Government of JERSEY

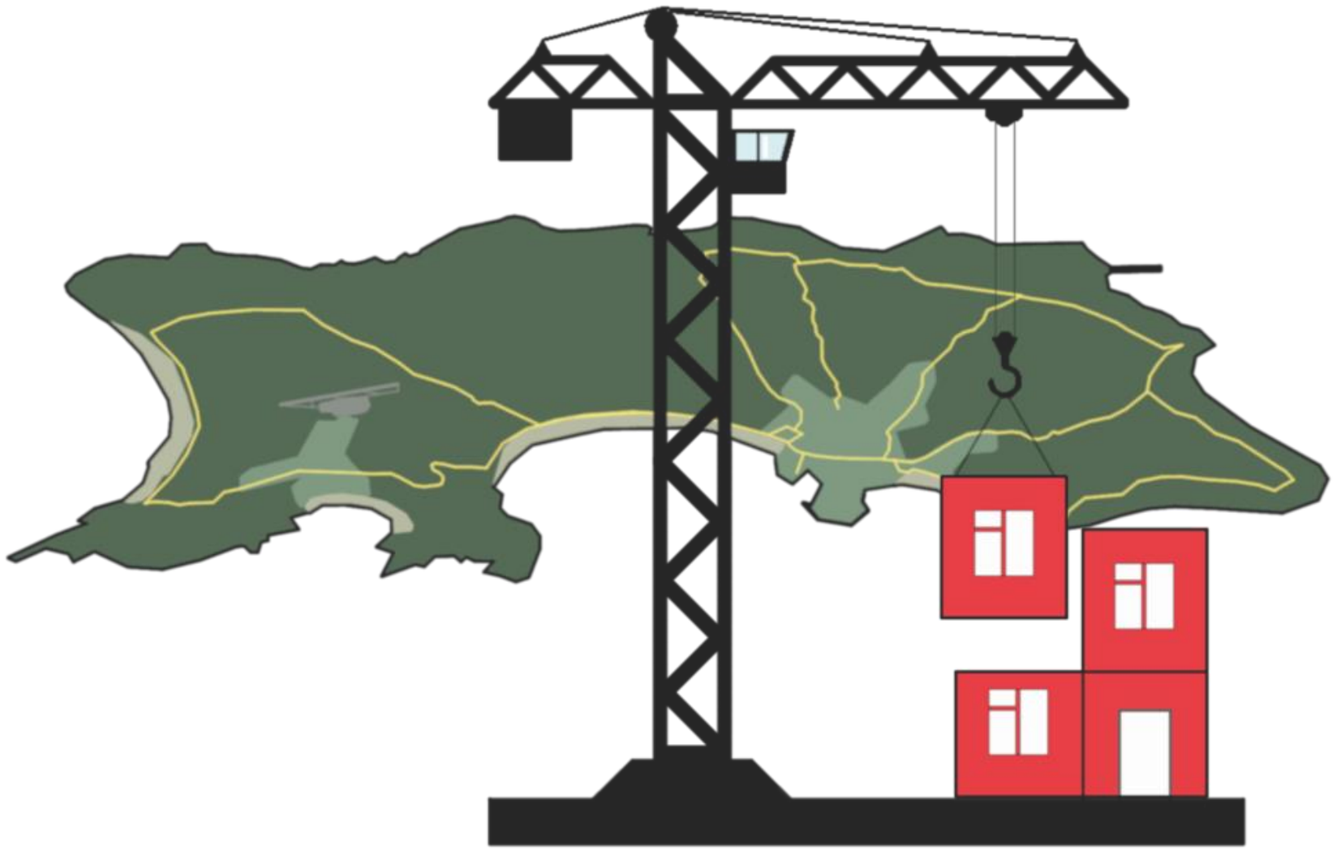
ARUP

Government of Jersey

# MMC Report

## High-level Precursor Study
## Summary Report

Final Submission
March 2022



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# Section 1
# Introduction

## ABOUT THIS STUDY

### BACKGROUND

The Minister for Housing and Communities has convened a working group to review opportunities and challenges associated with implementing Modern Methods of Construction (MMC) in Jersey

The group includes Con. Le Bailly, Dep. Huelin and relevant officers from SPPP and IHE. The group also includes Andium Homes, who have shown an interest in taking forward MMC in their development programme.

