context for prefabrication and innovative housing models.

The key findings of the scoping study were:

- Build to rent is not a singular model of housing development that is clearly distinct from build to sell development. Some forms of housing that could be classified as build to rent are only intended to be rented for finite periods of time before being sold, and other build to sell projects have been converted into rentals. Consequently, some build to rent assets may not be built to prioritise high quality or low emissions in their construction over lower upfront costs and therefore may not provide a viable opportunity for prefabrication.
- Housing models that shift from capital to operational profit models make prefabrication viable against traditional construction methods. However, it puts a significant risk on small and emerging prefabricators around cash flow and insurance.
- Consortiums, bridging funds and shifts in GST and land tax settings can enable businesses to bridge the gap between upfront costs and delayed or operational profit.
- Build to rent contains two key shifts from typical build to sell housing: profit from short term capital growth (and related reduction of upfront construction costs) to long term operational profit (and related reduction of ongoing costs); and a move from product development to customer orientated service provision.

- Housing that is developed with input from the long-term asset owner, operator or occupant are more viable markets for prefabricated construction than speculative development. The opportunity emerges from a long-term reframing of costs, return on investment, risk, brand and other ‘soft’ benefits which offsets the higher initial outlay of money and risk of investing in Australia’s still ‘niche’ prefabricated construction sector.
- While some housing models are more viable for prefabrication, for the above reasons, viability also relies on the specific markets, specialisations and typologies within each of those housing models.
- Viable markets for prefabrication in Australia align with gaps in the housing market. As emerging or niche markets, they face similar finance, regulatory and risk assessment start up barriers as prefabricated construction. Consequently, solutions that unlock pathways for expansion in the housing sector may also create opportunities for addressing barriers to prefabrication.
- The reputation of prefabrication in Australia is tainted by its association with prior housing development that was misaligned with the desires and expectations of the Australian market.
- A lack of cross sector knowledge sharing has resulted in many companies individually addressing barriers, such as negotiating new financial products with lenders, which inflates operational set up and product development costs.

Opportunities for further steps and research for the prefabrication sector in the Australian housing market are:

- The continuation of mapping and analysing housing models and international case studies to understand the opportunities and implications that shifts in government policy, incentives, housing markets and demographics may have
- Targeted market research and sector wide branding and advocacy initiatives that could shift the framing of prefabrication to a leader for quality design and sustainability
- Undertaking a life cycle analysis of prefabricated components within housing assets that are collectively managed and maintained
- Product development in response to market--moving away from project-based approach--long term cycles
- Service provision opportunities (maintenance, blockchain technology, environmental and performance data, etc) for prefabrication components and companies
- Opportunities for prefabrication components and systems in the retrofit and renovation sector, including adaptation for accessibility, renewable energy, indoor environment quality and functional flexibility
- Open Innovation network opportunities for prefab companies in housing provision
- The relationship between the upscaling of prefabricated construction and housing affordability in Australia

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# PROJECT OVERVIEW

## WHEN PREFAB HITS THE GROUND: BARRIERS AND OPPORTUNITIES IN THE AUSTRALIAN HOUSING MARKET

### Industry Problem Statement

Construction companies are under significant pressure from developers to build high performance and durable end-products while maintaining as low a cost as possible and delivering within tight schedules. At the same time, end user expectations are similarly increased, particularly in the residential sector. The housing markets of Australia are undergoing transition in response to the shifting regulatory landscape, demographic change, and enviro-social pressures stimulated by the climate crisis and current pandemic.

Prefabrication, particularly volumetric solutions, has long promised higher build quality, delivered in shorter time frames, while some have argued for its ability to respond to cost pressures. However, market penetration in Australia has generally been stymied by its inability to compete with the very low delivery costs of the residential volume housing sector. The implications of the specificities of the Australian housing market on prefabrication is not well understood, further limiting prefabricated and volumetric construction solutions to cater to more than specialist market sectors and specific typologies.

Recent changes to tax legislation in some states and their likely take up nationally will mean that bodies such as superannuation funds will begin to invest in build-to-rent housing projects. These institutions will be motivated to invest in durable, low maintenance, energy efficient, and sustainable housing as they will have long-term responsibility for these assets. This will most likely disrupt certain residential development sectors where the emphasis is currently on point of sale and there is little incentive to invest in the long-term quality and performance of the building. It also means that the current cost differential between conventional residential building and prefabrication will not be an impediment because the former process is unlikely to achieve the building quality and performance that these new types of development will require. In addition, sectors such as the not-for-profit community housing sector as well as others are growing and will have similar long-term commitment dynamics. Increased uptake and incorporation of prefabrication into the construction process in these types of developments also has the potential to create a trickle-down effect where prefabrication could be better incorporated into the build-to-sell residential volume building sector.

Many challenges arise in developing and matching the prefabricated systems to housing market sectors to ensure competitive advantage. Focus must be placed on aligning prefabricated systems, processes, and product solutions with market sector, the workforce, customer preference, site conditions, assembly techniques and innovative material systems. These solutions must deliver low-maintenance, high-performance built products that achieve a sustainable built environment in terms of embodied carbon and occupational energy efficiency.

### Objectives

- To understand existing barriers to the uptake of prefabricated and volumetric construction products and processes in the Australian housing market
- To understand how current and emerging market demands impact on the design and construction of built-to-sell and build-to-rent assets
- To identify opportunities and potential barriers for prefabricated and volumetric systems and processes to improve the design and operation of built-to-sell and build-to-rent assets
- Document the business model implications for industry partners, in light of the market and regulatory survey, in delivering prefabricated/volumetric products in the Australian housing market.

## PROJECT OVERVIEW (cont.)

### WHEN PREFAB HITS THE GROUND: BARRIERS AND OPPORTUNITIES IN THE AUSTRALIAN HOUSING MARKET

#### Research Approach & Methodology

Fundamental to the viability of prefabrication and volumetric building solutions processes in the build to rent sector is understanding the existing and emerging Australian housing market.

A literature review sought to examine the specificities of the Australian context, including taxation, regulatory settings, and their historic, current and future implications for the market shifts that are underway and their implications for the uptake of prefabrication processes. Current and emerging regulatory shifts at the state and federal level will be documented to understand possible alignments with the viable build to rent typologies, viable prefabricated construction solutions, and market conditions.

The literature review was undertaken alongside the review of local and international case studies in two stages. First, Australian residential projects and start-ups were examined to identify historic and current barriers to the uptake of a range of prefabricated systems in the build-to-sell sector. Then, local and international build-to-rent projects were studied to understand the specificities in the design, construction, and operation of build-to-rent assets in comparison to build-to-sell products. The study concluded by speculating on opportunities for the adoption of prefabrication processes and systems of future build-to-rent and built to sell projects within the Australian context.

#### Report format

The following report discusses emerging housing models and prefabrication sectors and opportunistic overlaps between the two. This scoping study concludes with a list of key findings and further research opportunities are outlined in the executive summary. Housing and business-model case-study summaries are also provided in the appendices and cross-referenced in-text to keep the report concise while allowing the opportunity to further drill down into specific companies for business development or further research.



# How the Australian housing market could benefit from a scaled up prefabricated construction sector

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Interest in off-site construction for the Australian housing market has varied since the post-war era. Despite the benefits of prefabricated construction being widely understood, it has never scaled up to occupy a significant share of the market. These benefits include build quality, construction efficiencies, project delivery time, lower carbon footprint, and waste reduction. Beyond construction processes, there are social, economic and systemic changes to the Australian housing market, which can create new opportunities for innovative approaches to residential buildings.

The opportunities include:

- changes in construction and planning policies
- taxation law
- rising land value
- climate change, energy security and resulting policies
- changing methods for procuring social and affordable housing (including PPPs)
- housing affordability
- changing attitudes toward home ownership
- the impact of shared and circular economies on housing, such as Air BnB
- requirements for accessible housing prompted by “Ageing in Place” policies and NDIS funding
- broadening housing investor market, including superannuation companies
- growth in multi-residential housing market

Prefabricated housing has the potential to address these drives through the following threads.

## Quality control

High quality-built outcomes are often associated with prefabricated construction methods. Built with manufacturing tolerances, prefabricated houses provide accurate solutions for energy-efficient, air-tight dwellings that will meet the needs for net-zero building legislation changes. This accuracy is also beneficial in the construction of universally accessible homes. Especially where “zero thresholds” are required and the flexibility of prefabricated dwellings, which are easily adapted to meet changing needs as occupants age or experience changes to abilities. Beyond the technical quality attributes, design quality can be tested in a warehouse and product improvement integrated into the design and construction processes

## Less disruption

Off-site construction leads to lower disruption through more minor site disturbance and less rubbish on site. Less disruption is beneficial to neighbouring sites, where on-site construction time is faster, cleaner, safer, and significantly less risky in terms of damage to nearby properties. This is especially valuable where housing is constructed on inner-city sites, infill sites for suburban renewal projects, and secondary dwellings with an existing building on the same site, such as granny flats.

## Time

Offsite controlled construction environments result in longevity of built outcomes and minimisation of faults. Time savings are a key driver for prefabrication in the construction industry. They can offset higher square meterage costs with the building ready to lease or sell earlier than traditional construction programs. Offsite construction is also more efficient for coordinating trades, which can minimise any disruption to the critical path.

## Efficiencies

Prefabricated housing is efficient in materials, working processes and energy requirements for building operation. Designed efficiencies are the product of controlled approaches to material application in modular and panelised prefabrication methods. There is also potential for efficiencies by collapsing professional services into the design and construction processes. Repetition of elements also promotes efficient construction, maintenance, and ongoing facilities management for prefabricated buildings.



# Barriers to the scaling up of prefabricated housing in Australia

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Despite the significant potential to improve the Australian housing sector’s quality, efficiency, and sustainability, the percentage of new residential work undertaken each year that includes prefabricated components or processes is estimated at only 3%. According to research by Dale Steinhardt and Karen Manley, in the Australian context, “prefabricated housing remains a minor part of the house construction industry, with its strengths resulting in niche or specialised residential builds (e.g., mining camps, rural housing, and ‘granny flats’) and non-residential structures (e.g., site offices, remote hospitals).”<sup>1</sup>

Steinhardt and Manley point to a correlation between high rates of private homeownership and low uptake of prefabricated housing in both Australia and the US. However, there needs to be further research undertaken to provide detailed evidence for this correlation.

The main drivers for a strong prefabricated housing industry are:

- a large housing industry;
- sudden spikes in demand;
- a consumer preference for new housing over renovations;
- state ownership that promotes prefabricated dwellings;
- and a large multi-residential building sector.

The Australian housing market currently lacks these drivers. With a relatively small population, a lack of state ownership of housing and a preference for detached dwellings over multi-residential buildings, there are currently limited opportunities for prefabricated housing markets to thrive. The lack of exemplar business and project models in Australia has led the investigation to look at international precedents as a model to outline existing strategies. These are then compared to the existing uptake of prefabrication in Australia. The findings, documented as a set of case studies in the appendices, are summarised below as a series of interconnected barriers.

## Perceptions of quality

According to a study by Dale Steinhardt and Karen Manley, “all of the interviewed early adopters believed what they produced were of better of better quality than traditional builds”.<sup>2</sup> However, many still believe that the perception of prefab is plagued by the association with low quality generated from “post-war and 1960-70s social housing projects”.<sup>3</sup>

In response, Aitchison argues Australian companies such as Prebuilt who prefabricated bespoke projects aim to counteract this negative stigma with an emerging focus on solutions revolving around aesthetic architectural design rather than “performance engineering” which exists in countries such as Japan and Sweden to deliver standardised products that emphasise high performance rather than a bespoke aesthetic. Historically, it can be argued that Australian culture has placed a high value on aesthetic particularly in the post war period where veneer homes arose as a solution to aesthetic demands and material shortages.

## Misunderstanding of Costs

Steinhardt mentions that reductions in costs have “not easily been translated into reductions in overall project costs”<sup>4</sup> which removes a significant theoretical benefit of prefab. Blismas believes that “a lack of understanding of the construction process and its associated costs is arguably the single most significant barrier to the use of OSM as it will invariably appear more expensive than traditional methods”.<sup>5</sup> In Australia, there are a number of factors that contribute to the lack of clarity about cost, including an immature supply chain and market. A further lack of awareness of best practices often results in design that does not consult or interact with the systems, and prefab is applied as an afterthought. Consequently, cost and time may be affected as systems or designs adapt. Furthermore, Australian construction has a high value on cost/sqm, which can misconstrue the best value option when comparing builds of different quality.

Consequently, there is a need to be able to highlight the design value added by prefabricated construction particularly regarding quality, its effects on more expensive costs/sqm and future cost savings and the reduction of costs from other processes such as design when compared to a lower quality traditional construction.

## Design then Prefab – rather than Prefab with Design

With a lack of knowledge within the construction industry on prefab, it is often mistreated as an option that can be handled and approached within a traditional construction process whereby design is completed before construction tender. As modern methods of construction (MMC) is a systems-based approach to custom design, there is a need to understand system models when designing to maximise the system’s advantages. Otherwise, projects may increase costs as design or construction is adapted, and bespoke accommodations significantly deplete the product’s certainty.

The lack of collaborating and its limitations for prefab are why Blismas champions the need for education and awareness. He argues it promotes the overarching industry contention shared by companies such as Lindbacks who believe there is a need for earlier and more integrated relationships from the point of design “to ensure system interfaces are managed and designed for production, erection and performance”.<sup>6</sup>

# Barriers to the scaling up of prefabricated housing in Australia: RISK

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## Set Up Costs

Initial set-up for MMC builders requires an intense amount of investment into developing systems and production. This strategy has a considerable risk because the company is pouring significant resources to build before entering the market, especially in countries with no preceding examples and proof of market, and therefore, investment is hesitant.

An exemplar of the resource-intensive nature of the establishment phase is Ilke Homes in the UK who had reported a £30.1 million loss compared to a £2.9 million turnover from the time of their conception in August 2017 until March 2019, according to Housing Today.<sup>7</sup> However, the development has placed the company in a position where it has been awarded multiple mass building projects at a neighbourhood scale valued at over £40 million.

In Australia, the initial set-up costs and its uncertainty influenced the demise of the prefabricated timber manufacturer, Strongbuild. Whilst the company had 150 employees, a turnover of \$160 million in the 2017-18 FY and project deliveries that included 110 apartments in Campbelltown, Frasers Australia became aware of Strongbuild's debt and subsequently cancelled a contract for 104 townhouses due to a lack of confidence in the financial state of Strongbuild. Consequently, the renegeing on the development contract led to the company's almost immediate entry into voluntary administration in November 2018.

The initial investments needed to develop a system are significant for companies, particularly when the return on investment can take a considerable amount of years. However, there are examples where companies have targeted specific missing markets to increase pre-emptive confidence in the UK and Sweden. The UK government's focus on developing affordable housing and Ilke Homes' clear alignment of strategy and principles inclined Homes England to invest £30mn which was invested into a factory site. In Sweden, Boklok studied the finances and developed a concept to suit the circumstances of a 2-person household with only one salary to live on. It took 15 years, in which time the company maintained an oversubscription of subscribers for their product before the company first expanded its product range to address other demographics such as retired elderly citizens. There is, of course, more risk in immature markets, and as there are more examples of success, there will be more investment at lower rates, according to Bertram.<sup>8</sup>

## Cash flow

The traditional method of assessing progress payments is a significant issue. It often results in cash flow issues for MMC companies as progress payments are not approved until installation on the client's site, which is a problem considering that 80% of the project is complete before delivery.

Companies, therefore, need a solid financial resource base to start projects to finance the project until they can be awarded approved payments. Nadim and Goulding found that some companies will provide a forward financing requirement into their tender application as a result.<sup>9</sup>

The UK govt. has responded to the MMC cash flow issue by implementing a new strategy for allocating funding to projects in the 2021-26 Affordable Housing Programme. This adjustment changes the financial arrangement proportions of 50% at site start and 50% at practical completion in the 2016-21 programme to a more front-loaded approach which provides 40% at acquisition, 35% at the beginning of site and 25% at practical completion.

## Pipeline

The processing pipeline of MMC requires much more foresight to plan the logistics, and at the same time, there is a greater rigidity of timeline and design decisions. Companies such as Lindback's will have a "certain time period booked for the start of volume production", and therefore, a lock-in date for strategic design occurs far earlier in the process because their "factory controls the schedule of the construction process".<sup>10</sup>

A more rigid design timeline potentially increases risk because there is significantly less flexibility once production begins. Consequently, development and tests of systems before market interaction is of increased importance so that on-site issues that may cause high cost and time ramifications are minimised.

As these processes are increasingly standardised, a company can provide far more assurances on costs and time. Evidence of the accuracy of assurances and delivery may become significant in developing a return and new market relationship with clients.

# Barriers to the scaling up of prefabricated housing in Australia: MARKET

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## Competing with traditional construction practices in Australia

Australian companies generally lack intense focus on a specific target market, spread themselves thin, and compete with traditional construction companies. In comparison, many of the international studies have a strong target market which they focus on and that in time, with a solid footing, companies develop slowly and broaden their range.

Furthermore, there are several new government programs that these company systems precede. As existing companies may not adapt to respond, it may provide an opportunity for a new company to slot into a market that aligns with those programmes.

## Australian Banks and restrictive lending practices

Since 2008, Australian banks have restricted lending practices for the residential property market. These restrictions are mostly driven by financial risk mitigation from lending institutions and regulatory guidance from APRA. A by-product of this tightening in the residential mortgage market has resulted in anti-competitive lending practices, with significant banks limiting finance to specific procurement methods and building contracts for housing. Via these contracts, loans for residential building contracts are restricted to particular five or six stage progress payments, with each progress stage often valued on site. These lending practices inhibit alternative methods for procurement and residential construction. They can impede innovation in the Australian housing market and have been labelled as “anti-competitive” by the Australian Institute of Architects. Additionally, it shifts financial risk from banks to builders, perpetuating cash flow issues outlined above, with builders and fabricators waiting for cash injections between progress stages instead of regular, monthly payments.<sup>11</sup>

# Housing Futures and Prefabrication in Australia: BUILD TO RENT

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Over the past five years, several Australian capital city Lord Mayors have declared their cities are experiencing a housing crisis, citing a lack of stock as the cause of growing housing unaffordability and homelessness. However, researchers at the University of Sydney argue that the focus on shortages is a red herring, instead citing issues driven by the financialisation of housing.<sup>12</sup> Whether or not there are enough dwellings, Bennett argues that the critical issue is the quality, composition, tenure and location of housing assets relative to the needs of Australia’s contemporary households.<sup>13</sup>

Sassen further argues that the fundamental shift in framing housing from shelter and a human right to a product of global financial networks is the cause of the misalignment between the housing that we need and the housing that we have.<sup>14</sup> Understanding the implications of financialisation on the design of housing assets, and the new housing models emerging in response, enables prefabricated construction companies to better identify opportunities for infiltration and growth in the Australian housing sector.

An analysis of emerging Australian housing models is presented in Appendix 3 and summarised on the following pages in two sections. The first discusses some key attributes, characteristics, implications, and opportunities of both buildings to rent and build to sell housing models within the Australian context. The second outlines a series of identified specialisations within the Australian housing context that have been enabled through considering housing opportunities beyond speculative build to sell assets.

## Build to sell vs Build to rent

Build to Rent (BtR) is a residential development built for rental occupation. Housing use for rental-based income, particularly second and third homes for ‘mum and dad investors’, is well established in Australia. However, the development of medium to large scale residential assets held in single ownership and is intended to generate long-term revenue, represents a clear departure from Build to Sell property models.<sup>15</sup>

Short-term held assets purchased by small-scale property owners may account for the household’s total personal investment and, consequently, represents a higher investment risk within the volatile Australian housing market. To protect the profitability of the asset, small scale investors are more likely to make decisions on the construction and use of the asset to appeal to a broader range of buyers. Such decisions are more likely to provide less satisfactory responses to tenants in terms of quality and financial burden. Consequently, despite accounting for the majority of all Australian rental stock,<sup>16</sup> small-scale investor-owned housing is unlikely to present much opportunity for prefabrication.

While the prospect of long-term profits may represent investment and operational challenges to large-scale investors, it can potentially increase the quality and performance of housing stock. Prefabrication applied to Build to Rent models with a long-term view may help mitigate some of these risks, based on the opportunities to decrease costs via large-scale manufacturing and stimulate innovations in construction to increase quality and energy efficiency.

Although Build to Rent developments for commercial, residential use are common in Australia (e.g., students’ accommodations), Build to Rent models for long-term residential use are relatively recent and only represent a small percentage of the Australian housing market. The composition of the property market depends on several economic, cultural, legislative, and policy factors influencing the growth of one housing model over the other, which in some regions (US) have determined the rapid adoption of Build to Rent models.<sup>17</sup>

Our analysis of the Build to Rent sector identified that it is not a singular model of housing development that is distinct from build to sell development. Some forms of housing that could be classified as build to rent are only intended to be rented for finite periods before being sold, and other build to sell projects have been converted into rentals. Consequently, some build to rent assets may not be made to prioritise high quality or low emissions in their construction over lower upfront costs and therefore may not provide a viable opportunity for prefabrication.

# Housing Futures and Prefabrication in Australia: SPECIALISATIONS

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To understand the opportunities related to the implications of the profit model for the housing asset, this scoping study attempted to map out the full spectrum of emerging housing models from build-to-rent to build-to-sell, contained in Appendix 3. While the analysis suggested that some of the models in the spectrum are more likely to be viable for prefabricated construction, an opportunity was more likely to be determined by the target market, the scale of development, location and objectives of the party or parties funding the development. From the analysis of these influencing factors, several opportunities for specialisation that span across and beyond the residential sector were identified.

## Green Sector

The scale and management of BTR assets could ensure building occupation aligns with the operational needs of accredited green residential developments. Prefabricated construction, particularly that which enables easy ongoing tracking of material source and performance, is well placed to assist in the accreditation and operation of green developments. Until the government requires their projects or all developments are built and operated in line with sector-wide carbon targets, market demand for net-zero construction and operation will primarily be driven by bespoke and higher-end markets.

## Superannuation Companies

There are over 200 Superannuation providers in Australia, who collectively hold the largest share of investment in the Australian trading system. Analysis of recent super activity indicates an increase in investments aimed at environmental, social, and governmental targets.<sup>18</sup> Therefore in terms of scaling up prefab opportunities in the green sector, targeting the asset requirement needs of BTR and super or ethical investment funded BTR/BTS development is the largest opportunity.

## Disability + Aged Care sector

Due to the implications of competing regulatory and funding requirements, accessible housing is a growing market that could benefit from a standardised approach.<sup>19</sup> Prefabricators could act as expert contractors for other builders in navigating the clashes in one-off retrofits or develop solutions suitable for the aged care, retirement and social housing sectors.