Initial Strengths, Weaknesses, Opportunities and Threats (SWOT) analysis has been undertaken by the Government of Jersey (GoJ), summarised below:

| Strengths | Weaknesses |
|---|---|
| • Political priority and focus.<br>• Strategic policy fit: Island Plan, carbon neutral etc. | • Manufacturing and assembly skills and experience.<br>• Logistics cost of importation. |
| **Opportunities** | **Threats** |
| • Small size gives the ability to coordinate across housing market players inc. to develop new policy.<br>• Government connections with providers.<br>• Likely review of building bye-laws. | • Lack of confidence and understanding commissioners, providers and the public.<br>• On-island logistics and infrastructure. |

**Table 1 - Initial SWOT, GoJ**

### INTRODUCTION

Arup have been appointed by the Government of Jersey (GoJ) to undertake a high-level precursor body of work. This work falls within the “Increasing supply, manage demand” element of the Government’s Action Plan. The work examines the use of Modern Methods of Construction (MMC), with particular emphasis on modular housing, in the context of Jersey. It explores how MMC could assist with increasing housing supply, performance and in turn improve housing affordability. This report aims to summarise our findings and will allow GoJ to make key decisions around viability and determine which aspects they may wish to explore in greater detail.

### SCOPE

Our scope includes consultation with on-island contractors / developers and MMC manufacturers. Consultation is strictly subject to availability given the short timescales of this work.

Our Methodology (Section 3) is centred around responding to four key lines of enquiry:

1. What do industry believe are the technical opportunities and challenges for MMC in Jersey?
2. What do the public think about living in homes that use MMC?
3. Where is MMC being effectively implemented and what can Jersey learn from these schemes?
4. What action can GoJ take to maximise the identified opportunities and address known challenges?

### CONSULTATION

In writing this report, we have consulted with MMC Specialists within Arup, members of the GoJ and industry representatives including:

- Andium Homes
- Jersey Development Company
- Camerons Ltd
- Norman Limited
- ilke Homes Limited
- M-AR Offsite Construction
- Laing O’Rourke
- Stewart Milne Group

# Section 1
# Introduction

## MMC – WHY NOW?

### WHAT IS MMC?

Modern methods of construction - also known as MMC or ‘smart construction’ - is a fast way of delivering new buildings, by maximising the efficiency of material and human resources.

### WHY NOW?

Modern Methods of Construction (MMC) is seeing a significant resurgence in interest and support. Use of manufacturing principles in the delivery of buildings has long been established as a route to improved productivity, quality, reduced cost of delivery and operations and maintenance (O&M) for a wide range of buildings.

MMC has established its credentials and benefits in several sectors of the built environment. Such as hotels, military accommodation, schools, colleges, hospitals and construction accommodation. The combined value proposition of speed of construction, improved programme certainty and minimisation of disruption offer distinct and compelling advantages over traditional construction methods.

Key performance indicators (KPIs) cited as the reason why MMC was selected over alternative methods include:

- Early revenue providing enhanced Return On Investment (ROI)
- Improved safety and security throughout construction and installation.
- Minimal disruption to normal operations on or around the site.
- Programme certainty
- Less reliance on traditional construction skills which are recognized as being in short supply

Each sector of the built environment has its own drivers and the benefits case for MMC can be measured and in many cases monetarised to establish a value proposition that is relative to alternative construction methods.

### THE HOUSING CHALLENGE

MMC for housing is potentially a huge growth sector. Governments around the globe are turning to MMC in order to fix broken housing markets. Globally the MMC markets are forecast to grow at over 7% CAGR[1] and there are a common set of drivers; a reported crisis in availability of housing and the undersupply of housing over the past few decades.

As part of a range of issues that include planning, skills, productivity and the structure of housing delivery many governments specifically outline the opportunity to build better cheaper and faster using MMC.

Taking the UK for example, political support for MMC in housing is not new. The benefits have been discussed for many years, reports include; Latham 1994, Egan 1998, Barker 2004, and more recently Farmer 2017. All recommending investment and innovation in industrialised construction, particularly production of housing, each report building stronger recommendations for MMC. This aligns with other industrial and technological advances. In addition, the McKinsey Global Institute report ‘Reinventing Construction – a route to higher productivity’ highlights the huge productivity gap between construction and manufacturing estimating the opportunity at an additional $1.6 trillion of value that could be added to construction if the industries moved to manufacturing style production systems.