# Housing Futures and Prefabrication in Australia: SPECIALISATIONS

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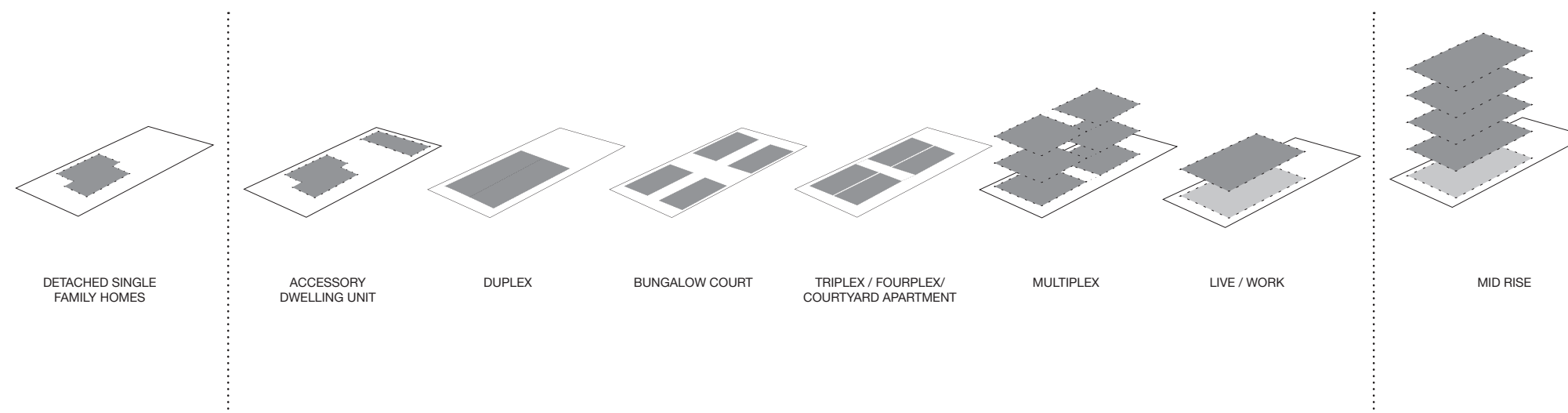


Figure 1: Missing Middle Housing in Australia<sup>20</sup>

## Missing Middle

The missing middle is a term for a spectrum of medium density housing typologies that sit between the scale of a single-family detached dwelling and a multi-story, mid-rise apartment block (Fig. 1). A key distinction in the spatial composition of missing middle typologies, compared to typical apartment blocks, is their alignment to the needs of contemporary households and their ability to sensitively increase household density on small lots within proximity to established amenities, public transport and employment. Consequently, many state governments across Australia have been exploring ways to incentivise and increased uptake in the delivery of missing middle typologies, including reducing development risk and red tape via changes to planning regulation.<sup>21</sup>

Missing middle typologies present a unique opportunity for prefabrication as their typical two to six storey construction aligns with viable scales for modular construction, compared to large scale commercial or traditional homebuilders.

## Renovation + retrofitting

A culture of residential renovations uniquely buoys the Australian housing market. The alterations and additions, typically undertaken by homeowners as owner-builders or with small-scale domestic builders, is estimated to equate to a third of all money invested in housing annually.<sup>22</sup>

Typically, such construction would not involve commercial builders. However, a shift in government policies to support missing middle infill, and employers supporting increased working from home arrangements, has created a market for infill modular granny flats and studio pods.

In addition, Australian researchers are currently exploring ways to address the challenges of aging public housing and body corporate managed residential apartments without demolition. In one approach established in Europe, the life of the buildings is extended through the large-scale extension and recladding of façade to address structural issues, poor amenity apartments and create higher performance buildings. A vital aspect of the projects is their use of prefabricated modules to enable residents to stay on-site during construction, with each mid-high rise tower taking approximately a fortnight to install.<sup>23</sup>

# Creating and preparing for expanded prefabricated housing futures : INDUSTRY CHANGES

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While there is no singular catalyst or indicator that the prefabrication sector is ready and able to shift to expand operations in the residential sector, some specific actions and approaches could be adopted to help prepare or facilitate a transition. Each, which would require further examination, is discussed in case studies and literature reviews in the appendixes but is summarised below.

## Up front collaboration

An expansion and shift in engagement with developers, builders, lenders, clients, asset operators and other parties to ensure that expert input occurs as early in the development process as possible. Specifically, the engagement of prefabricators and asset operators after the design process limits the leveraging of many benefits of prefabricated systems and ultimately impacts project viability.

## Partnerships and consortiums

While it may be feasible for some prefabricators in the Australian market to offer turnkey solutions, including financing and operating Build to Rent assets, the case studies demonstrate the most resilient operators formed partnerships or consortiums. Doing so may be less profitable overall but distributes risk, reduces upfront liabilities and leverages the expertise of other partners relative to their specific sector (e.g. finance, construction, real estate, residential operation).

## Many minor moves

International prefabrication case studies of companies that have successfully gained a significant share of market operations have done so by building up and sustaining operations over decades.

## Specialise v generalise

As the housing model analysis demonstrates, the market is highly variegated. While designing for an asset class (such as apartments or detached dwellings) might seem to be one way to ensure prefabrication has a broader appeal, targeting specific models and markets will enable products to be highly aligned to client needs. Doing so will allow prefabricators to have a competitive advantage.

## Lifecycle reframing

With an increase in demand for low-carbon products that consider the long term and whole of life performance of construction comes a great opportunity for prefabricators to leverage the benefits of their existing and new products, systems and services. Understanding the requirements of ethical and sustainable investors and ensuring that operations shift to support these needs would make it much easier to market to developers, other contractors and partners.

## Reputational reframing and knowledge sharing

Government incentives and other market shifts may create opportunities and pipelines for the rapid construction of large-scale Build-to-rent housing over the next decade. However, there is a risk that the quality and public perception of development created in that context could conflict with the market advantage that prefabrication could have over traditional construction approaches. A sector-wide focus on public reputation and reframing of prefabrication, strategies for targeted market infiltration and public advocacy campaigns, and knowledge sharing could benefit the whole sector.



## Creating and preparing for expanded prefabricated housing futures : GOVERNMENT INTERVENTION

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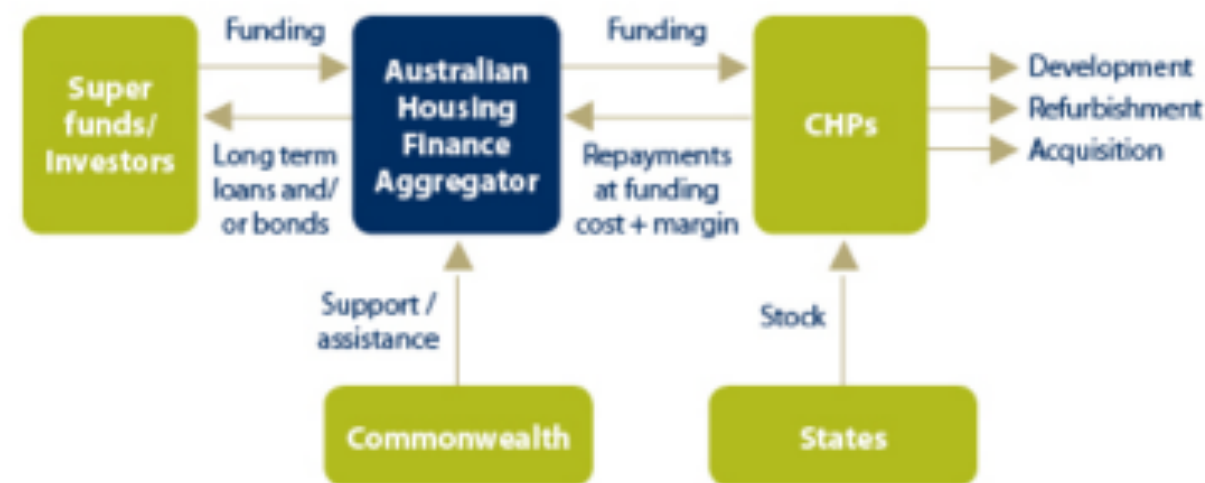


Figure 2: Proposed aggregator model for the Australian market<sup>25</sup>

### Housing finance

The international experience has demonstrated the critical role of supers and pension funds in supporting BTR investments. One crucial policy factor in the international experience is having a housing aggregator<sup>24</sup> that simplifies the process by defining funding needs and source from superannuation funds and other institutional investors. This is the case of the Housing Finance Corporation in the UK. Social Ventures Australia has proposed a similar model, which could be adjusted for similar purposes in the Australian context (Fig 2). The government could enable emerging housing models and, by association, higher quality construction practices by supporting and assisting the establishment and operation of an Australian Housing Finance Aggregator.

### Government Contributions and Incentives

State governments across Australia are interested in using the BTR model as an opportunity to increase supply for social and affordable housing, particularly in public-private partnerships, which reduce the burden of significant upfront construction investment. Approaches adopted to date include the provision of land leased for a defined period or giving tax incentives to land buying provided that several social/affordable units are provided. While short-term incentives targeted at either the prefabrication or build to rent sector might provide pipeline and incentive, further exploration of the implications on quality and market prices needs to be explored.

### Best practice government projects

By way of using prefabrication in their projects, government leadership could provide a pipeline or a means for industry to overcome upfront set up related constraints. However, suppose the design quality in pilot projects is radically different from high-quality market housing, especially for social housing. In that case, there is a risk of further stigmatisation and isolation of prefabricated systems. Further exploration of the possible impacts and opportunities of exclusively deploying prefabricated systems in specific niche markets needs to be done.

### Rental laws and incentives

Tenancy regulations respond to the Build to Sell models despite the increased percentage of home renters. This policy gap has created structural issues for tenants facing uncertainty in the long-term continuity of rental agreements. Recent housing bills have addressed the increased number of tenants in the housing market (Queensland and Victoria), impacting attitudes to renting in the future. Tenant laws and shifts in taxation could refocus the provision of rental housing from an investment in a financial asset to an investment in residents. Doing so could create a culture that encourages investment in higher quality rental assets of all scales, benefiting Australian households and creating more opportunities for prefab.

## CONCLUSION:

### KEY FINDINGS + FUTURE OPPORTUNITIES

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The scoping study has focused on identifying and overcoming barriers for prefabricated construction in Australia by investigating the opportunities and implications created by an increasingly financialised Australian housing market.

The key findings of the scoping study were:

- Build to rent is not a singular model of housing development that is clearly distinct from build to sell development. Some forms of housing that could be classified as build to rent are only intended to be rented for finite periods of time before being sold, and other build to sell projects have been converted into rentals. Consequently, some build to rent assets may not be built to prioritise high quality or low emissions in their construction over lower upfront costs and therefore may not provide a viable opportunity for prefabrication.
- Housing models that shift from capital to operational profit models make prefabrication viable against traditional construction methods. However, it puts a significant risk on small and emerging prefabricators around cash flow and insurance.
- Consortiums, bridging funds and shifts in GST and land tax settings can enable businesses to bridge the gap between upfront costs and delayed or operational profit.
- Build to rent contains two key shifts from typical build to sell housing: profit from short term capital growth (and related reduction of upfront construction costs) to long term operational profit (and related reduction of ongoing costs); and a move from product development to customer orientated service provision.
- Housing that is developed with input from the long-term asset owner, operator or occupant are more viable markets for prefabricated construction than speculative development. The opportunity emerges from a long-term reframing of costs, return on investment, risk, brand and other ‘soft’ benefits which offsets the higher initial outlay of money and risk of investing in Australia’s still ‘niche’ prefabricated construction sector.
- While some housing models are more viable for prefabrication, for the above reasons, viability also relies on the specific markets, specialisations and typologies within each of those housing models.
- Viable markets for prefabrication in Australia align with gaps in the housing market. As emerging or niche markets, they face similar finance, regulatory and risk assessment start up barriers as prefabricated construction. Consequently, solutions that unlock pathways for expansion in the housing sector may also create opportunities for addressing barriers to prefabrication.
- The reputation of prefabrication in Australia is tainted by its association with prior housing development that was misaligned with the desires and expectations of the Australian market.
- A lack of cross sector knowledge sharing has resulted in many companies individually addressing barriers, such as negotiating new financial products with lenders, which inflates operational set up and product development costs.

While the findings are preliminary and high-level observations of complex and constantly shifting markets, they indicate that the Australian housing sector is ripe with opportunities for the expansion of prefabricated construction.

Opportunities for further steps and research for the prefabrication sector in the Australian housing market are:

- The continuation of mapping and analysing housing models and international case studies to understand the opportunities and implications that shifts in government policy, incentives, housing markets and demographics may have
- Targeted market research and sector wide branding and advocacy initiatives that could shift the framing of prefabrication to a leader for quality design and sustainability
- Undertaking a life cycle analysis of prefabricated components within housing assets that are collectively managed and maintained
- Product development in response to market--moving away from project-based approach--long term cycles
- Service provision opportunities (maintenance, blockchain technology, environmental and performance data, etc) for prefabrication components and companies
- Opportunities for prefabrication components and systems in the retrofit and renovation sector, including adaptation for accessibility, renewable energy, indoor environment quality and functional flexibility
- Open Innovation network opportunities for prefab companies in housing provision
- The relationship between the upscaling of prefabricated construction and housing affordability in Australia

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# APPENDICES

End of Project Report FINAL  
CRC 23: When prefab hits the ground

The following appendices contain notes, observations and diagrams compiled by the team during course of the six month scoping study. Given the short timeframe for the project, and a lack of publically available data, the work is still preliminary. However, it is provided as a supplement to the report to facilitate further research and development. Consequently, for the purposes of use of the following information, the contents of this appendices should be considered a work in progress and not a conclusive summation.

# APPENDIX 1: PREFABRICATION BUSINESS MODELS

## PREFABRICATION CASE STUDIES

CRC 23: When prefab hits the ground

# PREFABRICATION BUSINESS MODELS

## PREFABRICATION CASE STUDIES

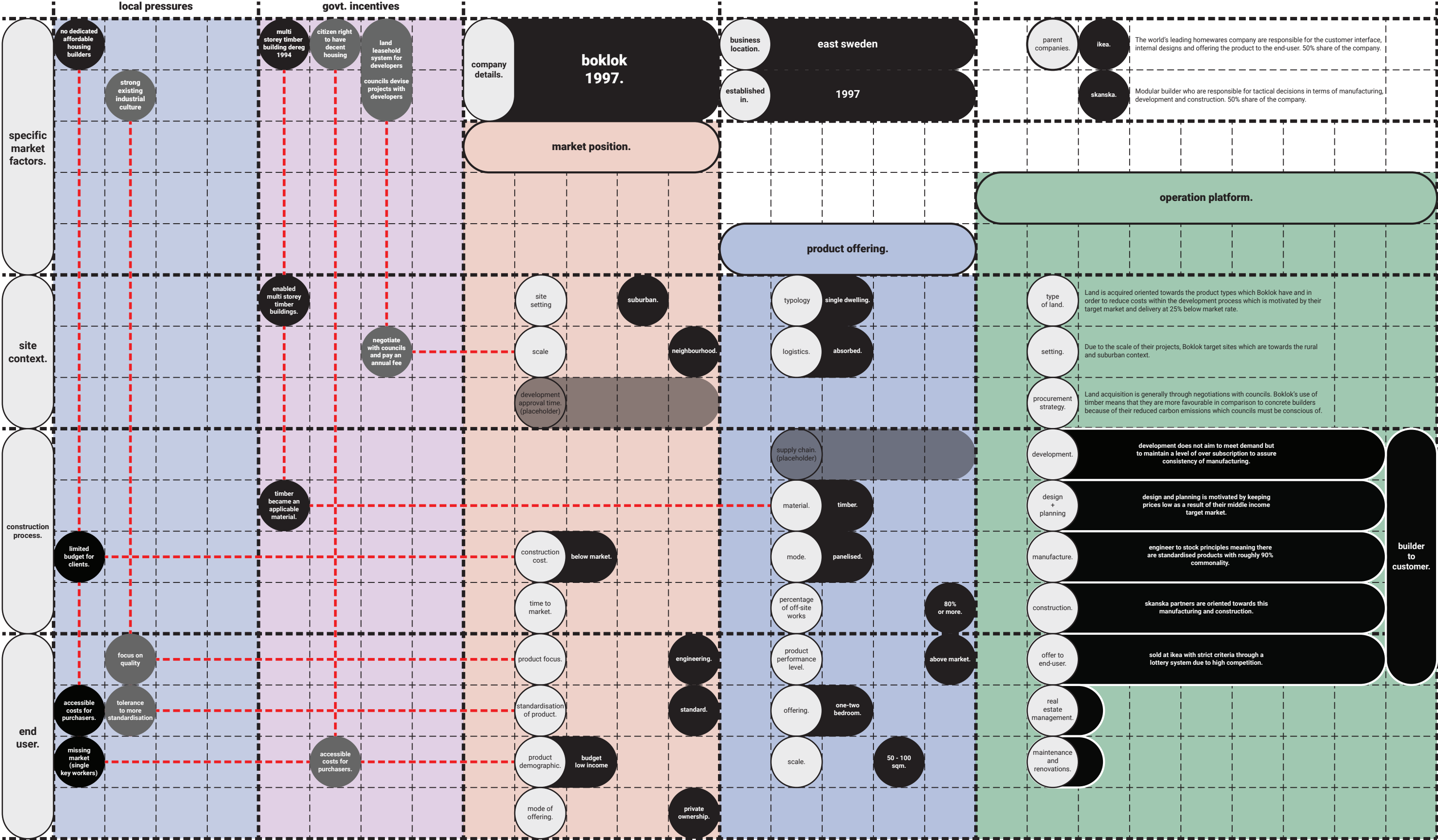
CRC 23: When prefab hits the ground

Case studies are explored at a company level, and grouped by country as follows:

SWEDEN	26
Boklok	27
Lindbacks	29
UNITED KINGDOM	30
Homes England	31
Ilke Homes	32
Urban Splash	33
Pocket Living	34
UNITED STATES	35
Factory OS	36
Full Stack Modular	37
Sustainable Living Innovations	38
JAPAN	39
Sekisui Heim	40
AUSTRALIA	41
Timber Building Systems	42
Hickory Building Systems	43
Modscape	44

# SWEDEN

PREFABRICATION CASE STUDIES  
CRC 23: When prefab hits the ground



BOKLOK- 1997

SWEDEN  
CRC 23: When prefab hits the ground

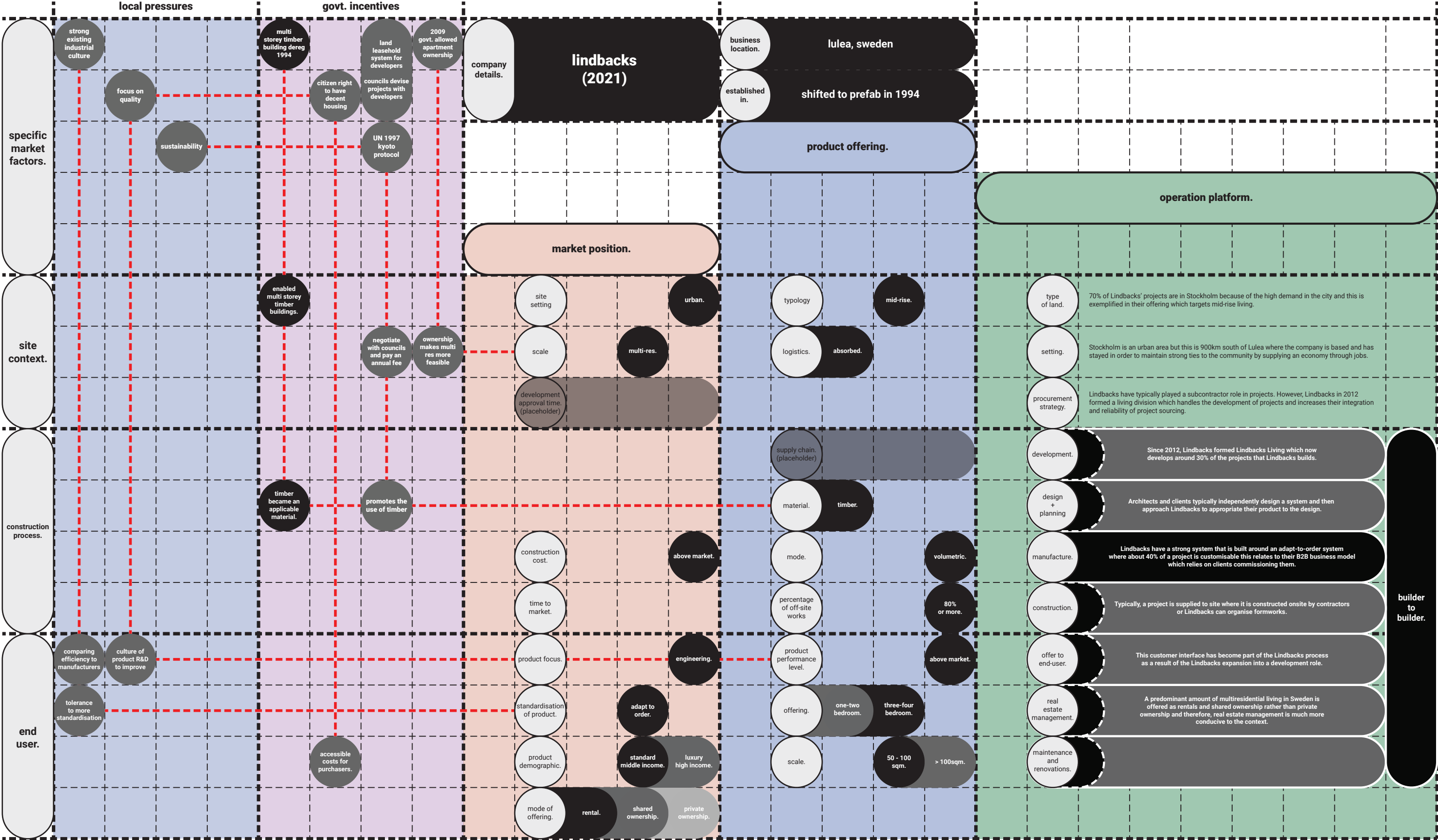
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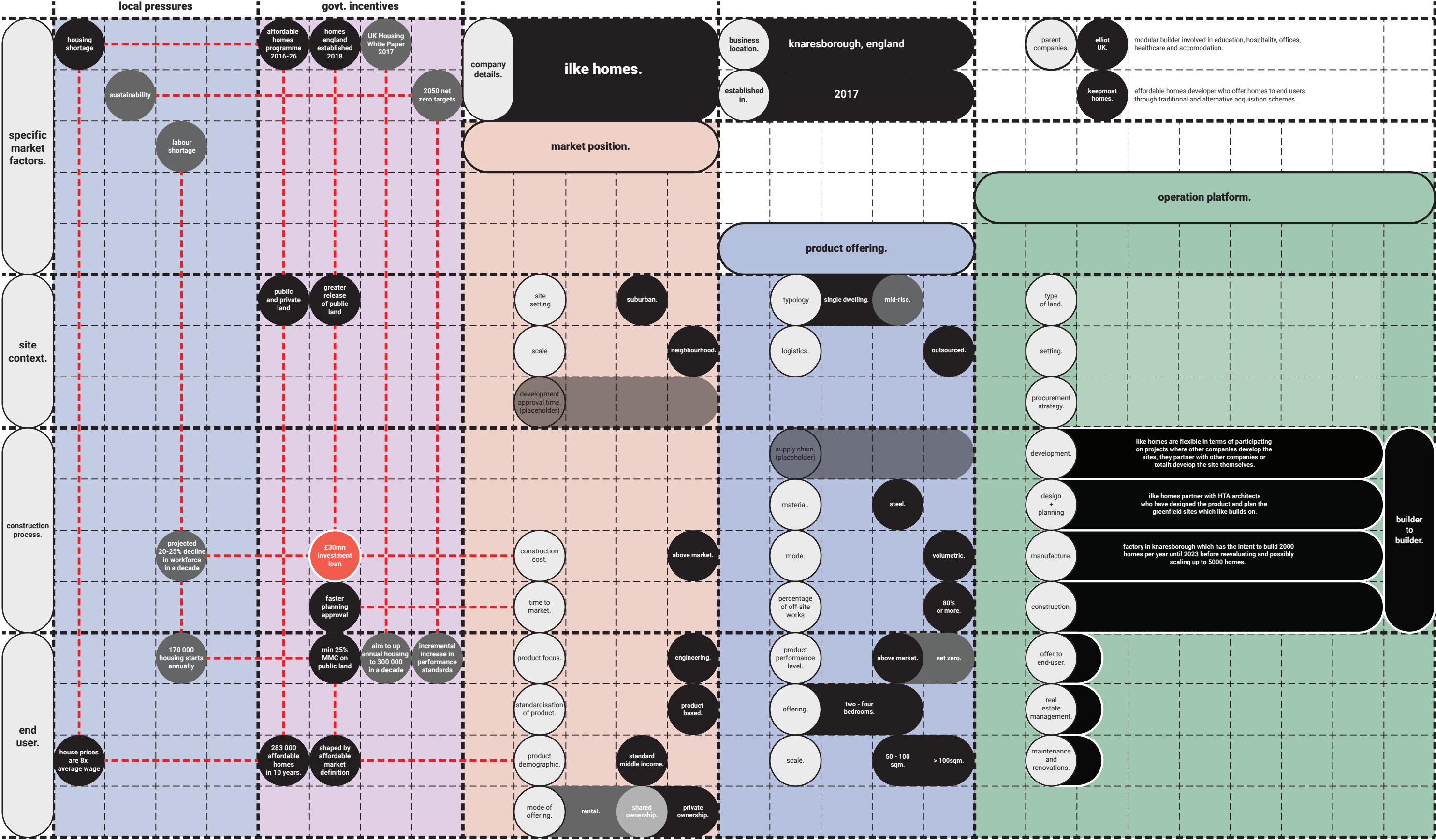
LINDBACKS- 2021

SWEDEN  
CRC 23: When prefab hits the ground

## UNITED KINGDOM

### PREFABRICATION CASE STUDIES

CRC 23: When prefab hits the ground

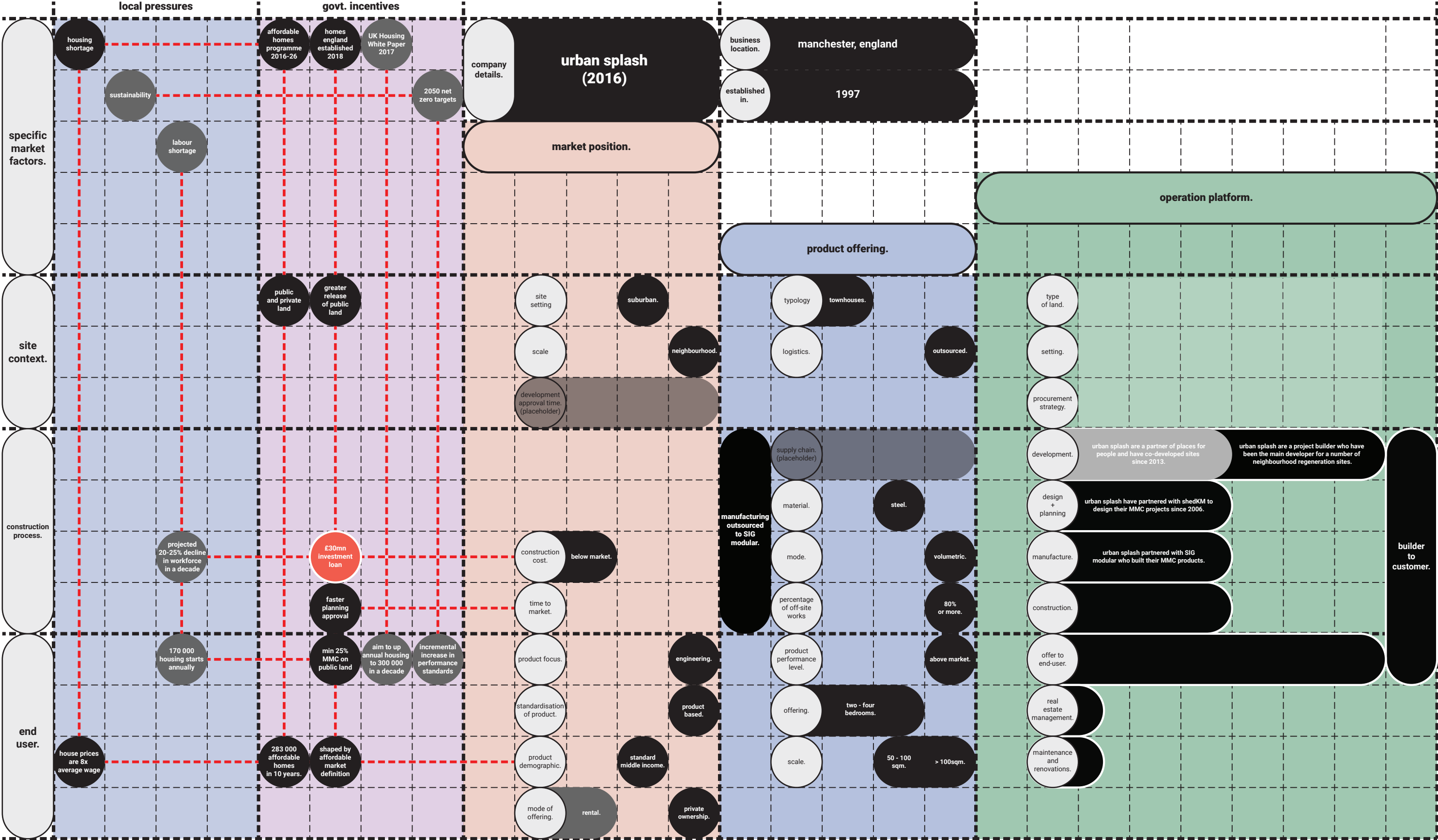


ILKE HOMES

UK  
CRC 23: When prefab hits the ground

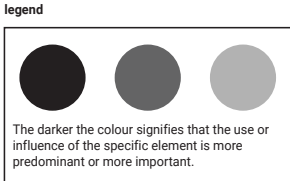
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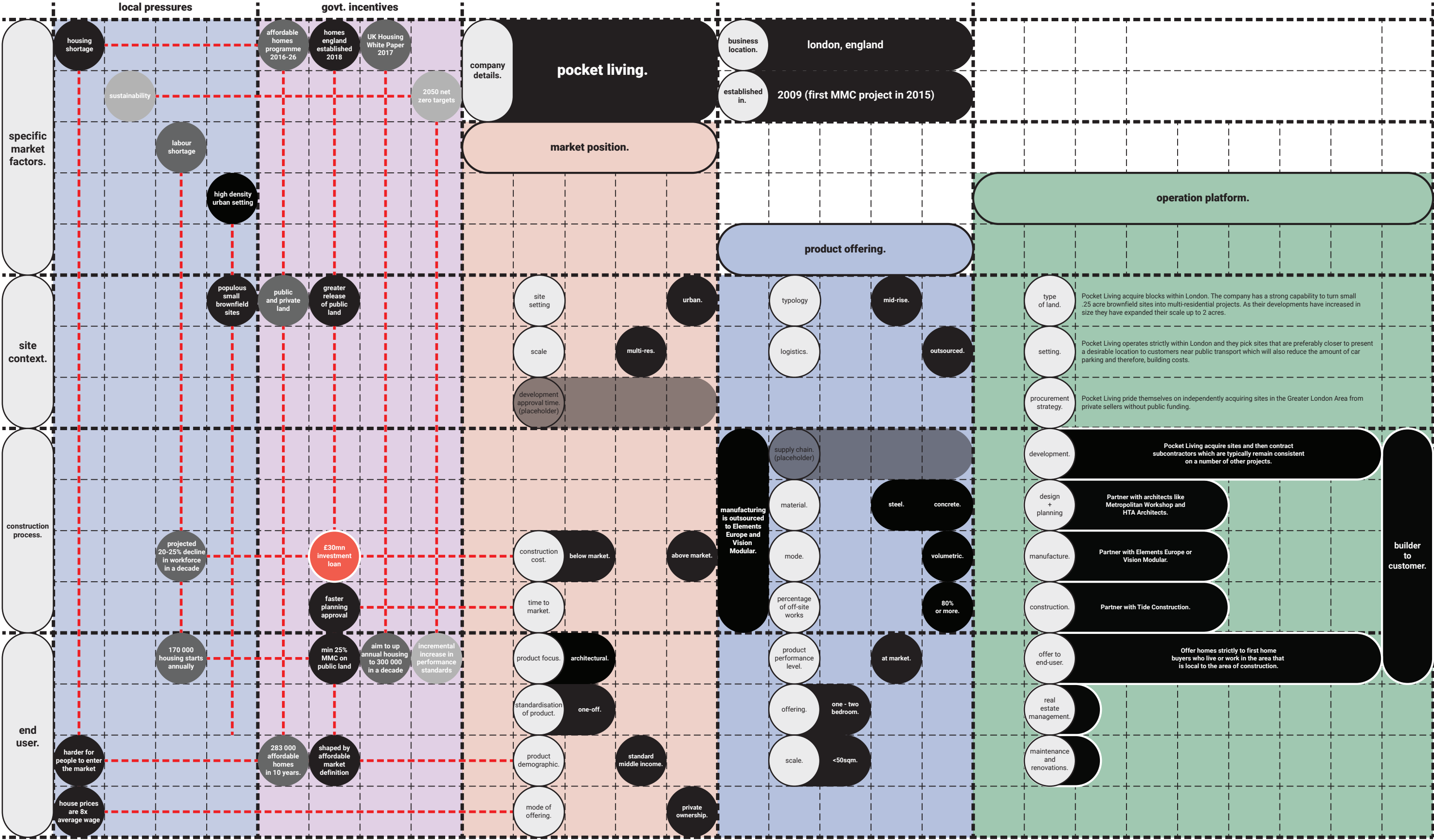


URBAN SPLASH - 2016

UK  
CRC 23: When prefab hits the ground







POCKET LIVING

UK  
CRC 23: When prefab hits the ground

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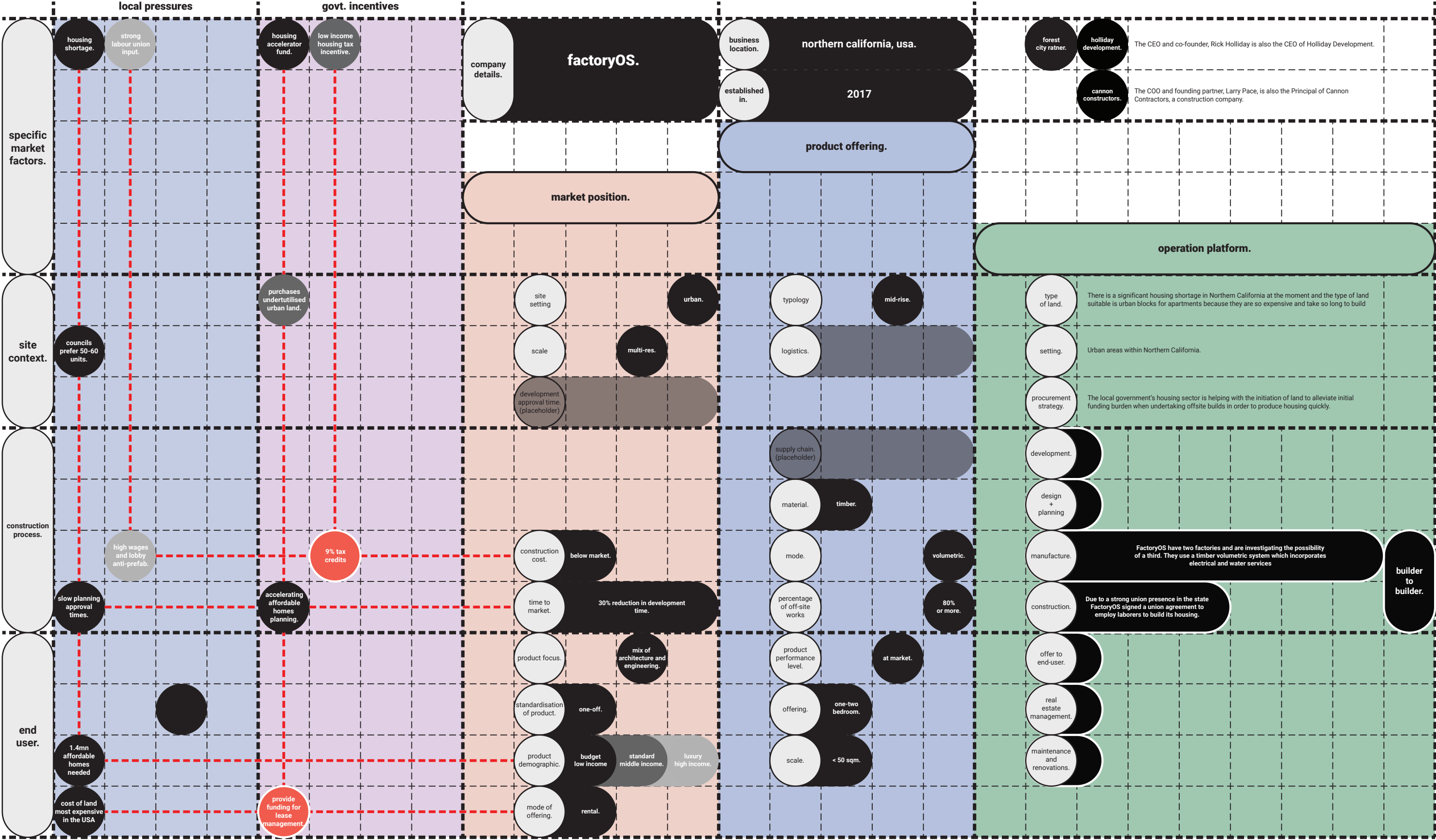
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# USA

## PREFABRICATION CASE STUDIES

CRC 23: When prefab hits the ground



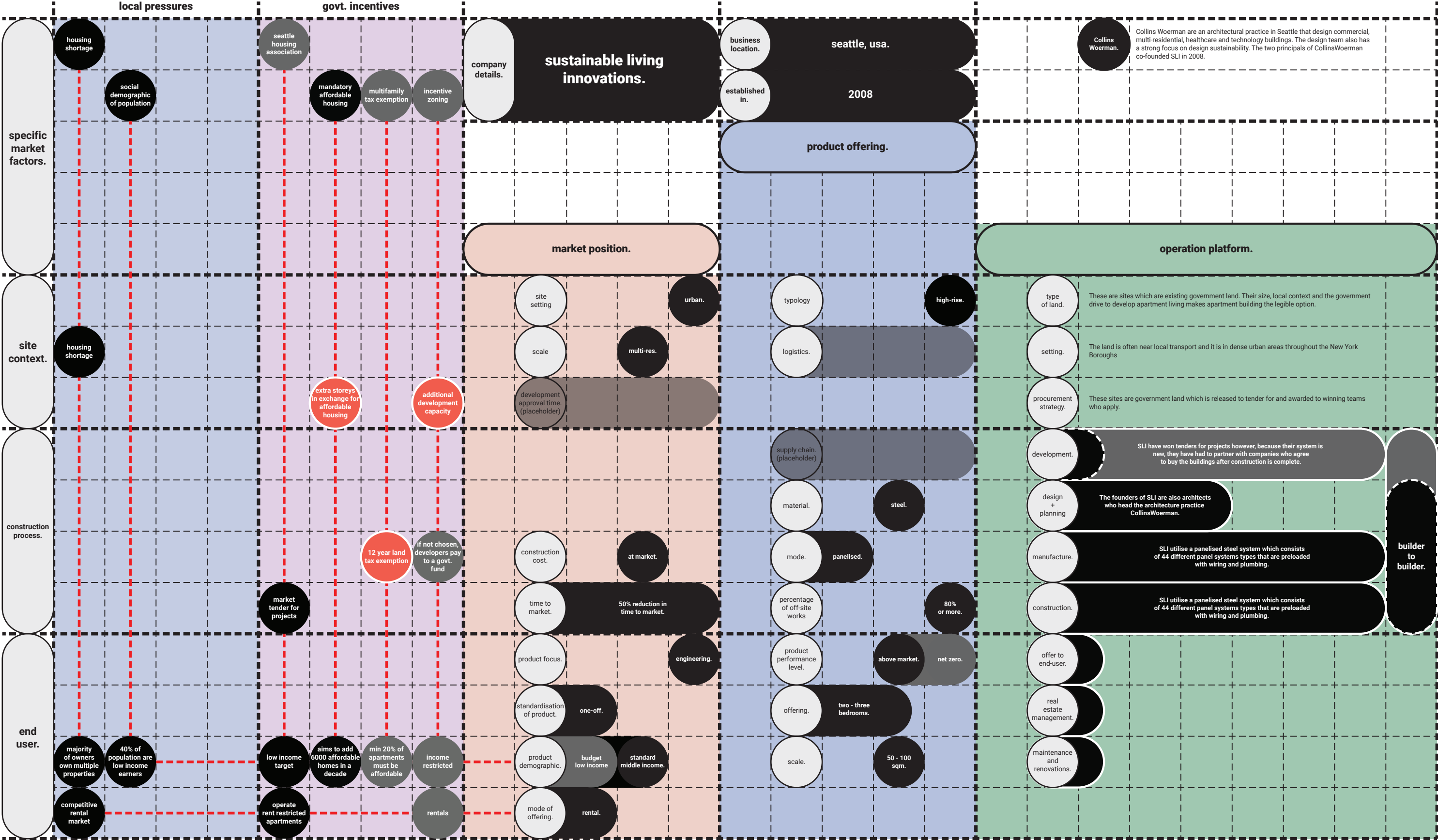
FACTORY OS

USA  
CRC 23: When prefab hits the ground

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SUSTAINABLE LIVING INNOVATIONS

USA  
CRC 23: When prefab hits the ground

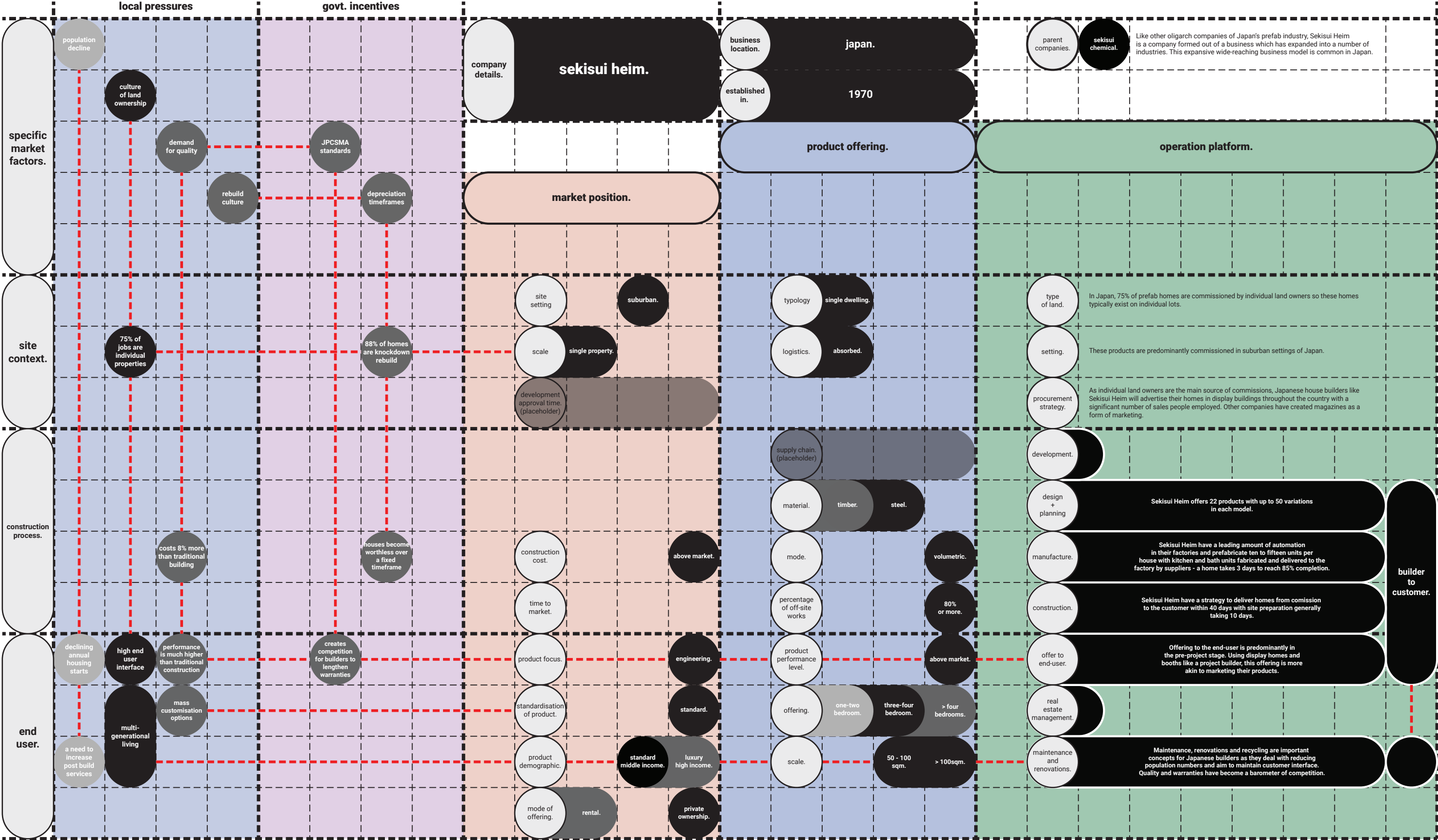
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# JAPAN