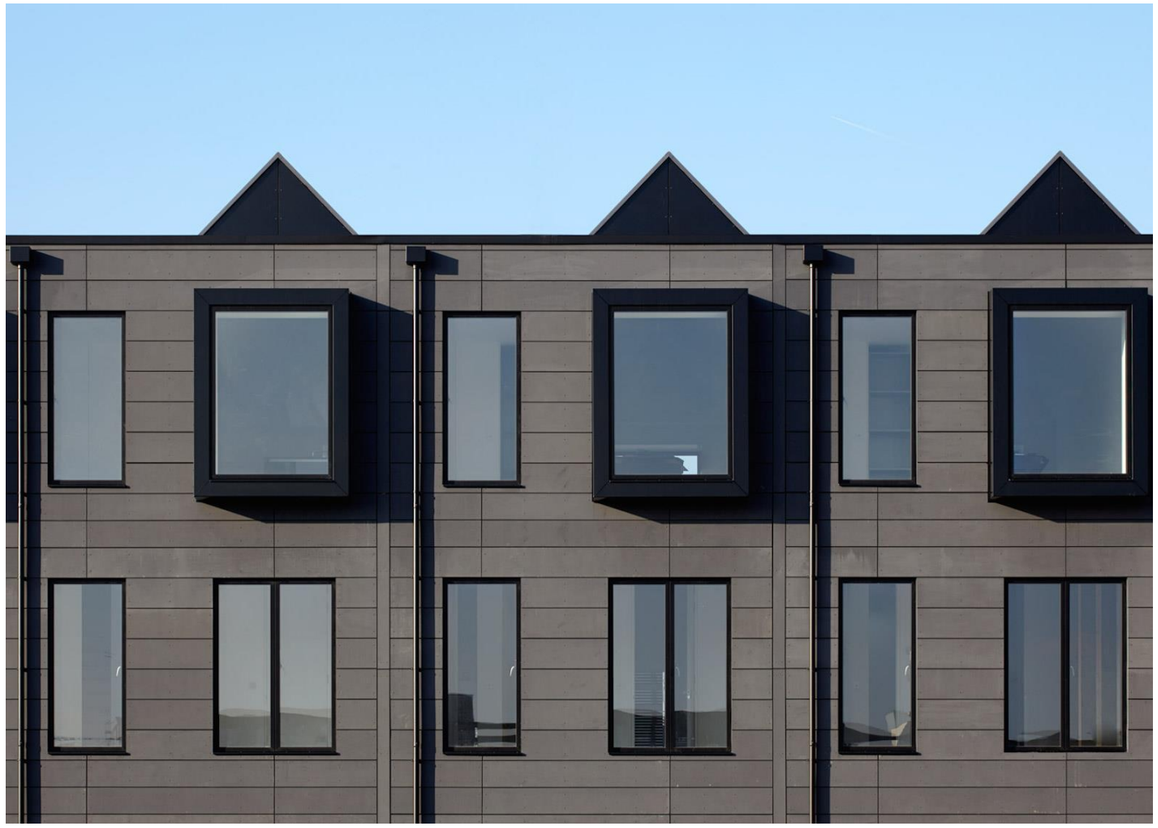


Image 1 - hoUSe by Urban Splash

### References

[1] Arup’s own market research into ‘Global Growth of Off-site Manufactured Housing’.

# Section 1
# Introduction

## DEFINITION, EXPLANATION

### MMC CATEGORIES

The Department for Levelling Up, Housing and Communities (DLUHC), UK (formerly MHCLG), Joint Industry Working Group have devised a MMC definition framework. The seven categories enable a full and future proofed range of Modern Methods of Construction' used in homebuilding and allow them to be better understood with regularised terminology. The definition framework spans all types of pre-manufacturing, site, materials and innovative processes.

### BUILDING TYPOLOGY

Common typology utilised across MMC, and construction include:

- Houses
- Low rise apartments – less than 5 storeys
- Mid rise apartments – between 6-9 storeys
- High rise apartments – 10 storeys and above.