## PREFABRICATION CASE STUDIES

CRC 23: When prefab hits the ground



SEKISUI HEIM

JAPAN  
CRC 23: When prefab hits the ground

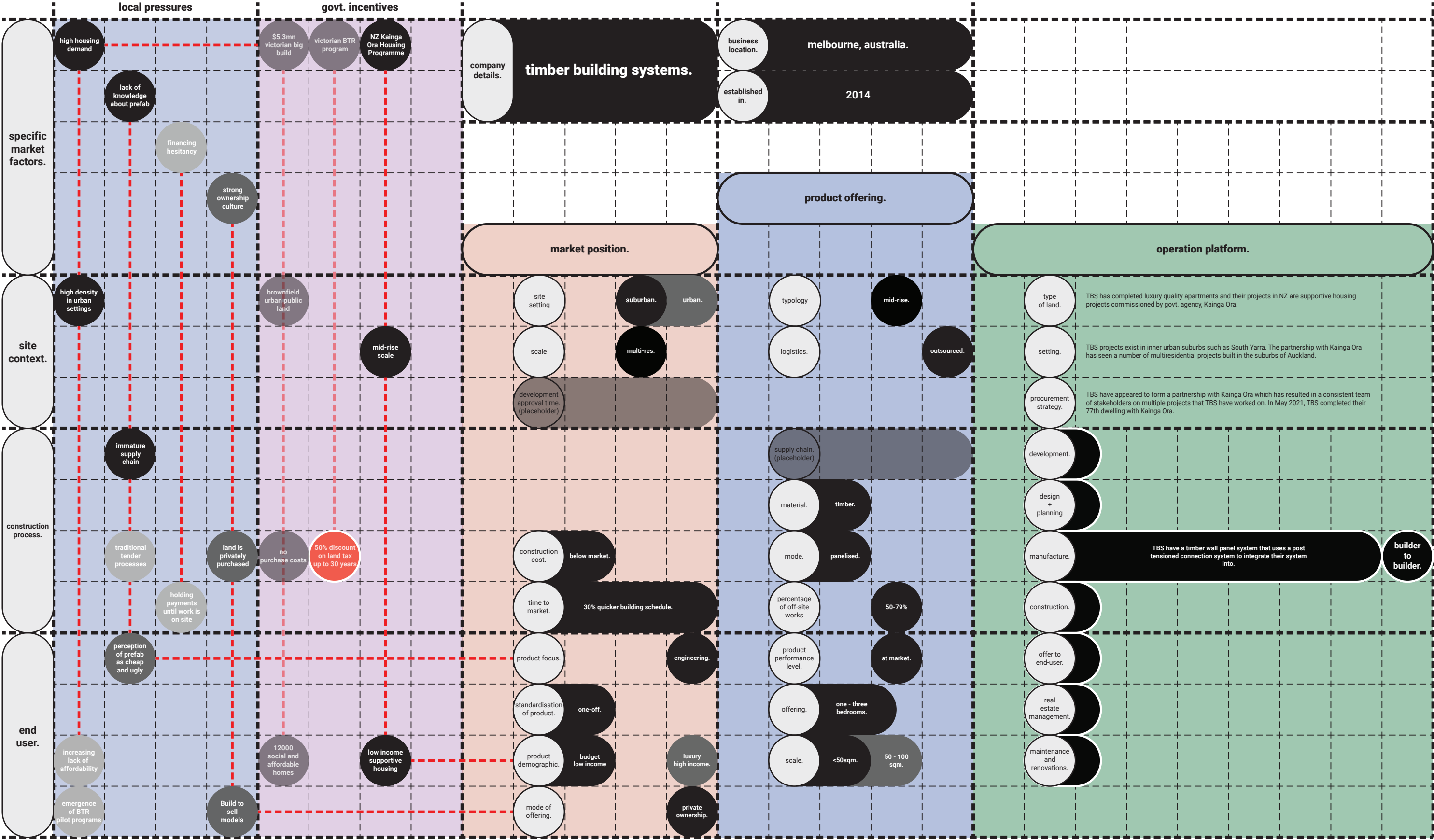
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# AUSTRALIA

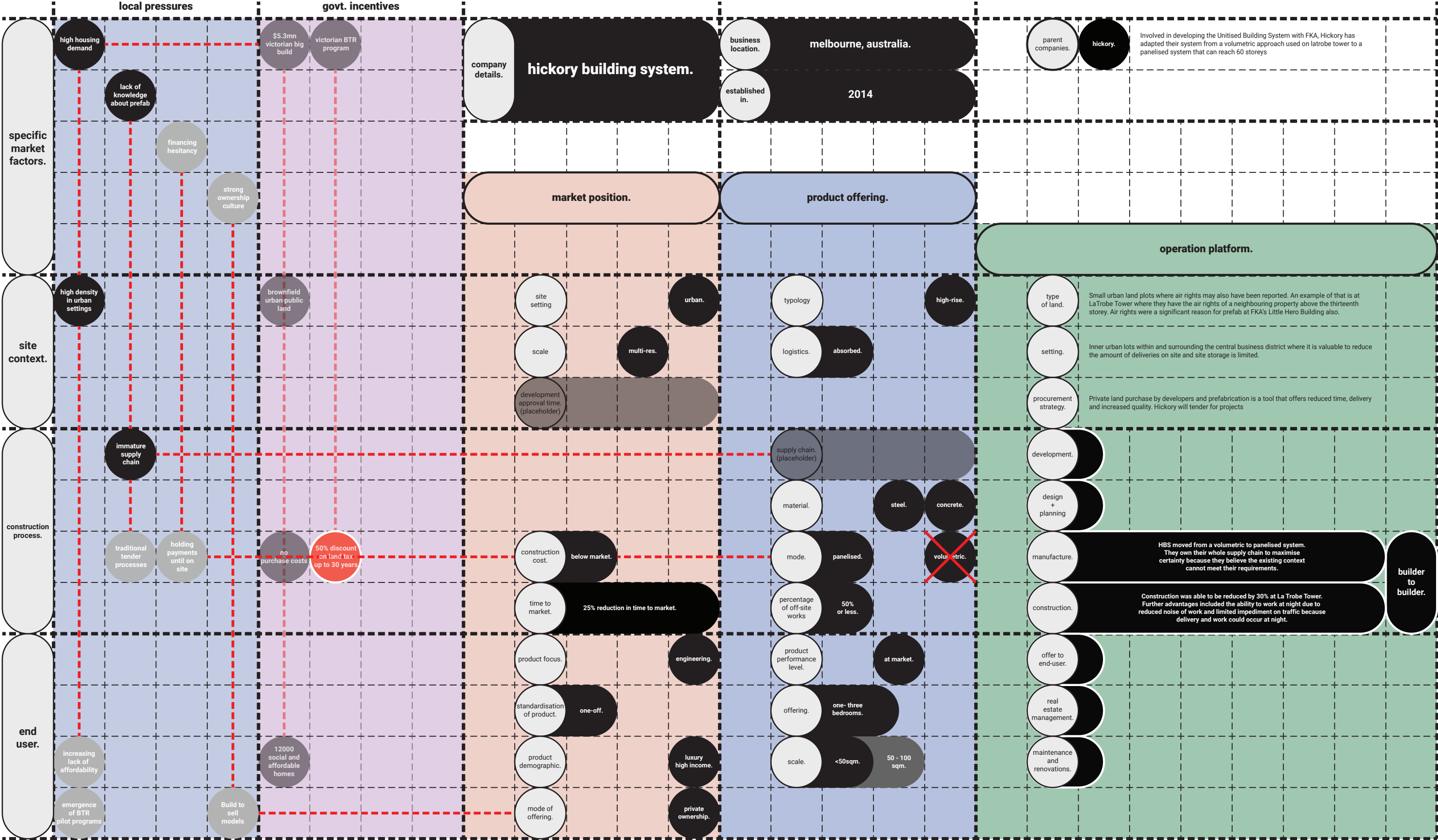
PREFABRICATION CASE STUDIES  
CRC 23: When prefab hits the ground





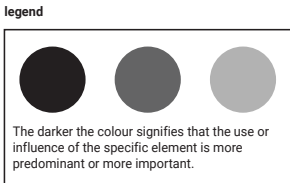
TIMBER BUILDING SYSTEMS

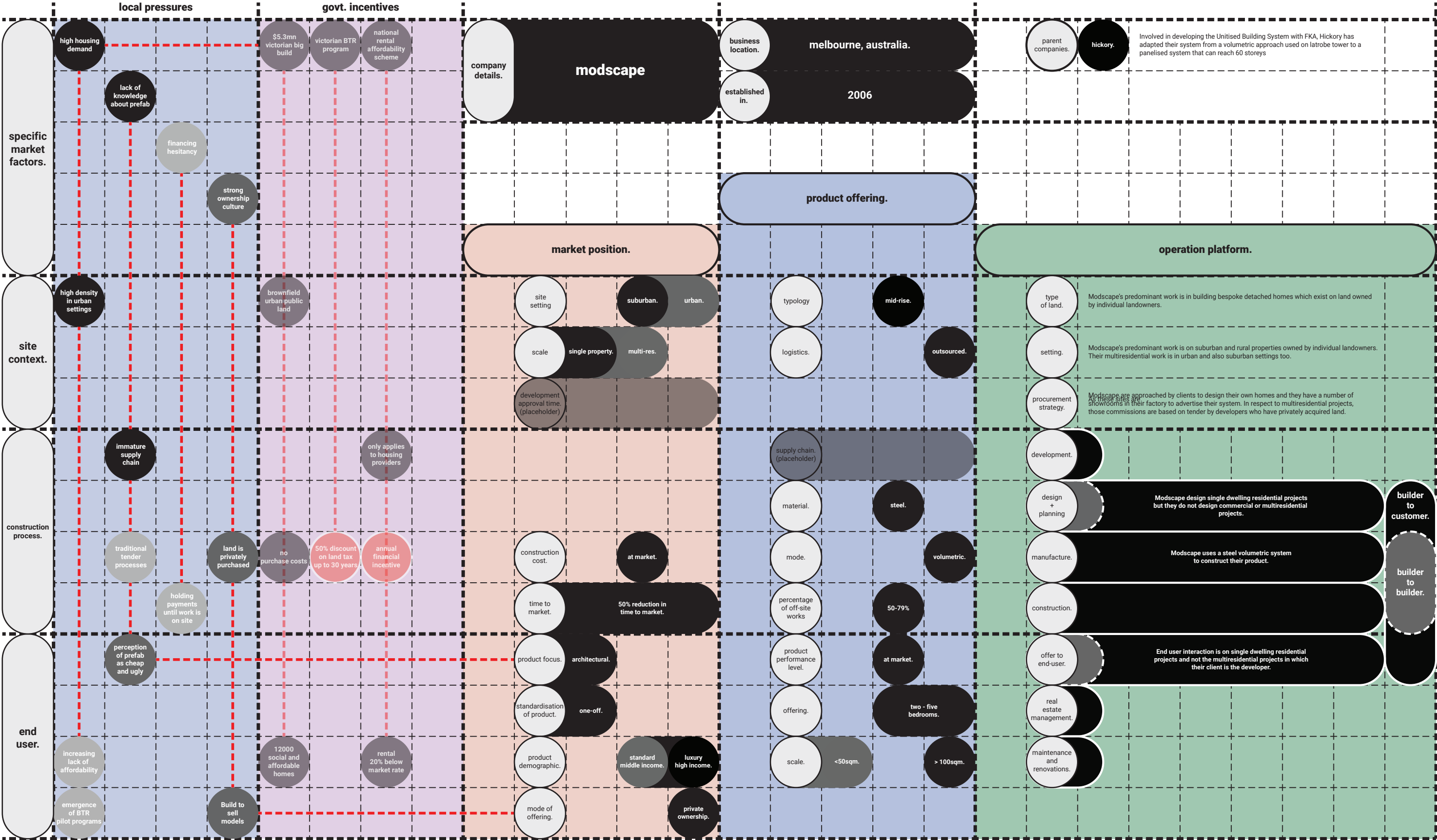
AUSTRALIA  
CRC 23: When prefab hits the ground



HICKORY BUILDING SYSTEMS

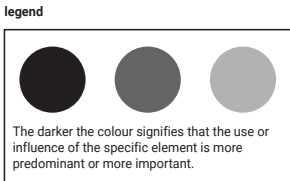
AUSTRALIA  
CRC 23: When prefab hits the ground





MODSCAPE

AUSTRALIA  
CRC 23: When prefab hits the ground



# APPENDIX 2: TURNKEY

## PREFABRICATION CASE STUDIES

CRC 23: When prefab hits the ground

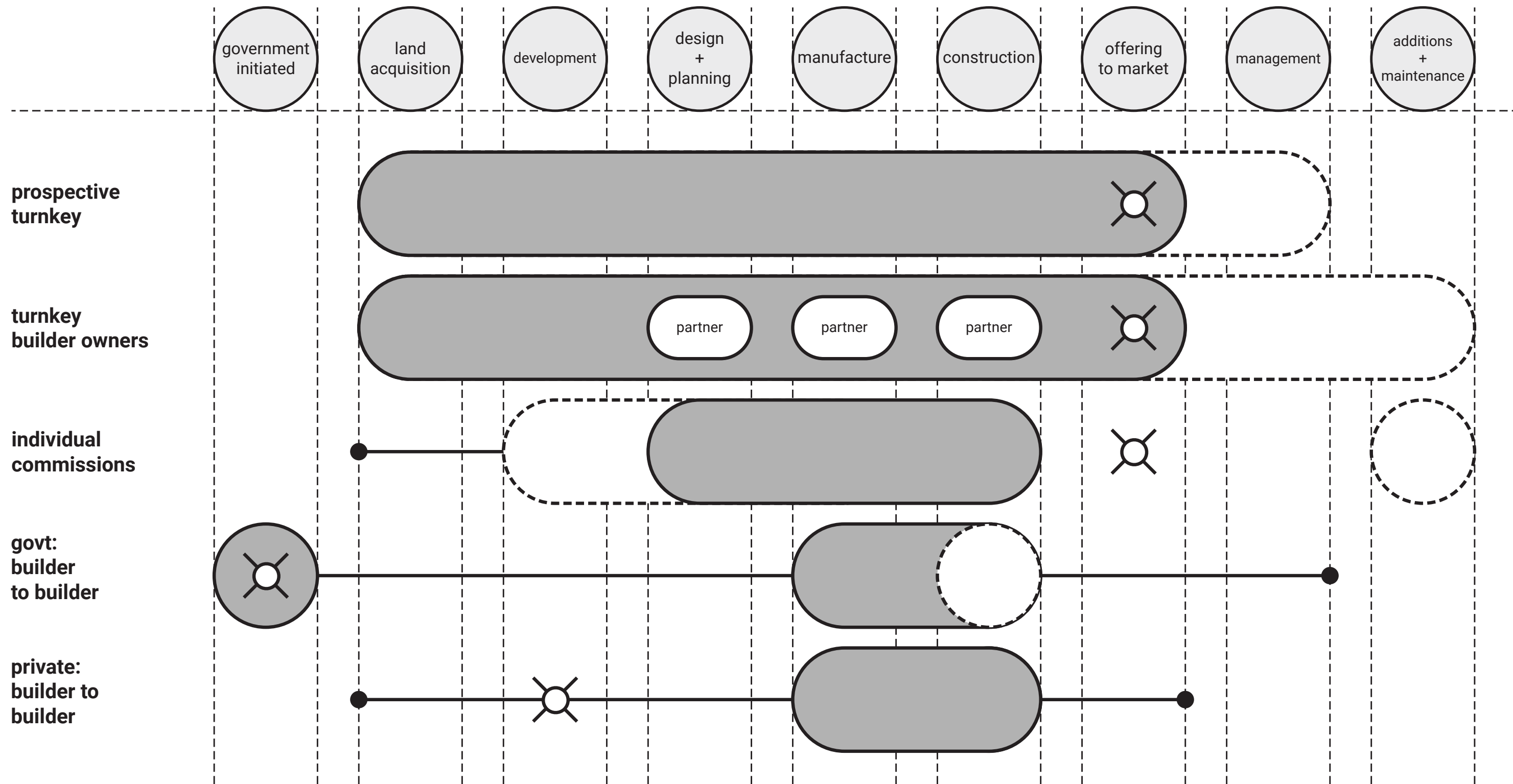
# TURNKEY

## PREFABRICATION CASE STUDIES

CRC 23: When prefab hits the ground

Turnkey case studies are explored at a company level, and grouped by approaches as follows:

TIMELINE	47
PROSPECTIVE TURNKEY	48
Ilke Homes (UK)	49
Urban Splash (UK)	50
Boklok (Sweden)	52
TURNKEY BUILDER OWNER	53
Lindbacks (Sweden)	54
INDIVIDUAL COMMISSIONS	55
Sekisui Heim (Japan)	56
Prebuilt (Australia)	57
GOVERNMENT BUILDER TO BUILDER	58
Timber Building Systems (Australia)	59
Factory OS (UK)	60
Full Stack Modular (US)	61
PRIVATE PARTNERSHIPS	62
Pocket Living (UK)	63
PRIVATE BUILDER TO BUILDER	64
Lindbacks (Sweden)	65
Hickory Building Systems (Australia)	66
Modscape (Australia)	67
Ilke Homes (UK)	68



# TIMELINE

TURNKEY  
CRC 23: When prefab hits the ground

**legend:**

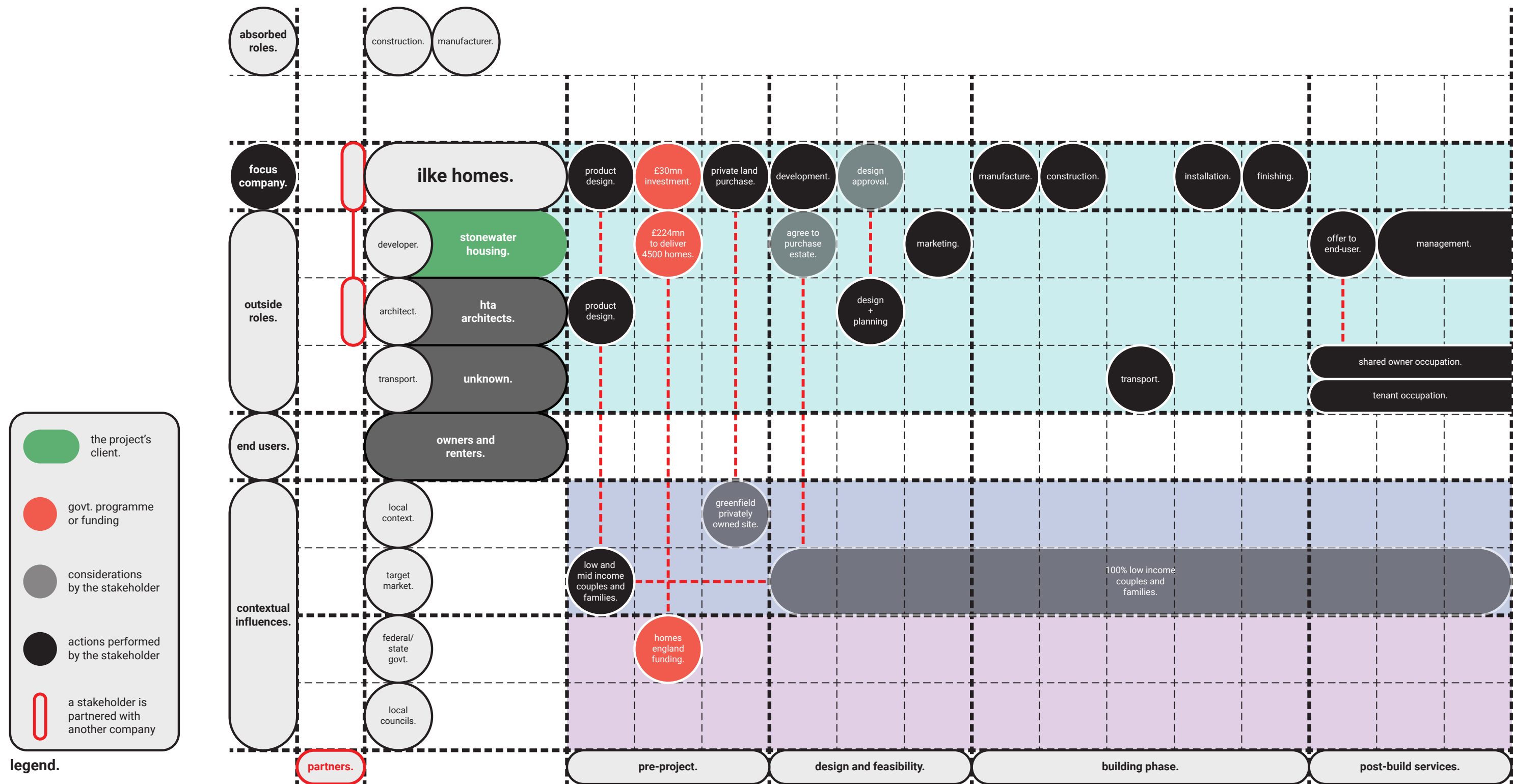
- customer for manufacturers
- absorbed processes
- possible absorbed processes

# PROSPECTIVE TURNKEY

## PREFABRICATION CASE STUDIES

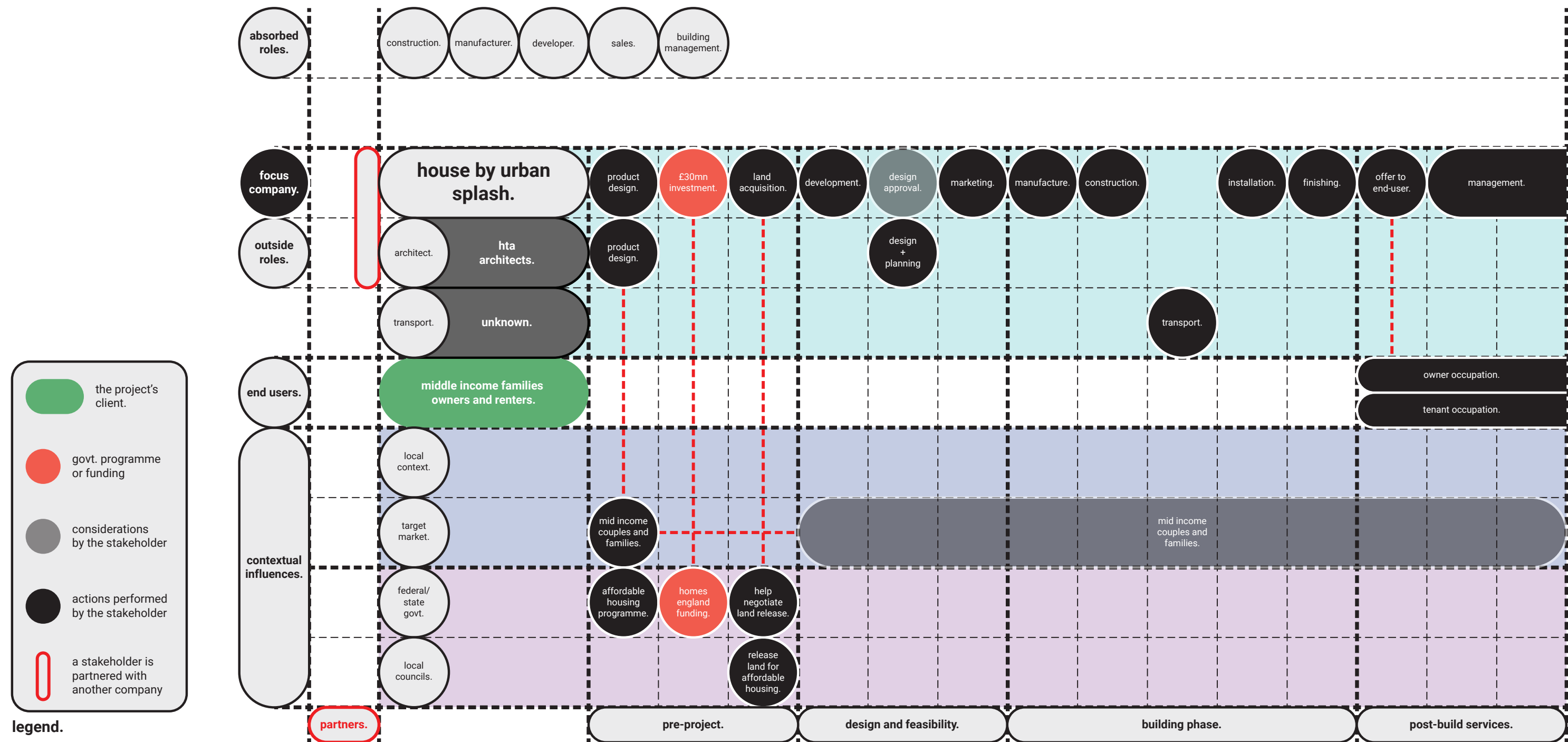
CRC 23: When prefab hits the ground





# ILKE HOMES

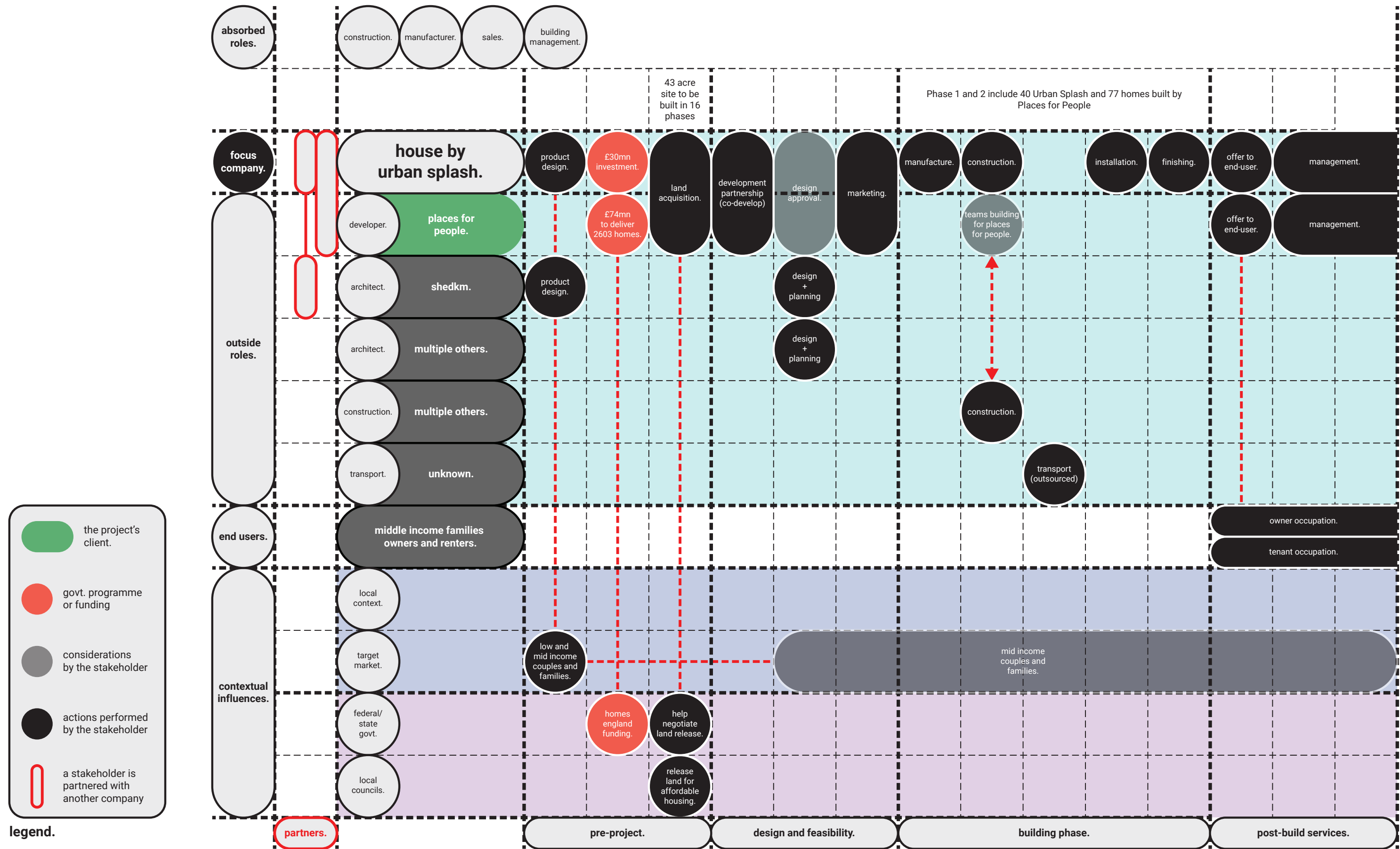
HEREFORDSHIRE DEVELOPMENT 2020 FOR STONEWATER  
 CRC 23: When prefab hits the ground



## URBAN SPLASH

HOUSE BY URBAN SPLASH- NEW ISLINGTON DEVELOPMENT

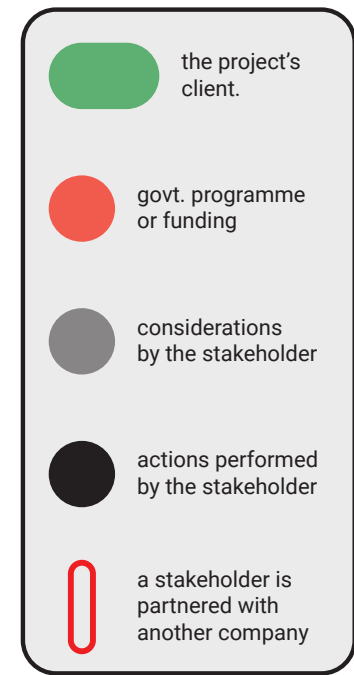
CRC 23: When prefab hits the ground



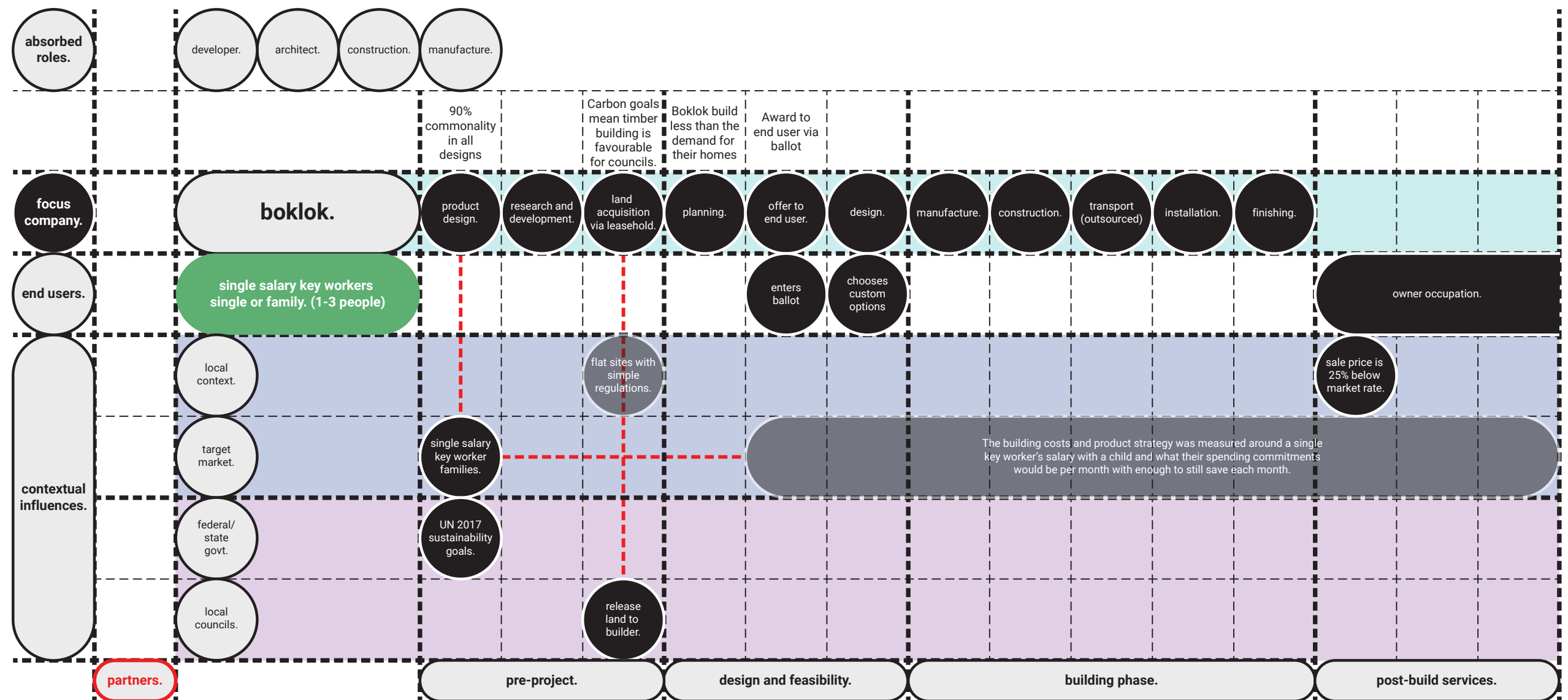
## URBAN SPLASH

### HOUSE BY URBAN SPLASH- PORT LOOP DEVELOPMENT

CRC 23: When prefab hits the ground



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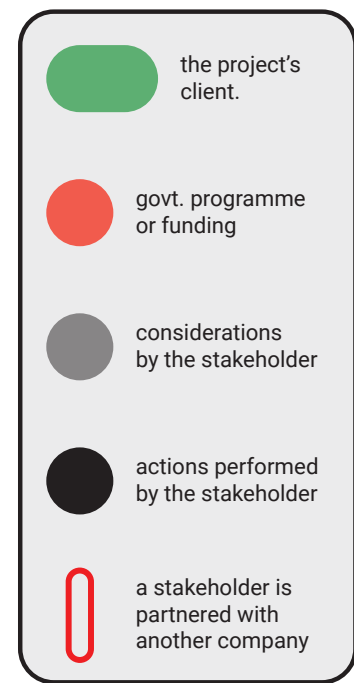


# BOKLOK

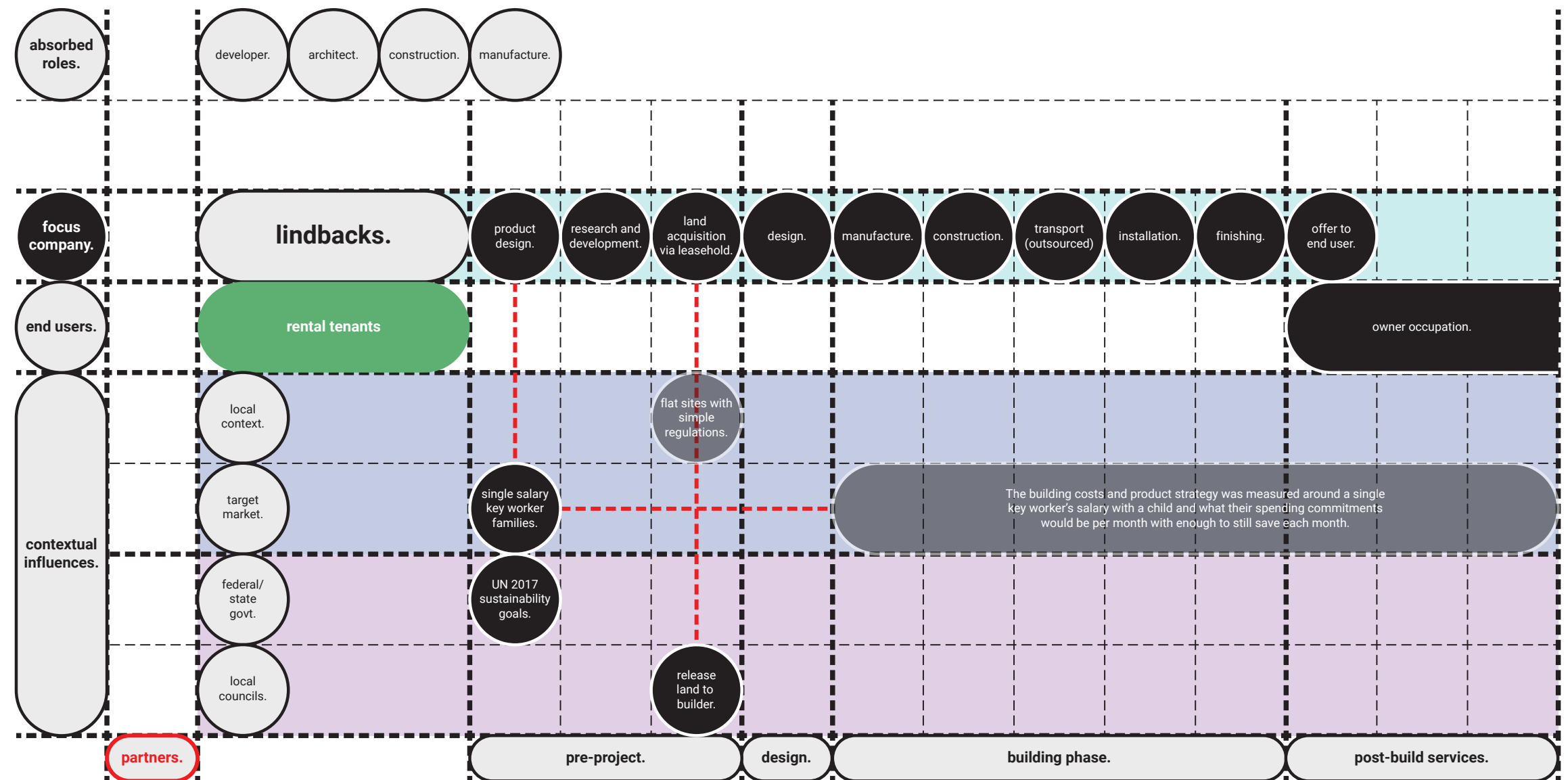
CLASSIC OFFERING- THE ALMHULT RANGE  
CRC 23: When prefab hits the ground

# TURNKEY BUILDER OWNER

PREFABRICATION CASE STUDIES  
CRC 23: When prefab hits the ground



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# LINDBACKS

KV TALLER 13

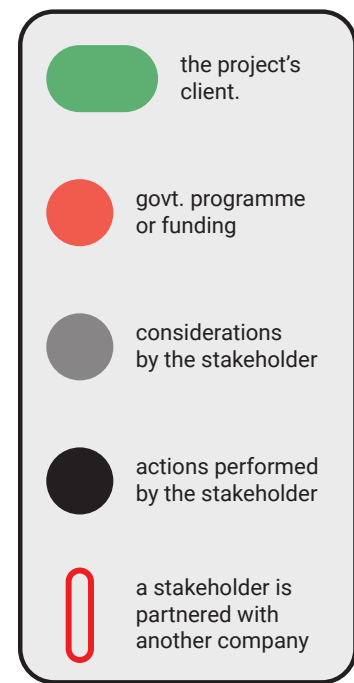
CRC 23: When prefab hits the ground

## INDIVIDUAL COMMISSIONS

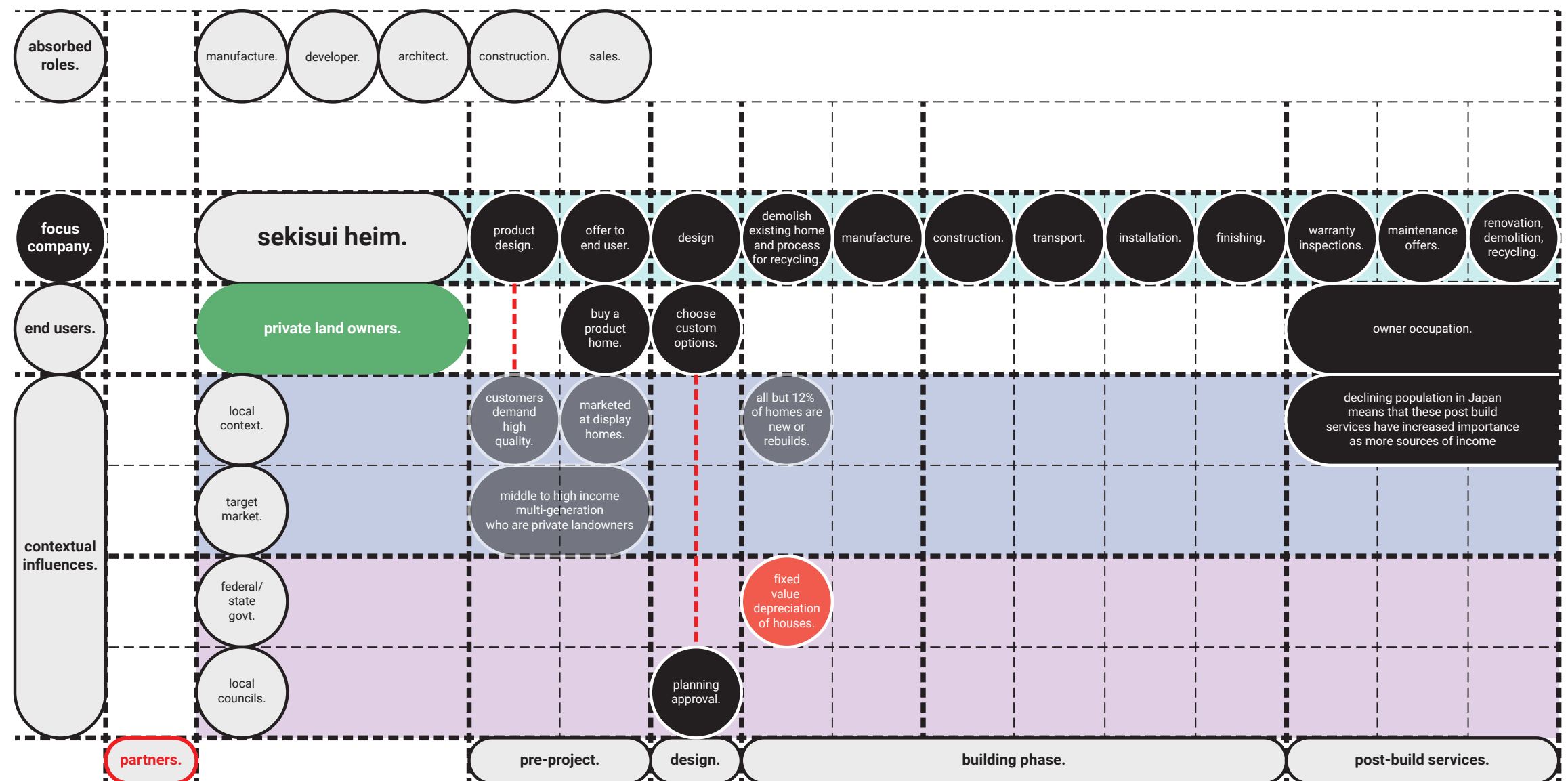
### PREFABRICATION CASE STUDIES

CRC 23: When prefab hits the ground



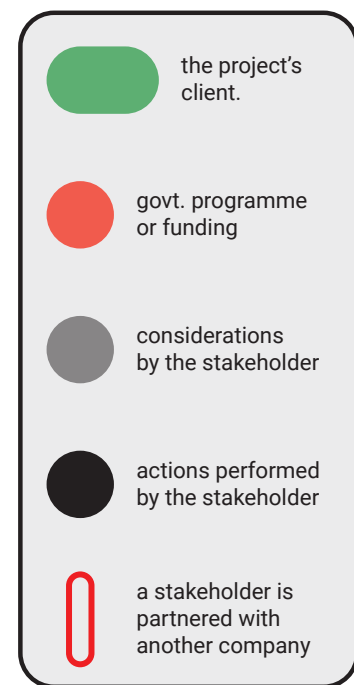


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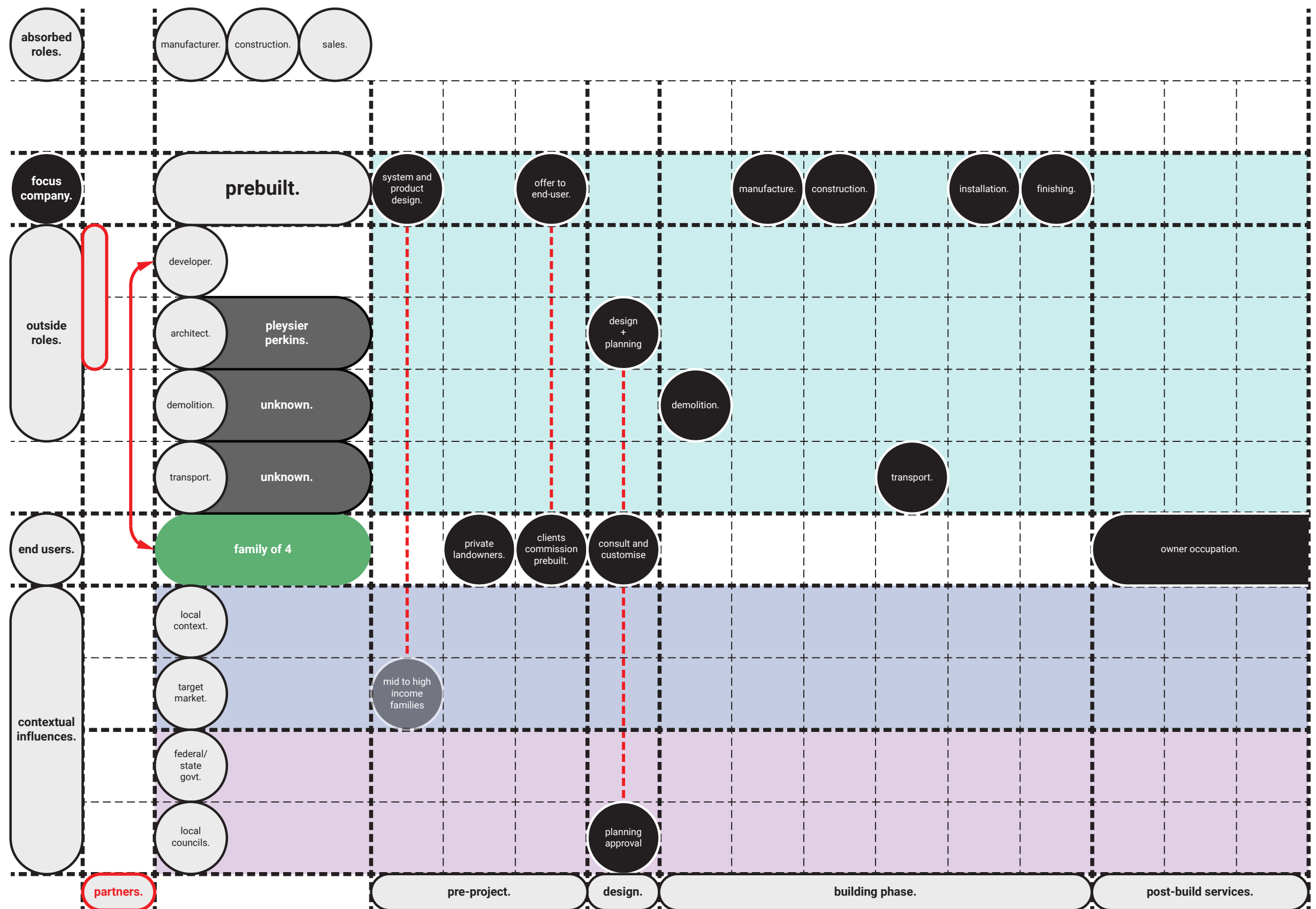