### CATEGORIES CONSIDERED

Within the scope of this report, we have considered primarily systems covered in Categories 1 & 2 as the options with higher off-site value added and thus the lowest demand for site-based labour and in particular traditional trades. The logic being that the immediate short term need for housing will require a higher degree of off-island work carried out in established factories. There are options discussed that fit into Categories 3 & 5 namely pre-cast elements that are configurable to form the structure for apartment buildings (which was the focus of discussions with Laing O'Rourke). There are strong examples on-island of Category 5 use, in the form of volumetric kitchen and bathroom pods, supplied from either UK or European suppliers.

Finally, as part of a longer-term consideration of the islands needs and not limited to housing, we have considered potential to develop or utilise new emerging technologies which may fall into Category 7.

| Category 1 | Category 2 | Category 3 | Category 4 | Category 5 | Category 6 | Category 7 |
|---|---|---|---|---|---|---|
| **Pre-manufacturing (3D Primary Structural Systems)**<br>A systemised approach based on volumetric construction involving the production of three-dimensional units in controlled factory conditions prior to final installation. Volumetric units can be brought to final item in a variety of forms ranging from a basic structure only to one with all internal and external finishes and services installed, all ready for installation.<br>The system includes structural performance. Full volumetric units in apartment buildings can include apartment space and common areas space. Mini volumetric structural units can include bathroom pods and the like which are structurally stacked and loaded. | **Pre-manufacturing (2D Primary Structural Systems)**<br>A systemised approach using flat panel units used for basic floor, wall and roof structures of varying materials which are produced in a factory environment and assembled at the final workface to produce a final three-dimensional structure. The most common approach is to use open panels, or frames, which consists of a skeletal structure only, with services, insulation, external cladding and internal finishing being installed on-site. More complex panels – e.g., closed panels – involve more factory-based fabrication and include lining materials and insulation. These may also include services, windows, doors, internal wall finishes and external claddings. | **Pre-manufacturing (non-systemised primary structure)**<br>Use of pre-manufactured structural members made of framed or mass engineered timber, cold rolled or hot rolled or pre-cast concrete. Members to include load bearing beams, columns, walls, core structures and slabs that are not substantially in-situ workface constructed and are not part of a systemised design. This category, although focused on superstructure elements, would also include sub-structure elements such as pre-fabricated ring beams, pile caps, driven piles and screw piles. | **Additive Manufacturing (Structural & Non-structural)**<br>The remote, site based or final workplace-based printing of parts of buildings through various materials based on digital design and manufacturing techniques. | **Pre-manufacturing (Non-Structural Assemblies & Sub-assemblies)**<br>A series of different pre-manufacturing approaches that includes unitised non-structural walling systems, roofing finish cassettes or assemblies (where not part of a wider structural building system), non-load bearing mini-volumetric units (sometimes referred to as 'pods') used for the highly serviced and repeatable areas such as kitchens and bathrooms, utility cupboards, risers, plant rooms as well as pre-formed wiring looms, mechanical engineering composites, would fall into this category.<br>Conventional masonry schemes utilising conventional building products such as windows and doors – are not considered sub assemblies in this category. | **Traditional Building Product Led Site Labour Reduction / Productivity Improvements**<br>Includes traditional single building products manufactured in large format, pre-cut configurations or with easy jointing features to reduce extent of site labour required to install. | **Site Process Led Site Labour Reduction / Productivity / Assurance Improvements**<br>This category is intended to encompass approaches utilising innovative site-based construction techniques that harness site process improvements falling outside the five main pre-manufacturing categories 1-5 or materials innovation in Category 6. This category would also include factory standard workface encapsulation measures, lean construction techniques, physical and digital worker augmentation, workplace robotics, exoskeletons and other wearables, drones, verification tools and adoption of new technology led plant and machinery. |

# Section 1
# Introduction

## DEFINITION, EXPLANATION

### SUPPLEMENTARY NOT REPLACEMENT

MMC is never going to entirely replace traditional house building. It is however likely to grow to become a part of the delivery process with new and different systems becoming commonplace for different applications, much the same way that prefabricated trusses have become the norm for constructing pitched roofs.

There are a number of drivers that are effectively promoting the uptake and investment in MMC. Housing shortages being the primary but also the need for better performing housing stock, with lower $CO_2$ both embedded and in use. This is achieved through improved energy performance engineered into designs and made possible using manufacturing techniques and equipment rather than hand / eye coordination of the tradespeople (i.e. traditional housebuilding). In addition, it is the shortage of those skilled trades that is opening doors for investment in MMC.