## SEKISUI HEIM

TYPICAL PRIVATE DWELLING  
CRC 23: When prefab hits the ground



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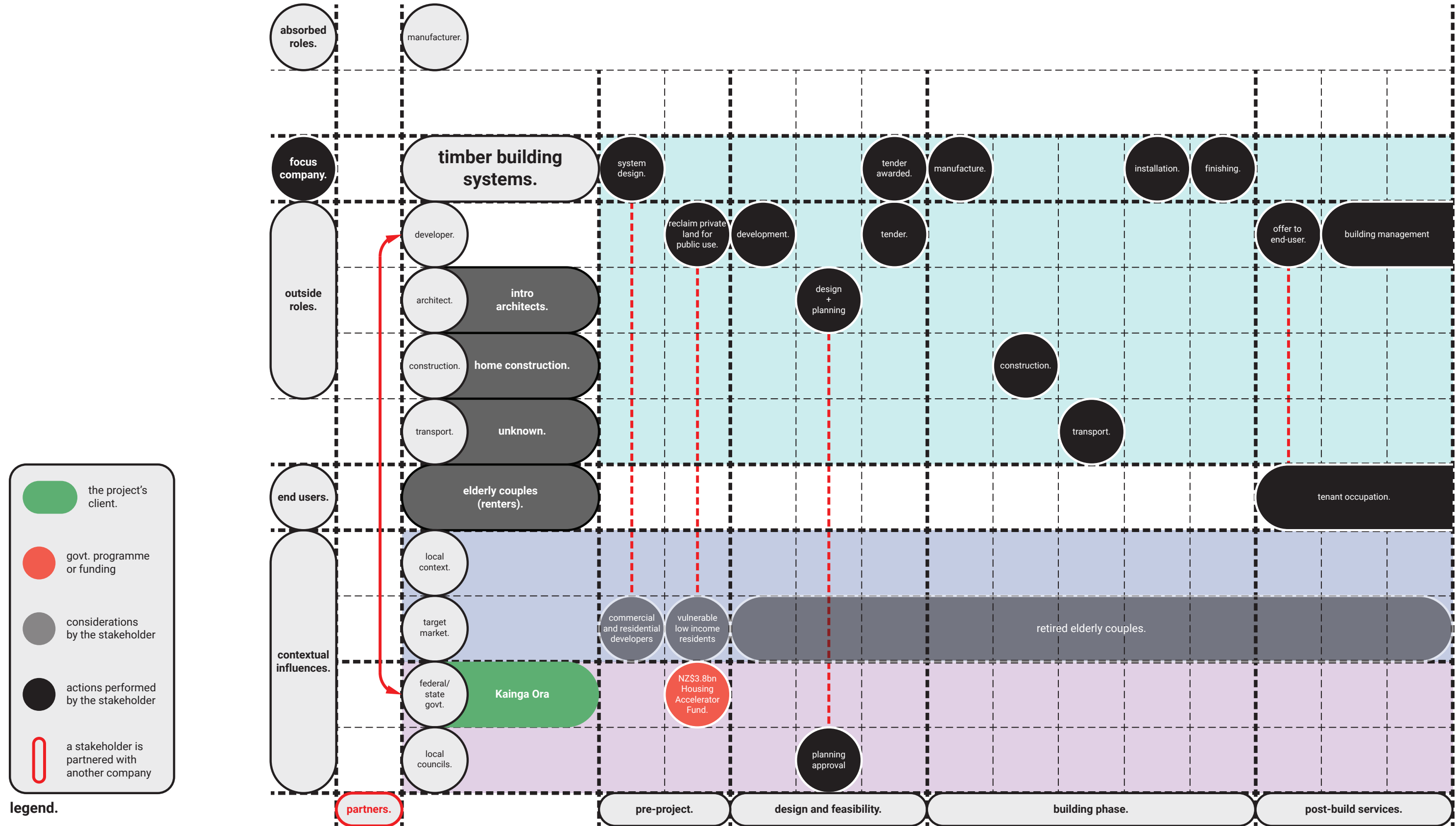
# PREBUILT

FRESHWATER HOUSE  
CRC 23: When prefab hits the ground

# GOVERNMENT BUILDER TO BUILDER

## PREFABRICATION CASE STUDIES

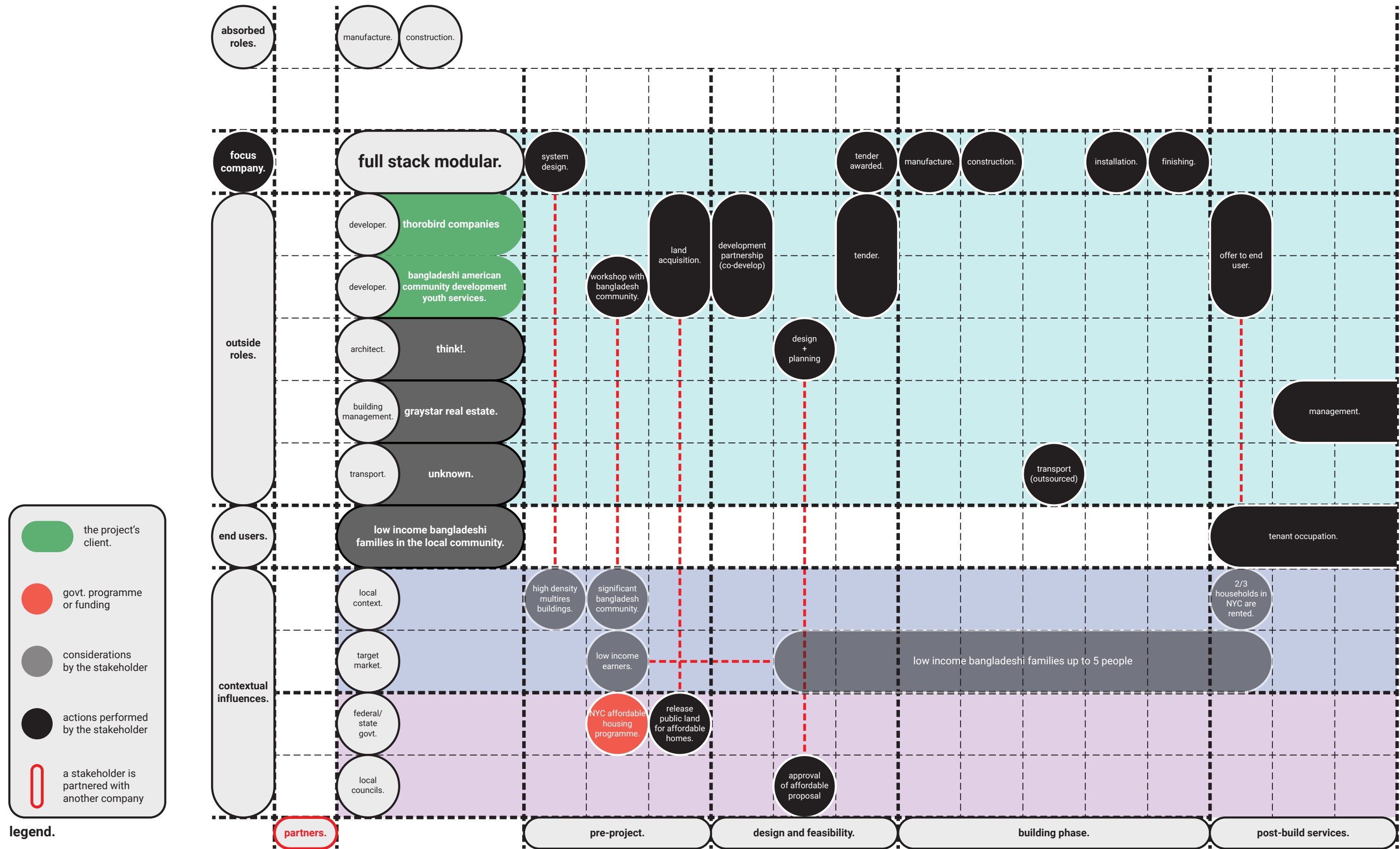
CRC 23: When prefab hits the ground



# TIMBER BUILDING SYSTEMS

ONEHUNGA  
CRC 23: When prefab hits the ground

# FACTORY OS



# FULL STACK MODULAR

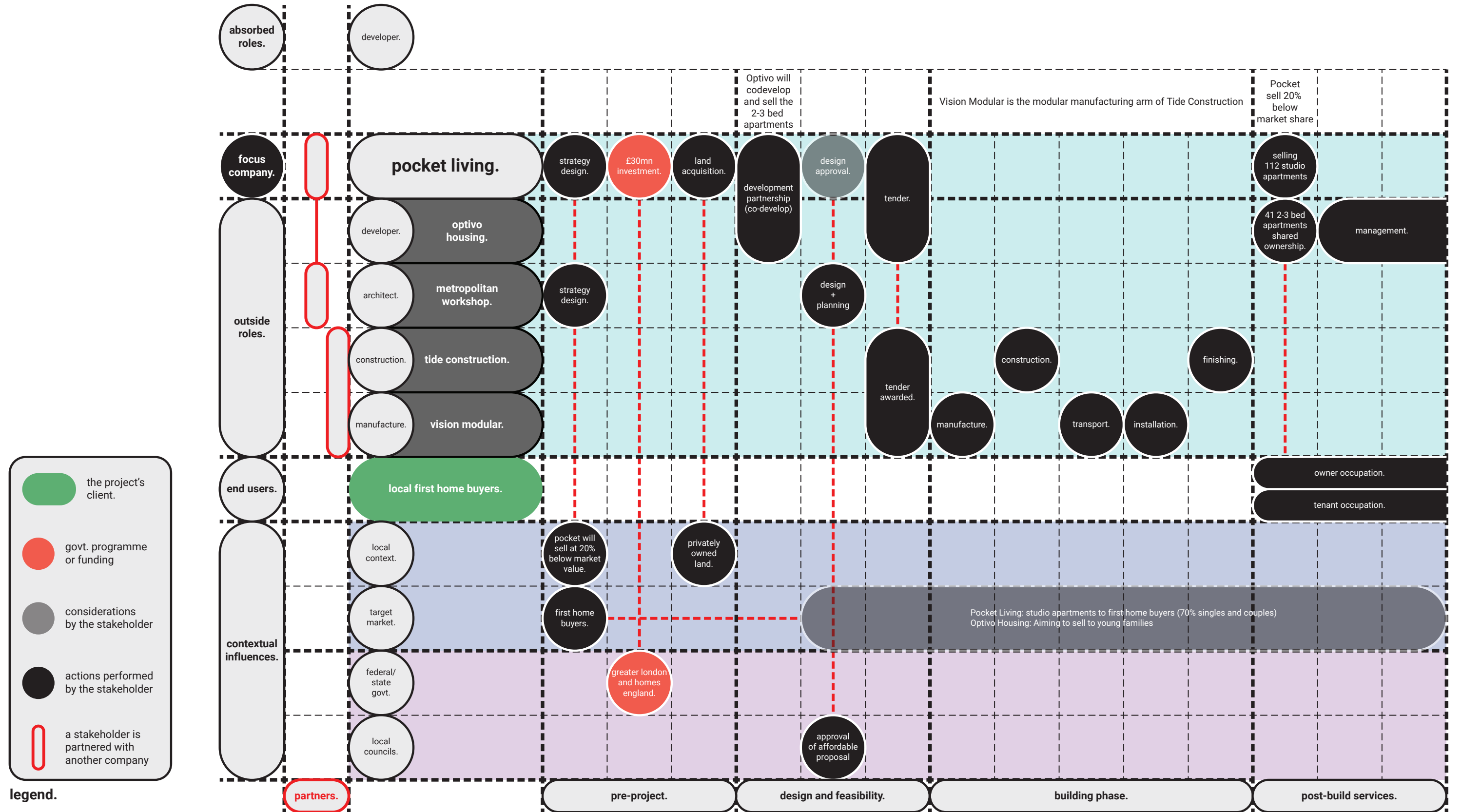
GRANT AVENUE  
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# PRIVATE PARTNERSHIPS

## PREFABRICATION CASE STUDIES

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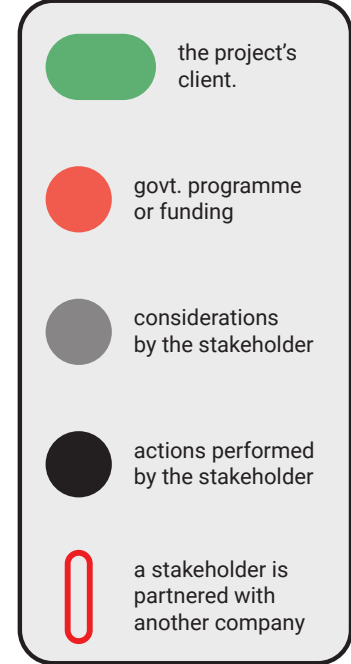
# POCKET LIVING

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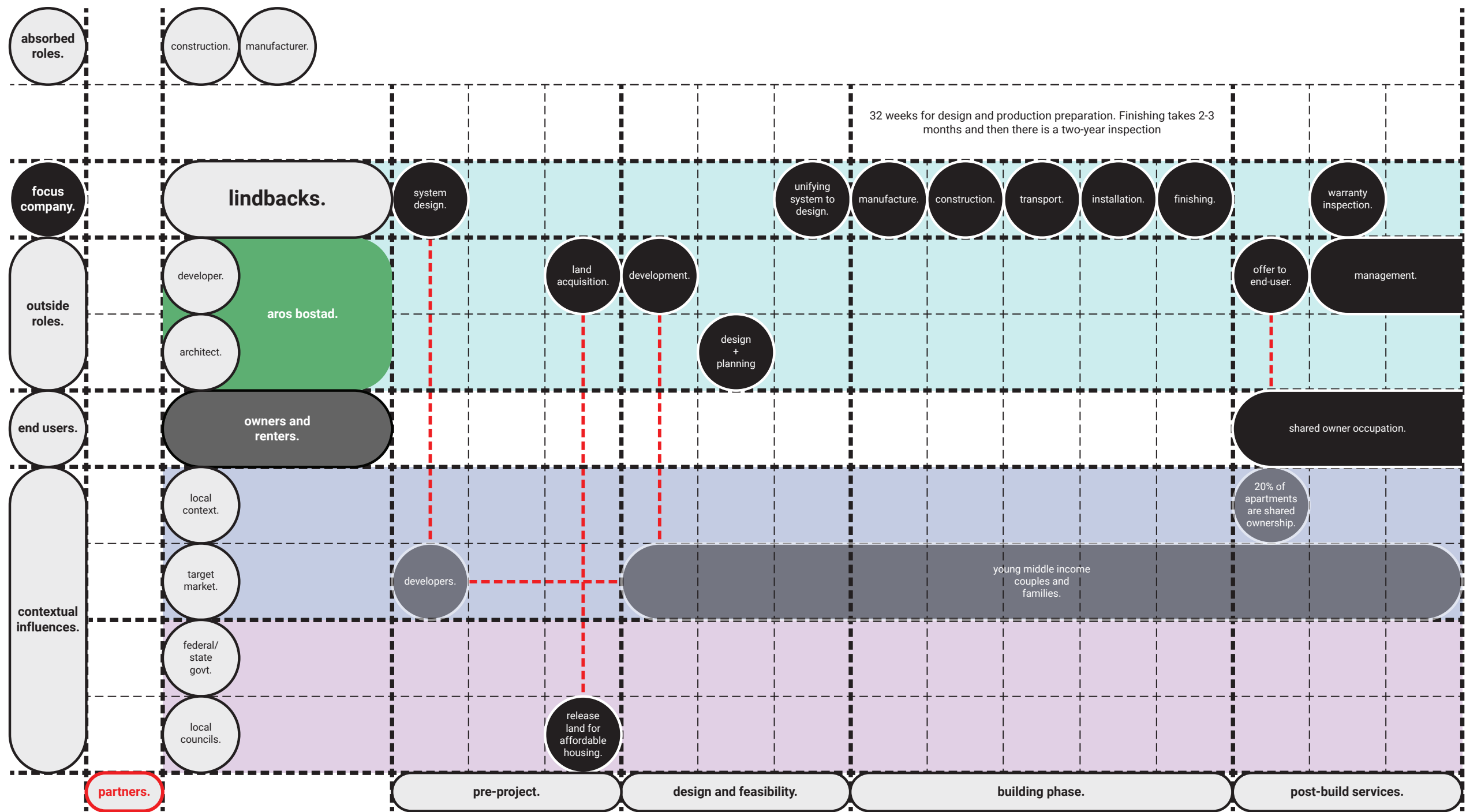
# PRIVATE BUILDER TO BUILDER

## PREFABRICATION CASE STUDIES

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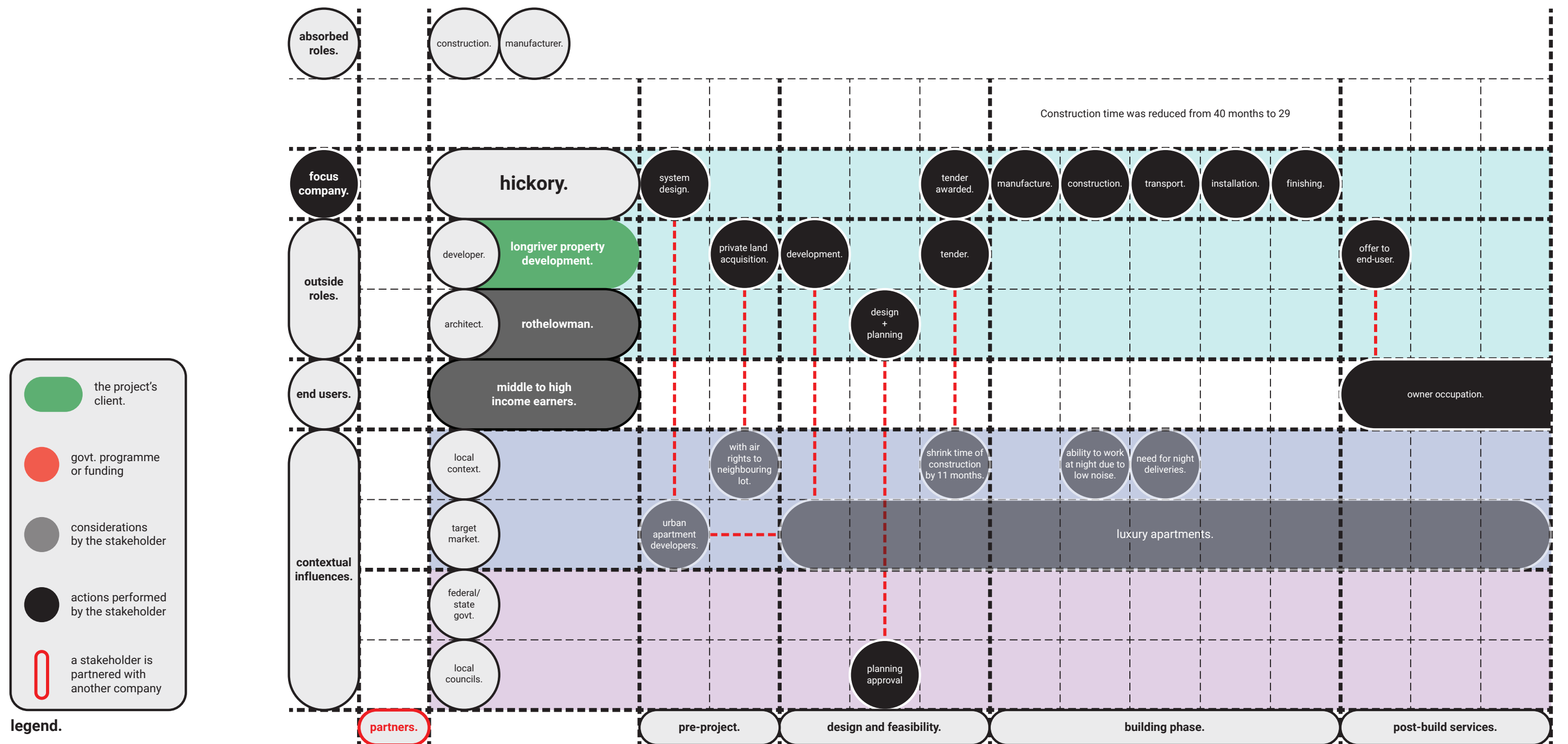