Given the lack of supply of housing over the past few decades traditional housebuilders have contracted to meet levels of investment and associated build rates. As a result the skilled trades required for building have become increasingly in short supply and as with every other commodity short supply means higher costs.

This has been a common trend globally but particularly in the UK where the ratio of construction workers retiring from the industry is almost three times the rate at which new construction apprentices are being trained. This growing skills shortage is further compounded by the effects of BREXIT and the exacerbation of overseas trades people returning to their home economies or to alternative markets.

So, despite UK government figures suggesting that a build rate of over 300,000 new homes per year is needed to address the shortfall to meet the domestic need, the actual number of all new homes built in the UK pre-covid in 2019 was just over 214,000. A shortfall of over 80,000, due in no small part to growing skills shortages, and as long as the shortfall continues the lack of supply will worsen.

### PART OF THE SOLUTION

According to the Royal Institution of Chartered Surveyors (RICS) of the c.214,000 homes delivered in the UK in 2019 only around 8% were delivered using MMC systems. Nevertheless, RICS are predicting a rise over the next 10 years up to around 20% which will align the industry in the UK with some of our more developed European neighbours.

Already we are seeing significant investments in capacity from government, banks and overseas investors particularly focussed on volumetric manufacturers. The capacity to deliver is already established in many cases and the UK manufacturers that we have engaged with have both the experience and interest in delivering to the Channel Islands. The opportunity for Jersey is therefore to capitalise on the growth of the UK MMC market and that of some of the established key European suppliers to identify how and where their systems and service offerings can supplement the existing capacity on the island.