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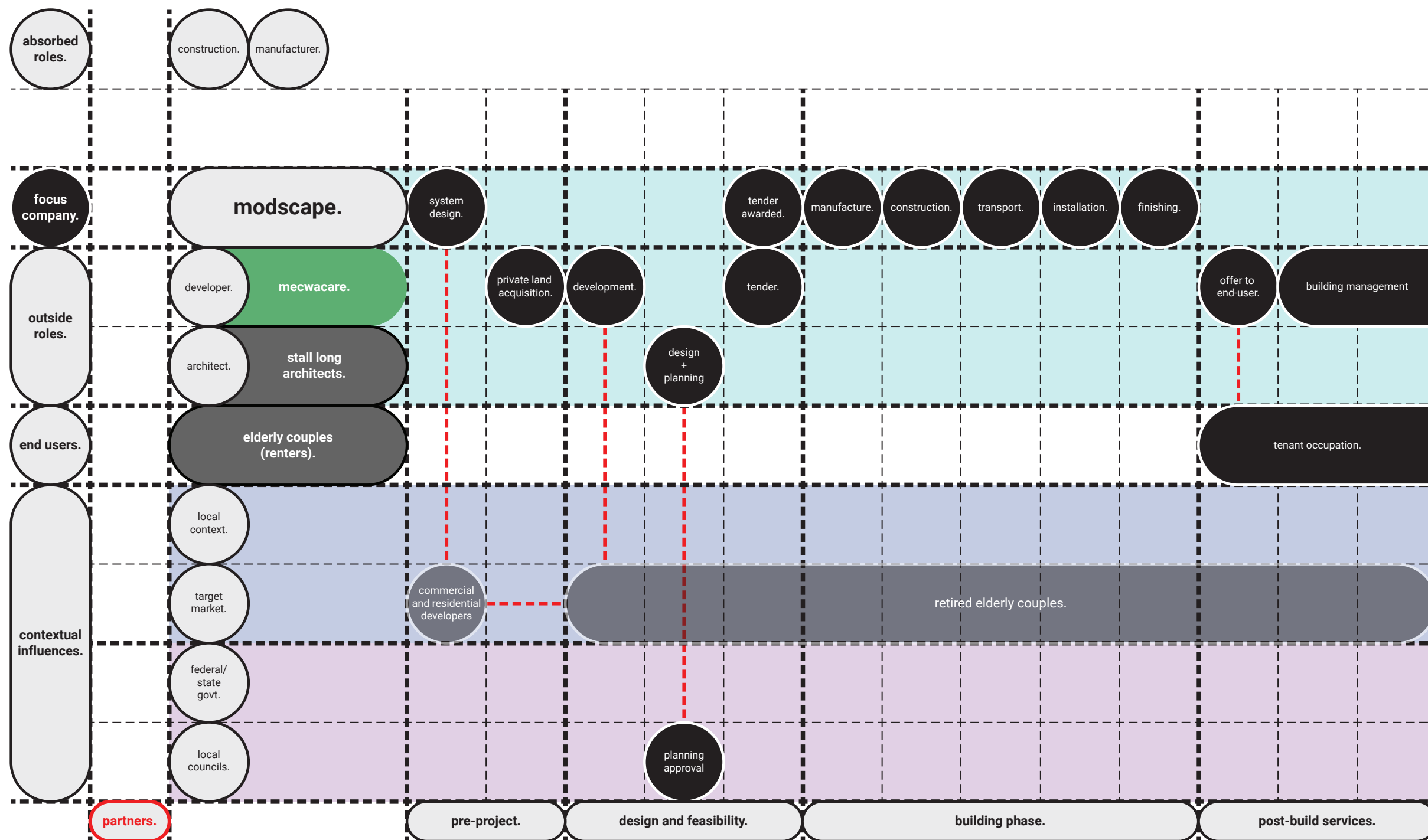
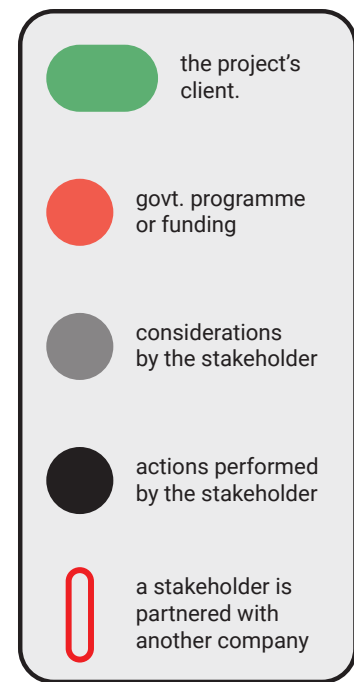
# LINDBACKS

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## HICKORY BUILDING SYSTEM

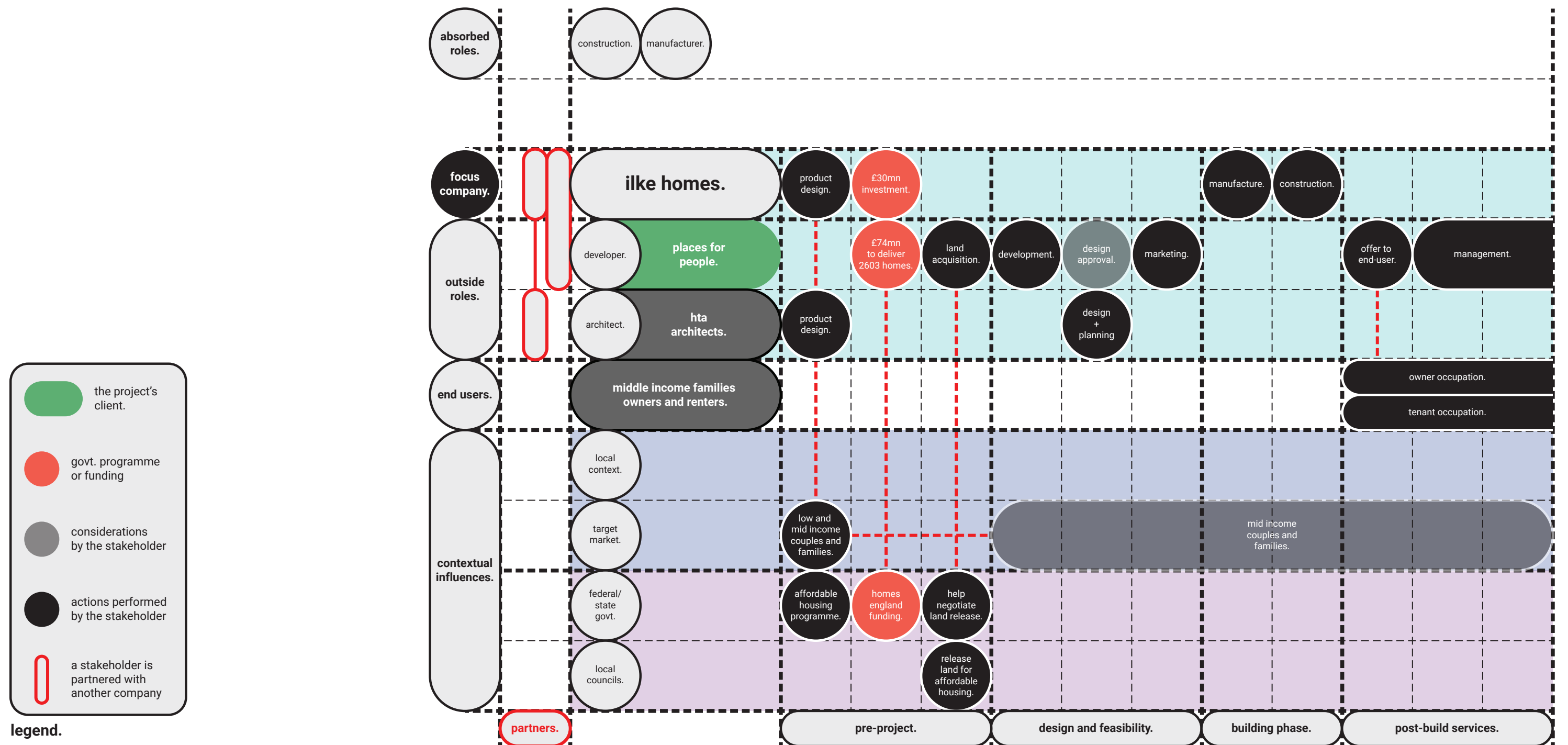
LA TROBE TOWER  
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# MODSCAPE

## MECWACARE

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## ILKE HOMES AND PLACES FOR PEOPLE

HOME BUILDING PARTNERSHIP  
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# APPENDIX 3: SPECTRUM OF MODELS

## EMERGING AUSTRALIAN HOUSING MODELS

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# SPECTRUM OF MODELS

## EMERGING AUSTRALIAN HOUSING MODELS

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Case studies are explored at a company level, and grouped by type of emerging model, as followss:

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# HOUSING MODELS

CRC 23: When prefab hits the ground

To better understand the opportunities for prefabrication within different Build to Rent property models, we conducted a scoping study aimed at understanding some of the factors influencing adoption in the Australian context.

## Build to sell < > Build to rent An expanding spectrum of housing typologies and markets

In undertaking our initial survey of Australian projects we identified a blurring of the boundaries between what could easily be defined as Build to Rent and Build to Sell. Some of the precedents we studied were hybridised or switched between the two tenure types over time to leverage the attributes of each in response to external contextual factors. We also recognised that some alternative build to sell models, such as Nightingale and Baugruppen, shared key attributes with the drivers and attributes of build to rent approaches. Consequently, we expanded our initial scope from modelling Build to Rent case studies to mapping and defining a spectrum of emerging housing models in the Australian market.

To structure the analysis, we have focused on two streams of work:

A) mapping housing models and characteristics in the Australian market, and

B) mapping the main operational and financial structures for each housing model.

We estimate that these streams are highly relevant to the prefab industry. For instance, these insights will assist manufacturers (A) to tailor solutions that respond to the demands of different housing models within the Australian context, and (B) to establish mutually beneficial networks with other stakeholders that could result in sustainable, long-term investments.

# BUILD TO SELL (BTS) MODELS

## EMERGING AUSTRALIAN HOUSING MODELS

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### Build to Sell- spec built/off the plan

- Build to Sell (BtS) are residential developments built by a contractor on a private land for the purpose of resale. Developments without a custom contract are referred to as Spec buildings, while those with a custom contract are known as Off the Plan.
- The main characteristic of Spec buildings is that properties are completed before they are sold<sup>1</sup>. Although this model simplifies the planning and building process and decreases timeframes and costs, buyers have no say in the home layout, materials, and appliances. Consequently, housing products may be misligned to occupants needs and could result in post construction changes being made, increasing the cost and material waste of housing.
- Off the plan properties are developments being sold before the building is completed or even started<sup>2</sup>. Although this model gives buyers the opportunity to provide input into the design layout, customization can increase timeframes for construction and operational costs.
- Spec and off the plan buildings are the prevalent housing models in Australia. For developers, BtS it is a short-term investment: buy land, build and sell within an average time period of 2 years<sup>3</sup>. While the model creates quick revenue and employment, it can create poor housing quality outcomes as a lower upfront construction cost, which may not consider the long term maintenance and operational costs, is typically more profitable.

# BUILD TO SELL (BTS)/BUILD TO RENT (BTR) HYBRID MODELS

## EMERGING AUSTRALIAN HOUSING MODELS

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### Build to Sell- Baugruppen/Nightingale

- In some cases, Build to Sell models are applied to residential developments built with the purpose of co-ownership and eventual resale after a period of time. There are currently two main models for co-owned housing in Australia:
  - The Baugruppen model is a form of development initiated by a collective (i.e., group of individual buyers).
  - The Nightingale model is typically self-commissioned by architectural practices with selected codesign input from the predetermined owners
- In the Baugruppen model, buyers’ collective is intentionally formed to build housing that reinforces community. In this model, also known as “deliberative development”<sup>4</sup>, housing typologies vary depending on the collective’s preferences and needs, resulting in a range of townhouses and mid-scale buildings. The Baugruppen model is similar to the Off the Plan building model in that the design responds to users’ inputs, resulting in better outcomes<sup>5</sup>. Since no developers are involved, overhead costs are kept low, yet the construction process can be time-consuming and represent more risk of bankruptcy to individual investors.
- Similar to the Baugruppen model, not-for-profit organisations with a design background raise funds to build multi-res buildings to reinforce community living in the Nightingale model. Melbourne-based architectural practice Breathe initiated this model in Australia, which seven other architectural firms subsequently adopted. Consequently, the model is now deployed via a not-for-profit organisation called Nightingale Housing which continues to evolve to include social and investor-backed housing. A key difference to the Baugruppen model is that apartments are built to be sold (although for an estimated 15% under market value<sup>6</sup>), and the primary design does not respond to the end-users inputs (similar to the Spec building model). Overhead costs are kept slightly higher than those assumed for the Baugruppen model, although fewer investment risks are expected.
- Initially, the Baugruppen/Nightingale models were deployed in capital cities with high population and access to services, primarily Melbourne, Sydney and Perth. However, due to the success of the model Nightingale is now targetting other major regional cities including Ballarat and Hobart.

# BUILD TO SELL (BTS)/BUILD TO RENT (BTR) HYBRID MODELS

## EMERGING AUSTRALIAN HOUSING MODELS

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### Build to Rent- commercial residential

- Commercial residential is a housing stock owned and operated for commercial purposes<sup>7</sup>. Property is designed and built to accommodate several residents, either in separate dormitories or rooms, and is often operated by a third party, not the property owner. Traditional commercial residential properties were oriented to short-term or predefined accommodation periods (e.g., hotels), which have recently expanded to mid and long-term agreements (4-12 months) due to the growth of student housing.
- Short stay residential is an accommodation model providing rental of dwelling houses or units for less than three consecutive months<sup>8</sup>. Due to the nature of this accommodation typology, no other amenities or opportunities for community involvement are included. This group's building typologies are backyard pods or prefab rooms financed by small-scale landlords to create a hospitality asset for investment with an estimated short-term revenue (2-year). Several international and Australian prefab manufacturers have specialized in this business model (e.g., ÖÖD rööm, based in Estonia<sup>9</sup>; ModnPod, based in Australia<sup>10</sup>). Interested investors can select design layouts, materials, and appliances from a predefined portfolio (off the plan building). A different typology within the short stay residential model is hotel buildings, which have recently shifted from traditional building processes to incorporating off-site technology in the manufacturing and assembly process (Tribe hotels by Idle Architecture Studio, in Perth, Australia<sup>11</sup>). This shift towards advanced manufacturing approaches can increase speed, resulting in modular hotel buildings built off-site and raised in 14 days. Similar amenities to those provided by traditional hospitality accommodations are included in this typology. Because this building model requires the presence of a yard of substantive dimensions, it is generally limited to low-density areas in Australia in proximity to natural attractions (e.g., Gold Coast).
- Student housing is apartment buildings tailored to tertiary education students that include a range of shared amenities and individual bedrooms or dorms<sup>12</sup>. It is a well-established property model in Australia, as the cohort of international students increases every year<sup>13</sup>. Leases are operated by property developers (Unilodge<sup>14</sup>, Iglu<sup>15</sup>) and can range from 4 months to 4 years. Tertiary education providers have also mandated the development of student housing buildings in recent years, establishing partnerships with prefab developers to deliver accommodations in short periods (Hutchison<sup>16</sup>). Student accommodations are usually located near universities and other tertiary education institutions, thus being found in Australia's main cities.
- Co-living proposes a similar business model to student accommodations, with the distinction that the targeted demographic is young professionals. Properties usually comprise studio apartments and are operated by private investors (180-182 St Johns Road, Glebe, Sydney NSW<sup>17</sup>, UKO<sup>18</sup>). The range of amenities includes free on-site entertainment, laundry, house cleaning, bills, Wi-Fi, and communal dinners, among others<sup>19</sup>. This development typology also emphasises creating a sense of community, similar to Nightingale models. Because rental costs for co-living are estimated to be higher than market prices, these are usually located in high-income suburbs in capital cities or near CBDs.

# BUILD TO RENT (BTR)

## EMERGING AUSTRALIAN HOUSING MODELS

CRC 23: When prefab hits the ground

### Private rental market in Australia – Key points

- In Australia in 2020, property buyers are usually small-scale investors, or private landlords (individuals/families)<sup>20</sup>.
- Private rental properties are usually operated by property managers (90% of the time<sup>21</sup>).
- Lease agreements have a median duration of 18 months<sup>22</sup>. This situation can create time and financial pressure on tenants, to cover overlapping rental bonds, end of lease cleaning, service connection and disconnection, removalist charges, as well as having to find and secure each tenancy.
- Because BtS is the prevalent property model in Australia, tenancy laws usually protect small-scale property owners. Recent adjustments to housing bills aim to increase the range of benefits to tenants (e.g., new Victoria housing bill<sup>23</sup>), as the percentage of renters has increased over the past two decades.<sup>24</sup>
- A key difference between the private rental market and Build to Rent housing is the duration of the lease agreement (median extension is doubled (i.e., 36 months) for Build to Rent agreements<sup>25</sup>).
- Another relevant difference between private rental market and Build to Rent is that average BtR rents tend to be 9.3% higher than those for the private rental market in the same areas (UK).<sup>26</sup>
- One key characteristic from Build to Rent models is that property operation and many services are included as part of the tenancy agreement. Well-established BtR developers act in partnership with property managers to deliver a range of community spaces and services and benefits through blockchain technology.<sup>27 28</sup>
- The integration of digital services does not only respond to hospitality services (e.g., apartment and car cleaning, pet walking and pet grooming), but also to energy efficiency and lifecycle assessment data<sup>29</sup>. These opportunities have been capitalised by prefab manufacturers through the development of digital product innovations (e.g., material passports), which will increase their green credentials and set a platform for diversified investments.
- There is a clear opportunity for these technology integrations to improve sustainable and green building design in the future (e.g., iteration of design components using machine learning for increased efficiency/ decreased material waste).
- The prevalent role of property management as part of this model also increases opportunities for co-design and consultation early in the design process<sup>30</sup>. The opportunity to receive upfront feedback can result in product innovations that closely respond to market trends and demographic preferences and needs.
- BtR also offers the option of collective discounted purchasing of as much as possible at a building level to reduce the cost of housing during tenancy (services, data, car, toilet paper etc), again to stabilise cost of living<sup>31</sup>. But could also be a way to ensure occupation aligns with operation from a green credential perspective and, in some models that were long term BtR, could be another space to offer a profitable service that helps offset upfront cost.

# BUILD TO RENT (BTR)

## EMERGING AUSTRALIAN HOUSING MODELS

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### Analysis of the Australian Build to Rent Market

- One of the key financial aspects to consider for property development in Australia is land ownership. Landowners must pay quarterly or annual taxes to states and territory governments based on the land value<sup>32</sup>. As land tax is applied to rental and investment properties<sup>33</sup> it increases the costs to developers interested in the rental property market and decreases short-term revenue. For this reason, BtR developers have adopted different approaches to building rental properties based on the advantages for land lease and land ownership established for this property model.
- Land Leased model: With the pressure to increase housing supply to respond to a sustained demand, state and federal governments have established a range of incentives for private developers to finance housing projects (including a percentage of social and affordable) on leased public land. This partnership benefits property developers through land tax exemption and the opportunity to profit from property rentals for a predefined period (PPP models). Several state schemes have been established in recent years oriented to this property development model.<sup>39 40</sup>
- Land owned model 1: In some cases, developers have followed different land ownership strategies as part of a business model focused on providing commercial amenities within the development (i.e., commercial-residential mixtures). First, BtR developments in Australia have followed these strategies based on the international experience (e.g., MIRVAC41 and Sentinel42). Developers have been inclined to build towers (32 storeys) with commercial and other hospitality amenities to maximise revenue. Freehold BTR developments may have some disadvantages in comparison to land leased developments, particularly if available land locations are not optimal.
- Land owned model 2: In other cases, developers follow a business model oriented to an escalated land purchase and property development (e.g., Pellicano43). This model often starts with the purchase and development of low-rise properties (e.g., townhouses) and escalate in number and size as time passes. Since land size is not as relevant as it is to Land owned model 1, Better options for location are expected for this model (i.e., better connectivity/more attractive).



## BUILD TO RENT (BTR)

### EMERGING AUSTRALIAN HOUSING MODELS

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#### Build to Rent – Company housing (BOO – BOOT)

- Build, Own, Operate (BOO) and Build, Own, Operate, Transfer (BOOT) are public-private partnership (PPP) models in which private developers build a project under contract for a government or a public sector partner. Private partners will profit from the development for a predefined period, after which it will be transferred to the public sector partner. Private partners usually assume the investment risks for the development and may receive a limited range of benefits from the public sector partner (e.g., tax exemptions).
- The BOO and BOOT models are appropriate to fund priority and critical infrastructure for public use with private funding. Through these models, a range of social housing projects has been developed in Australia under 40-year agreements (e.g., the Ground Lease Model Project in Victoria<sup>44</sup>).
- Along with social housing, the BOO and BOOT models have also been established to develop construction camps and accommodation villages in regional areas. Prefab companies have adopted these business models as part of their portfolio, providing modular solutions (e.g., Fleetwood' Searipple Workers Accommodation Village in Karratha, WA<sup>45</sup>) and energy management systems through the Internet of Things (IoT)<sup>46</sup>.

## BUILD TO RENT (BTR)

### EMERGING AUSTRALIAN HOUSING MODELS

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#### Build to Rent – Company housing (BtL)

- Build/buy to Let (BtL) is another public-private partnership (PPP) model in which private developers purchase and refurbish an auctioned, large-scale development for a government or a public sector partner. As in the BOOT model, this arrangement is oriented to finance public sector housing with private investment, which in turn can profit from rents for a predefined period. International case studies include towers in NYC (Developers + City council to ensure a percentage social/affordable<sup>47</sup>).
- Opportunities for the prefab industry include interior renovations for flexibility and specialisations (e.g., disability housing).
- Like other company housing models, land ownership remains with the government/public sector partner once the arrangement is completed.

## BUILD TO RENT (BTR)

### EMERGING AUSTRALIAN HOUSING MODELS

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#### Australian BtR model – Build to Rent to Own (BtRtO)

- Build to Rent to Own is a property model based on traditional Build to Rent principles that have been adjusted to respond to the financial characteristics of the Australian market. This model is oriented at incentivising ownership after an estimated 12-year period, and tenancy agreements reflect that.<sup>48</sup>
- Although the business model for BtRtO relies on ownership, during the leasing period, tenants will experience similar benefits to those experienced in traditional BtR models. That means maintenance and operational costs are to be covered by property managers and developers during the leasing period.
- Opportunities for the prefab industry include commissions for refurbishment and renewal of components during the tenancy period and long-term maintenance for future owners.

# BUILD TO RENT (BTR)

## EMERGING AUSTRALIAN HOUSING MODELS

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### Rental laws

- Current state (2020-2021). New schemes for first home buyers<sup>54</sup> and lower bank interests increased the number of people buying homes. Increase in demand and construction rates stable (fewer materials imported due to covid, tradespeople in demand), increased home prices. New home buyers are paying an estimated 20% increase over their parents' generation<sup>55</sup>. An increased percentage of renters in Australia / first home buyers will defer their entry to the market.
- Recent housing bills have addressed the increased number tenants in the housing market (QLD, Victoria), impacting attitudes to renting in the future. Tenancy regulations respond to the Build to Sell models despite the increased percentage of home renters. This policy gap has created structural issues for tenants facing uncertainty in the long-term continuity of rental agreements.
- One key difference between conventional property renting and BTR is the tenancy length. Currently 18 months for home rentals in comparison to 36 months for BTR<sup>56</sup>. A decrease in vacancy rates results in more efficient management processes. It also results in minor maintenance/cosmetic repairs once properties return to the rental market. BTR offers additional benefits to renters, including the option to renew tenancies at different units/developments with no bond renewals attached, access to amenities (physical and digital) and community spaces, and overall limited maintenance (all-included). BTR can be about 20% more expensive than average renting, so expectations of location, quality, and amenities are higher too.
- BTR models for the Australian market (i.e., BTRTO) also provide a sustainable pathway to property ownership. It allows renters to sign tenancy agreements that consider estimated time to save for a home deposit as part of the agreement/business model (7 years<sup>57</sup>).
- BTRTO may be a turning point for tenants looking to buy their first home right before retirement, as Australian retirement schemes still rely on homeownership for a tax deduction.
- Interestingly, current Australian BTR developments and amenities are customised to respond to the needs of Millennials (singles, couples), not downsizers or other potential demographics (young families). One probable reason is that BTR has implemented similar amenities to those provided by international BTR developments (renting may be more culturally ingrained and retirement incentives are not tied to homeownership).
- Amenities for BTR respond to the local culture and can be either physical (such as gyms and parcel storage) but also digital (data, material passports)<sup>58</sup>. Thus, there is an opportunity for prefab here, as advanced manufacturing technologies for the construction industry are likely to record this data as part of the optimisation process.

# ENDNOTES

## EMERGING AUSTRALIAN HOUSING MODELS

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## EMERGING AUSTRALIAN HOUSING MODELS

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<sup>37</sup> Sentinel Real Estate Corporation. “Build to Rent Australia.” Accessed December 10, 2021. <https://www.sentinelcorp.com/build-to-rent.aspx>.

<sup>38</sup> Pellicano Living. “Our Places.” Accessed December 10, 2021. <https://www.pellicanoliving.com.au/our-places/>.

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<sup>40</sup> Fleetwood Building Solutions. “Searipple Village.” Accessed December 10, 2021. <https://www.fleetwood.com.au/projects/searipple-village/>.

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<sup>42</sup> WTTW Chicago. “Stuyvesant Town- Peter Cooper Village.” March 26, 2016. <https://interactive.wttw.com/ten/towns/more/stuyvesant-town>.

<sup>43</sup> Smart, Belinda. “From Policy to Program.” Built Offsite (blog). Accessed December 10, 2021. <https://builtoffsite.com.au/emag/issue-15/from-policy-to-program/>

# APPENDIX 4: HOUSING MODEL CASE STUDIES

## EMERGING AUSTRALIAN HOUSING MODELS

CRC 23: When prefab hits the ground



# HOUSING MODEL CASE STUDIES

EMERGING AUSTRALIAN HOUSING MODELS  
CRC 23: When prefab hits the ground

Case Study 1: BTR CBus	85
Case Study 2: Pellicano	88
Case Study 3: Assemble	89

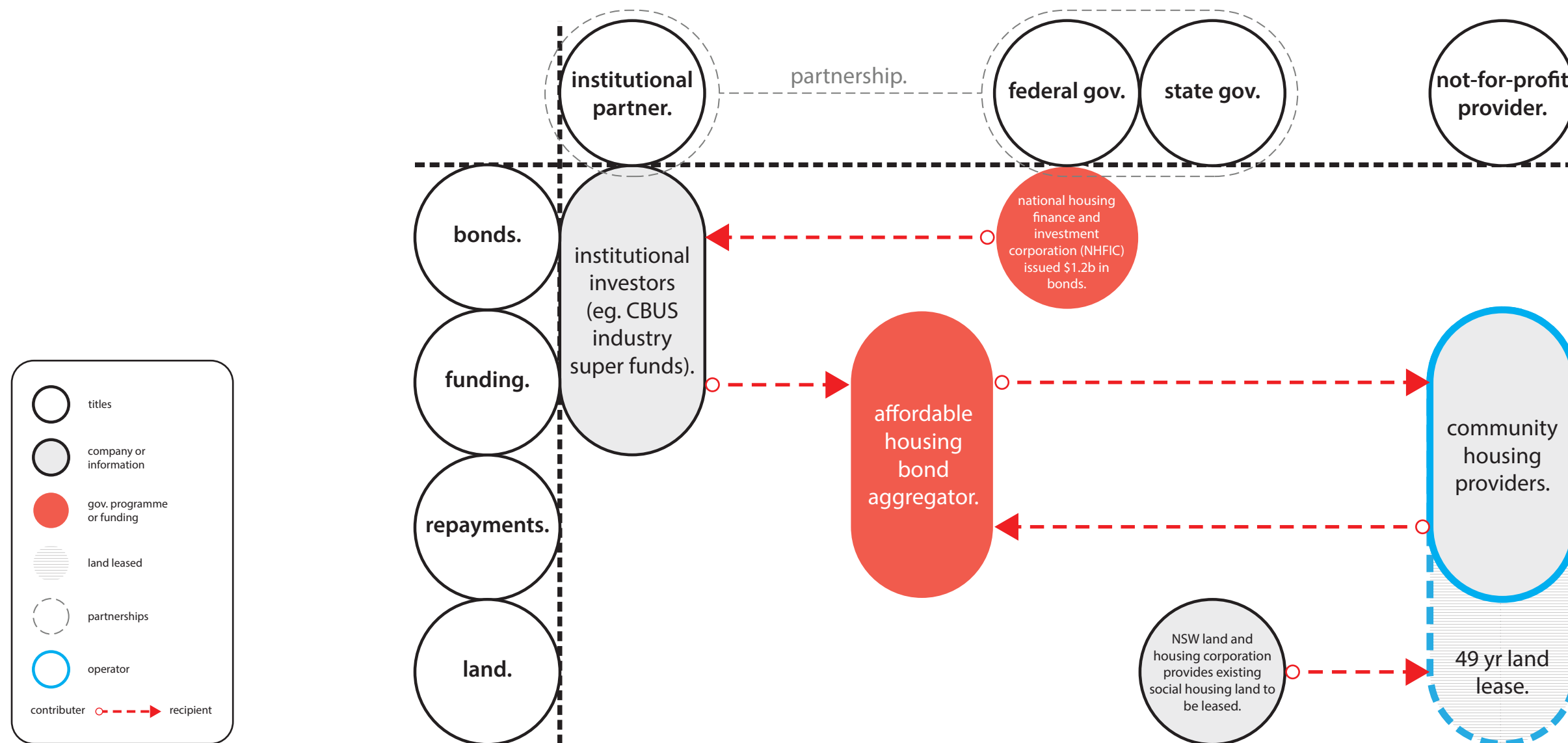
# BUILD TO RENT (BTR)

## EMERGING AUSTRALIAN HOUSING MODELS

CRC 23: When prefab hits the ground

### Case Study 1: BTR CBus

- Case study 1 is an example of Australian superannuation companies investing in local BtR developments. CBus is one of Australia's largest super funds, with more than 775.000 members and a portfolio of over \$65 billion. Sponsoring organisations are sourced from unions and employers' associations, such as the Australian Manufacturing Workers Union (AMWU), the Construction, Forestry, Maritime, Mining and Energy Union (CFMMEU), and the Master Builders Association (MBA).
- Motivated by the shortage of social and affordable housing, in 2020, CBus Super invested \$10 million in an NSW Build to Rent pilot (Parramatta, NSW). Following an agreement with New South Wales (through the Land and Housing Corporation, LAHC) and the Commonwealth Government (through the National Housing Finance and Investment, NHFI), CBus initiated the development of 96 dwellings across six sites, an estimated 25% of social housing.
- The scheme is a version of PPP's developments: It lets providers access a 75% debt-funding package provided by NHFIC, with the remaining costs covered by CBus super. CBus will lend for 12 years (i.e., two years during the construction period and ten years during the asset's life), after which CBus will exit the agreement. The provider is then required to refinance the 25% loan with NHIFC.
- Charter Keck Cramer acts as the provider for this development.
- Key to the partnership agreement, in this case, is the driver to finance affordable and social housing outlined by the Superannuation company, CBus. It is therefore anticipated that other priority targets for investment can be covered by the Prefab industry in future BtR developments, as in the case of Environmental, Social, and Governance (ESG) targets outlined in the 2030 Agenda for Sustainable Development.
- The business model envisaged for this PPP project follows a similar approach to the one outlined for privately owned Build to Rent developments (see Case Study 3: Assemble). This model outlines the need for financial contributions up until year 12 (or up until year 5), after which the asset is likely to be transferred (to LAHC in Case Study 1) or sold (to home buyers in Case Study 3).



legend.

## Case study 1: BTR Cbus

EMERGING AUSTRALIAN HOUSING MODELS  
CRC 23: When prefab hits the ground

super PPP model (public private partnerships).



# BUILD TO RENT (BTR)

## EMERGING AUSTRALIAN HOUSING MODELS

CRC 23: When prefab hits the ground

### Case Study 2: Pellicano

- Case study 2 is an example of a company delivering non-subsidized (privately owned land) Build-to-Rent developments in Australia.
- Established in 1967, the Pellicano groups' first Build-to-Rent development was built in 1970. Clayton House, a 24-townhouse development, provided tenants with convenient connections to amenities and public transport and allowed the group an escalated, low-risk growth in their asset's portfolio.
- Over time, the Pellicano group has invested in BtR multi-residential buildings (e.g., the Solarino House in Victoria), and more recently, BtR tower developments (e.g., the Stanley House in Queensland). Pellicano currently owns over 170 properties and has an investment portfolio of \$3.7 billion in developments completed across the residential, commercial, retail, and industrial sectors.
- Pellicano Group's business model is based on US private equity firms (e.g., Blackstone, Starwood Capital) that acquired large portfolios of single-family rentals after the Great Recession (2006-2009) and converted them in professionally managed (or commercial) rentals.
- Although the Pellicano group' initial developments prioritized location over amenities, more recent developments have prioritized retail amenities (ground floor offerings) within the development as part of the business plan (increased distance to CBDs).
- The use of digital amenities and blockchain services is also included as part of the property management plan.

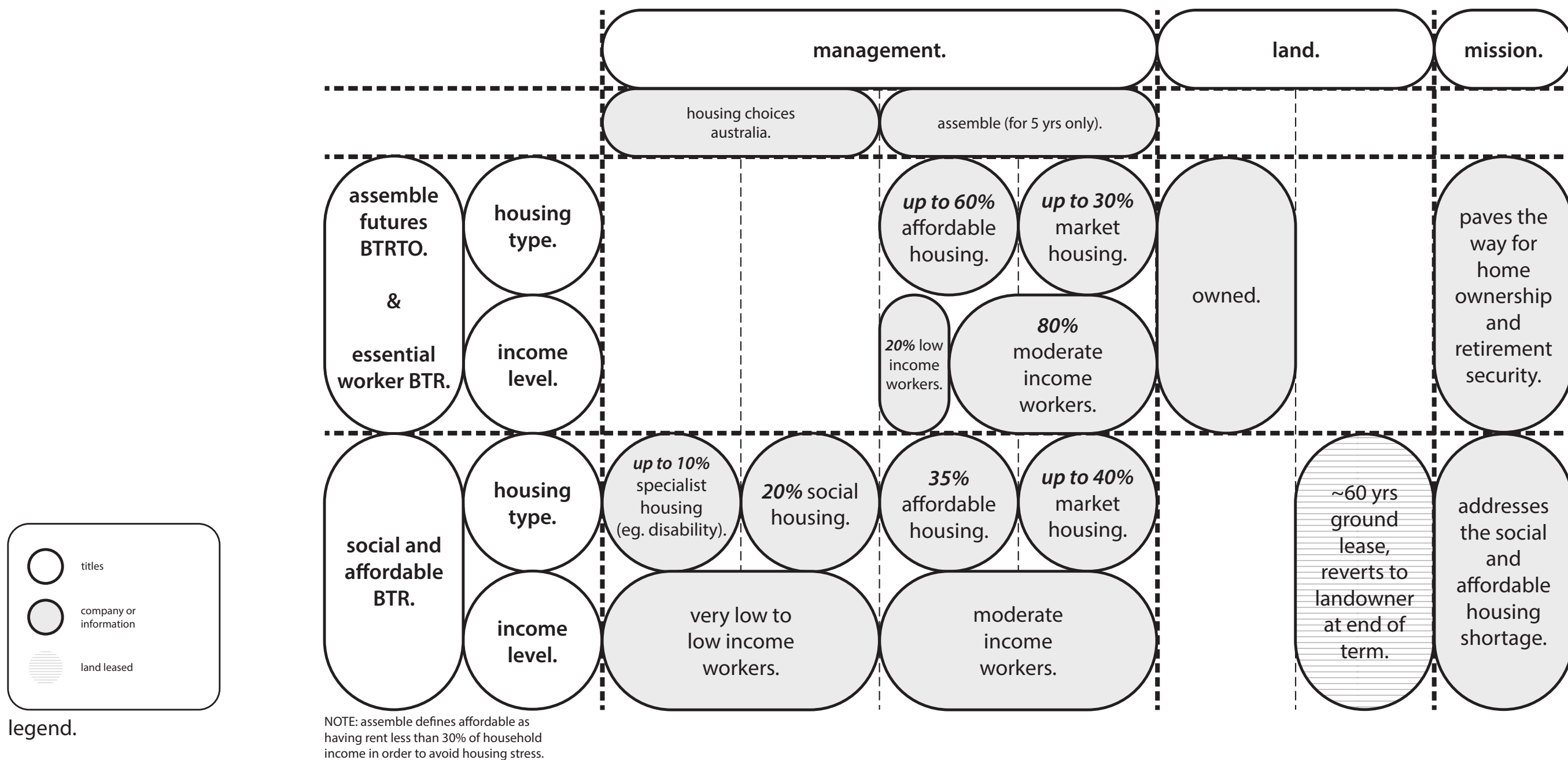
# BUILD TO RENT (BTR)

## EMERGING AUSTRALIAN HOUSING MODELS

CRC 23: When prefab hits the ground

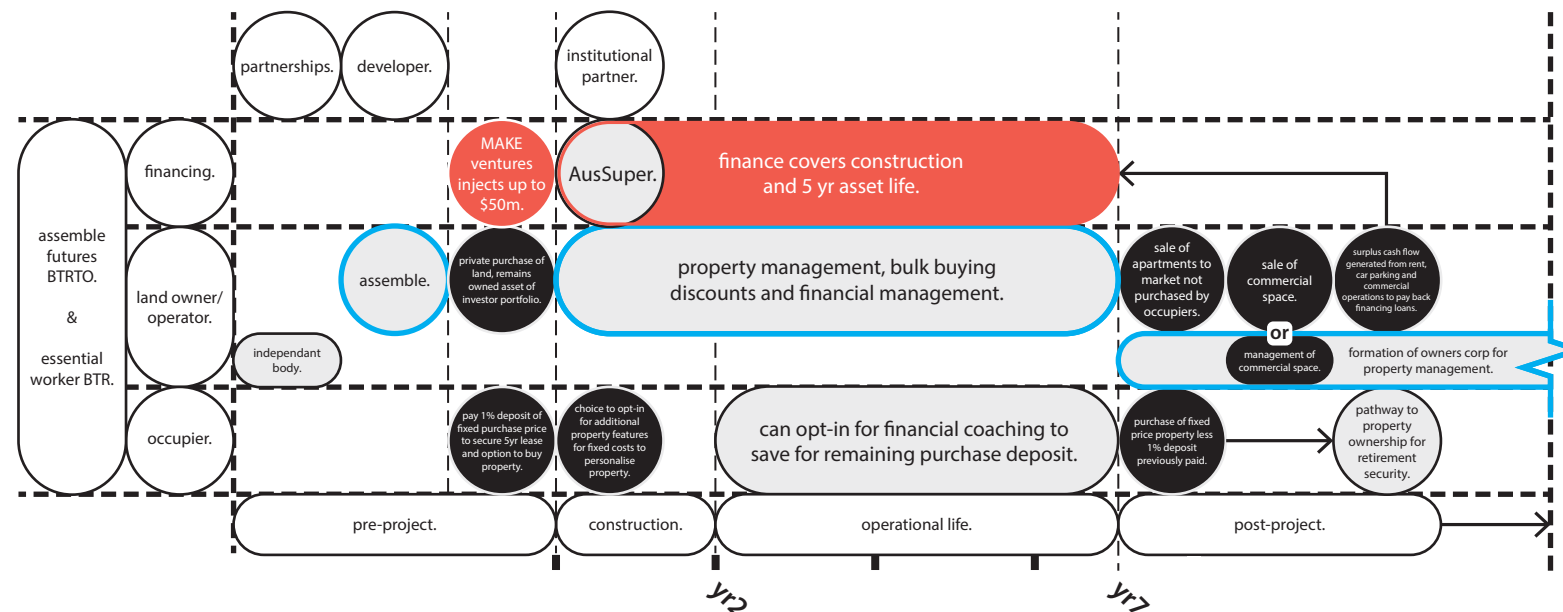
### Case Study 3: Assemble

- Aus Super invested in Assemble in June 2020. They’ve noted that it was in response to aligned beliefs in ‘dignity in retirement’. Homeownership in Australia is closely tied to tax deductions and benefits, especially those reaching retirement age. The scheme proposed by Aus Super and Assemble incentivises ownership after a renting period (Rent to Buy).
- In this model, tenants rent for an estimated 5-year period, after which they are encouraged to purchase the property. As previously noted (see Case study 1), this model involves Aus Super for a predefined period (i.e., two years during the construction period and five years during the assets life). The reason for this agreement to be shorter than the one observed in Case Study 1 (i.e., 12 years) may respond to the costs associated with land ownership (in this case, the land is privately owned by the investor, which will retain property in perpetuity).
- The service offering of renting as a collective, managing the communal spaces, maintenance, collective buying, financial management advice, etc., concludes at the 5-year mark. Unclear if communal spaces become spaces managed by the body corporate or sold off as commercial spaces (especially ground floor offerings), which could be another way to offset the cost of the units. But if the size and amenity of individual apartments is reduced because of communal spaces, and these then become unavailable if sold off, the risk is a glut of poor-quality dwellings.
- Rent does not contribute to deposits or repayments, which removes the complication of what happens if tenants do not buy at the end of the tenancy. However, tenants offered financial coaching to assist them in saving the deposit necessary. All costs for their housing are fixed during those five years (rent, services, etc.), which also helps in ensuring an ability to purchase. = a part of the model that helps overcome a barrier to ownership
- To further assist in stabilising the cost of living while saving the purchase deposit, an app facilitates the collective discounted purchasing of as much as possible at a building level to reduce the cost of housing during the tenancy (services, data, car, toilet paper etc.- 20% discount noted). But could also be a way to ensure occupation aligns with operation from a green credential perspective and, in some models that were long term BTR, could be another space to offer a profitable service that helps offset upfront cost.
- Mixed tenancy of ‘affordable’ and market dwellings, noting that the three-bed, two-bathroom units are not part of the available ‘affordable’ stock.



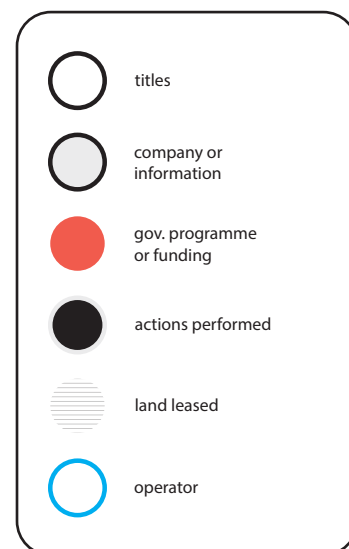
## Case study 3: Assemble

EMERGING AUSTRALIAN HOUSING MODELS  
CRC 23: When prefab hits the ground

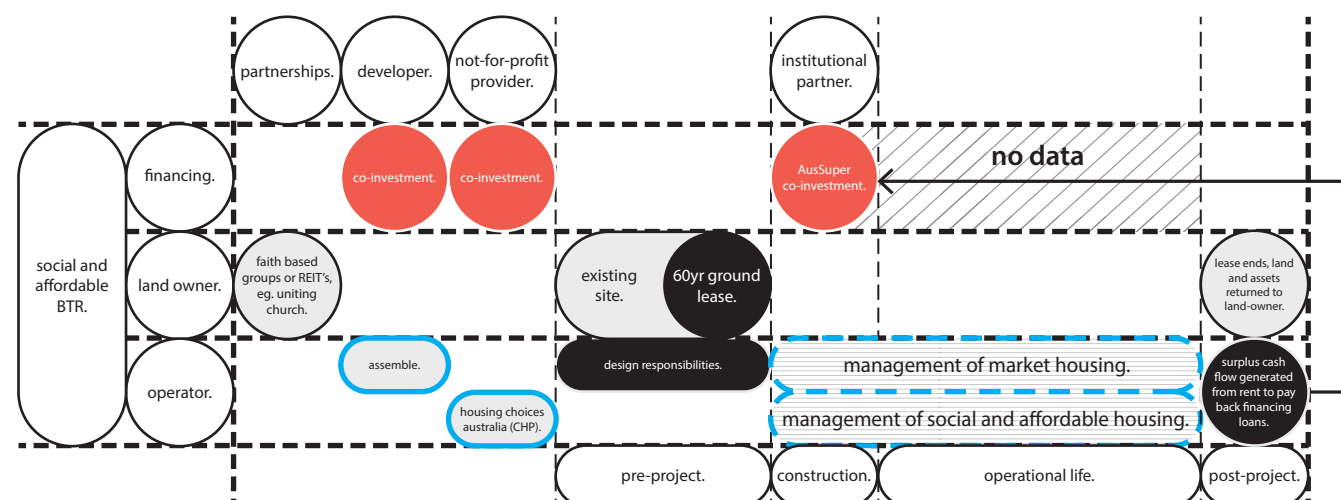


assemble futures				
15 Thompson St, Kensington.				
project.	8 story, 198 units	designed by hayball	\$111m est. value.	
housing type.	70% affordable housing.	30% market housing.		
bedrooms.	32	25	104	37
median unit rental cost.	\$395pw	\$455pw	1 bath: \$585pw 2 bath: \$685pw	1 bath: \$825pw 2 bath: \$900pw
median fixed unit purchase cost.	\$508.7k	\$593.7k	1 bath: \$780k 2 bath: \$892.5k	1 bath: \$1.062m 2 bath: \$1.267m
2021 est. market value in Kensington				
median unit rental cost.	-	\$330pw	\$400pw	\$580pw
median fixed unit purchase cost.	-	\$415k	\$535k	\$1.061m

NOTE: 15 Thompson St, Kensington is to start construction in 2023. Rent is subject to a 2.5% per annum increase, property price is fixed.



legend.



NOTE: investment into social and affordable BTR models occur after BTRTO developments.

assemble **BTRTO** and **social and affordable BTR**.

## Case study 3: Assemble

EMERGING AUSTRALIAN HOUSING MODELS

CRC 23: When prefab hits the ground