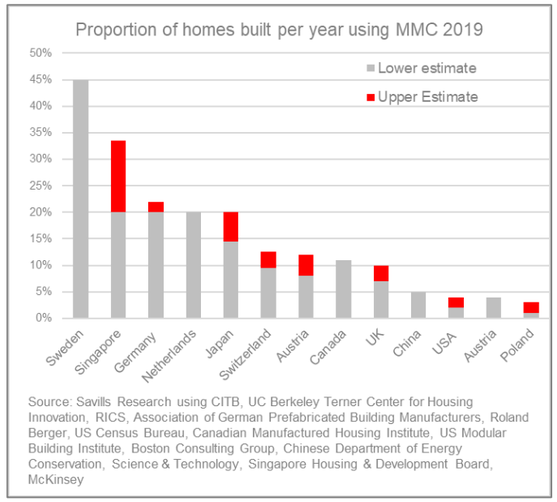



**Figure 1**
**Source: Savills Research**

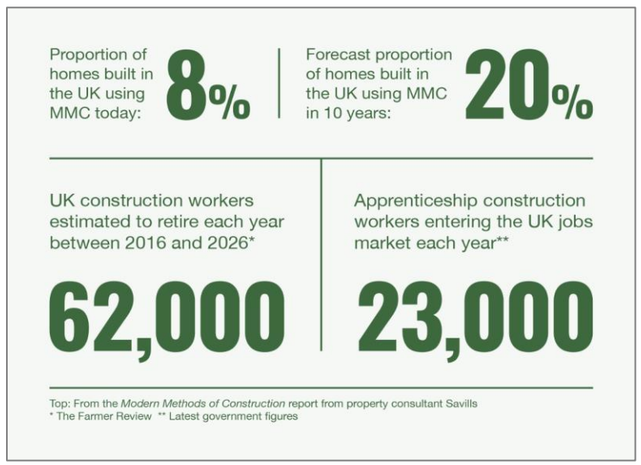



**Figure 2**
**Source: RICS - Why 2020 is the year of modular.**

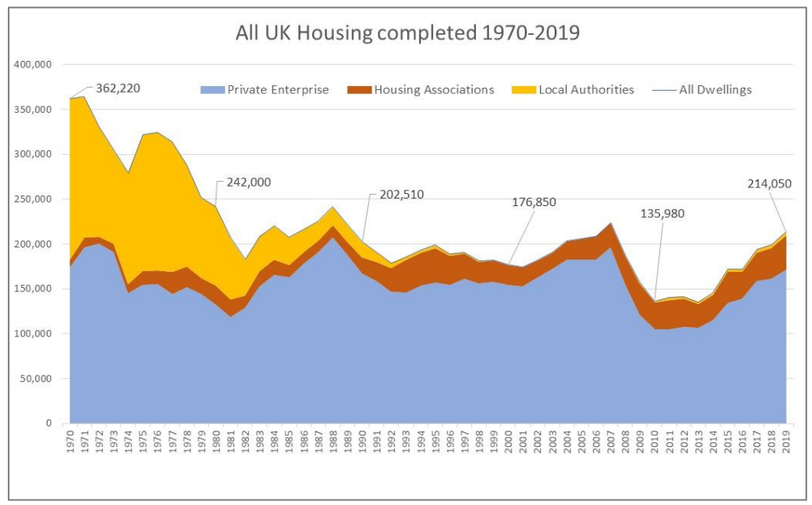



**Figure 3**
**Source: ONS.gov.uk - House building, UK: permanent dwellings started and completed**

# Section 1
# Introduction

## MEETING COP26 AND OTHER ASPIRATIONS

### ZERO CARBON

Adopting MMC can significantly reduce the embodied carbon of a building or structure. Manufacturing processes produce much less carbon as the build is completed 90% offsite and with less labour required to build. Most of the people working on the building live relatively close to the factory so are more likely to car share, walk, cycle or use public transport to get to work.

Research by Arup Research and Development has shown that up to 67% less energy is required to produce a modular building than a traditionally constructed building. This is due to a number of features of offsite construction including waste reduction, building materials, the energy efficiency of manufacturing processes, the ability to dismantle, relocate and recycle buildings, and reduced road miles and vehicle emissions compared to traditional construction projects.

If we are to achieve the dual challenge of reaching carbon neutrality while meeting housing demand targets, sustainable construction will be crucial. In the end, we have an obligation to future generations to find better ways to build, to ensure that the homes we create meet the needs of today without compromising the needs of the future.

### PASSIVHAUS

Arup have already undertaken a 'PassivHaus Planning Policy Review'. We understand this to be an important part of the Draft Island Bridging Plan.

MMC shares similarities. PassivHaus is a rigorous comfort, quality and energy standard proven to deliver high-performing buildings with excellent user comfort and satisfaction. MMC is relatable in the sense that it provides a route to delivering projects more efficiently and with less waste.

There are PassivHaus certified two-dimensional systems ranging from wall or roof constructions to full-build systems. These are essentially PassivHaus flat pack homes. Examples include German Manufacturer, K-HAUS.

Volumetric is more complex. The ambition of volumetric is to be completely finished in the factory and "zipped up" on site. This makes airtightness and ventilation requirements challenging – both of which are key components of a PassivHaus building. There have been few examples of PassivHaus buildings using this approach and these tend to be of a smaller scale.

Image 2 - K-HAUS Ulm - Semi Detached

# Section 2
# Key Influencing Factors

## IMPORTANT STATISTICS

The key influencing factors when considering the suitability of MMC include:

- Jersey has a population of **107,800 people** (18 June 2020)
- Accounting for previously unmet demand and future demand, Jersey's objective housing development target is **3,875 homes** over the period 2021 to the end of 2025, in addition to 125 key worker homes. New homes will comprise a mix of sizes and tenures, with up to **1,500 homes** specifically for **affordable purchase and affordable rent**.
- Recent years have seen an average annual build rate of **400 homes per annum**.
- Between 2019 – 2021 – the required demand was split approximately 50/50 between flats and houses. The supply however mainly sided with flats. Making the actual split c.60% flats, c.40% houses. This left a shortfall in houses of approx. 2,220 units during this period.

## ARCHITECTURE

The architecture on Jersey is respectfully varied. Today, it features aspects of most architectural styles. Examples of both pre and post-war architecture as well as modern day, contemporary developments.

Jersey has a sensitive landscape and natural environment. Therefore design, in terms of vernacular and the typologies / ability to be able to mass customise in conjunction with MMC, is particularly important.

### Examples of Mass Housing on Jersey

A total of 6,000 dwellings were built in Jersey from 1964 to 1974. During this time, housing had to be provided for a growing population, ranging from rich outsiders to in migration of labour. The States had to start providing mass housing. The pressure to provide a considerable number of housing units on a small island resulted in a number of high-rise housing schemes.

## CARBON NEUTRAL ROADMAP

The Government of Jersey are also developing the Island Carbon Neutral Roadmap, which may include proposals for energy performance standards such as PassivHaus.

## NOISE

Noise associated with demolition and construction sites is restricted to 08:00 to 18:00 (Monday to Friday) and 08:00 to 13:00 (Saturday). Noisy works are not permitted on a Sunday or Bank Holiday. This can be enforced by an abatement notice under the Statutory Nuisances (Jersey) Law 1999.

## PORT & ROAD NETWORK

### Port

The Port of Jersey (St Helier) provides commercial services to the island. It has regular ferries to France and the UK. 98.6% of all goods enter Jersey via the port. Key metrics include:

- Approximate annual tonnage of 600,000.
- Storage 2,000m² (Open), 500m² (Covered).
- Cargo Handling Facilities: 6x Railed mounted (10T), 2x Scotch derrick (30T), 2x Linkspans (180T)
- Max depth: 6.0m (Roll-on/roll-off)
- Max size of vessel accepted: Beam - 25m, Length overall - 130m, Draft - 5.8m
- No of berths: 9 including passenger.
- Berths total length: 800m

### Road Network

Weights and dimensions are more restrictive than the UK.

- Width restriction of 2.3m
- There is no specified height restriction, however it should not generally be greater than 3.65m.
- Rigid vehicles are restricted to 9.3m in length.
- Articulated vehicles restricted to 11m in length.
- Draw bar trailers restricted to 6.7m in length.
- Maximum weight restriction of 32 tonnes (with a maximum of 10.5 tonnes per axle).

Anything in excess of the above dimensions and or weight limit must seek the required permissions from the Traffic Services Officer.

## ECONOMY & SKILLS

### Economy

**The Jersey economy is dominated by finance.**

Jersey is largely a service economy. It is dominated by financial & legal activities (22%) which accounts for the largest share of employment. This is followed by wholesale & retail trades (13%), private sector education, health & other services (13%) and the public sector (13%). Other substantial sectors include hotels, restaurants & bars (11%), construction & quarrying (9%) and miscellaneous business activities (8%). The Island also has a small but growing sector engaged in computer & related activities.

An economy dominated by finance, coupled with a high concentration of financial investment institutions could make the potential innovation and generation of Intellectual Property (IP) commonly associated with MMC an attractive proposition for businesses / individuals of high net worth on-island.

### Skills

Jersey has seen a rise in service sector employment and decline in production and manufacturing. This is typical of the long-term trends seen in the UK, where these sectoral trends are accompanied with a rise in managerial, professional, associate professional & technical, caring, leisure & other service and elementary occupations and a decline in administrative & secretarial, skilled trades and process, plant and machine operatives.

The decline in skilled trades and process, plant and machine operatives supports the need to deskill aspects of construction.

# Section 2
# Key Influencing Factors

## BUILD COST

One development barrier highlighted for Jersey is the perceived high cost of development (land and build costs). The Building Cost Information Service (BCIS) data can be used to gain insight into the average build costs on-island.

Through consultation, indicative MMC volumetric build costs would appear mostly comparable with traditional build costs. Coupled with its combined value proposition of speed of construction, improved programme certainty and minimisation of disruption it offers distinct and compelling advantages. The build costs provided are heavily dependent on site particulars and level of specification. Further verification by a cost consultant is advised. Costs include direct provision of build teams, via the manufacturers, to guarantee labour / skills.

| Average Build Costs | £/m² |
|---|---|
| Detached House, 2 Storey | 1,360 |
| Semi-detached House, 2 Storey | 1,363 |
| Terraced House, 2 Storey | 1,383 |
| Flats (Apartments), 6+ Storeys | 1,997 |

Table 2 - 2019 Average Build Cost

| Volumetric Build Costs | Indicative Build Cost - Volumetric (Inc. Shipping from Mainland UK) |
|---|---|
| Detached House, 2 Storey | £1,250-1,450 / m² |
| Semi-detached House, 2 Storey | |
| Terraced House, 2 Storey | |
| Flats (Apartments), 6+ Storeys | £2,100-£2,300 / m² |

Table 3 – Volumetric Build Costs

Image 3 - Credits: Pollard Thomas Edwards, Housing - Good Practice Examples 2021

# Section 3
# Housing Need & Supply

## THE NEED

Jersey's Objective Assessment of Housing Need (2019) is clear that more housing is required in Jersey over the coming years. While migration is an important determinant of population and household change in Jersey, the need for more homes exists regardless of migration, due to population trends such as increasing life expectancy and reductions in the average size of households .

Moreover, housing need is not solely comprised of future need. Need figures should account for any backlog of unmet need under the previous Island Plan (2011-2020).

As an example, Table 4 presents the expected shortfall and surplus of different types of homes over the three-year period 2019-2021. The overall net shortfall of dwelling units is 2,750.

Table 5 examines the expected supply-demand balance over 2019-2021 by tenure type, revealing that the majority of potential shortfall is for owner-occupied properties.

The Draft Bridging Island Plan covers a three-year plan period from 2022-2025. However, the Plan takes a five-year view of housing supply (2021-2025). Accounting for previously unmet demand and future demand, Jersey's objective housing development target is **3,875 homes** over the period 2021 to the end of 2025, in addition to 125 key worker homes. New homes will comprise a mix of sizes and tenures, with up to **1,500 homes** specifically for **affordable purchase and affordable rent**.

## SUPPLY

The States of Jersey have set a new-build target which requires a notable increase in average annual build rates (in recent history, this rate has been about 400 homes per annum).

The Housing Land Availability and Assessment of Sites (2021) has informed the Draft Bridging Island Plan's estimation of where new-build housing supply will come from during the plan period. Table 6 sets out the main sources of supply expected to deliver the housing target.

The use of government-owned land to help meet the need for affordable homes is identified as a clear policy objective of the Island Public Estate Strategy 2021-35. A number of government-owned sites within the Island's built-up areas are expected to be released to arms-length housing bodies and housing trusts during the plan period for residential development, supply up to 425 affordable homes.

In addition to releasing sites within the built-up area, the States propose through the Draft Bridging Island Plan to rezone (release) some greenfield land around the edge of the island's existing built-up areas for affordable housing. Sixteen such sites, totalling circa 13 hectares across seven parishes, are identified in the Draft Plan. Together, these sites are expected to supply around 450 affordable homes over the plan period. If development of affordable homes has not commenced on these sites within three years of the Bridging Island Plan's approval, the States may utilise its compulsory purchase powers to expedite housing delivery.

| Type / size | | Total supply | Total demand | Surplus | (Shortfall) |
|---|---|---|---|---|---|
| Flat | 1 bed | 3,960 | 4,270 | ... | (310) |
| | 2 bed | 1,810 | 1,910 | ... | (100) |
| | 3 bed or more | 300 | 350 | ... | (40) |
| House | 1 bed | 460 | 780 | ... | (320) |
| | 2 bed | 960 | 1,880 | ... | (920) |
| | 3 bed | 1,650 | 2,710 | ... | (1,060) |
| | 4 bed or more | 1,220 | 1,140 | 70 | ... |
| | **Total** | **10,360** | **13,040** | **70** | **(2,750)** |

**Table 4 Surpluses and shortfalls (supply-demand) by type and size of dwelling, three-year totals 2019 - 2021 (Statistics Jersey)**

| Tenure / size | Owner-occupier | Social housing | Entitled / licensed private rental | Registered accommodation | Total |
|---|---|---|---|---|---|
| 1 bed | (230) | (190) | 0 | (210) | (630) |
| 2 bed | (520) | 0 | 20 | (520) | (1,020) |
| 3 bed | (960) | 90 | (240) | 30 | (1,090) |
| 4 bed or more | (130) | 0 | 80 | 100 | 60 |
| **Total** | **(1,830)** | **(100)** | **(140)** | **(600)** | **(2,680)** |

**Table 5 Surpluses and shortfalls (supply-demand) by tenure and size of dwelling, three-year totals 2019 - 2021 (Statistics Jersey)**

| Supply source | | Five-year supply estimate 2021-25 | |
|---|---|---|---|
| | | Affordable | Open Market |
| Under construction (end 2020) | | 625 | 700 |
| Planning permission (March 2021) | | 0 | 700 |
| Town Capacity | Private sites | 0 | 600 |
| | Government/approved housing provider sites | 425 | 150 |
| Windfall (outside of Town) | | 0 | 500 |
| Rezoning - strategic extension sites | | 150 | 0 |
| Rezoning - suburban extension sites | | 150 | 0 |
| Rezoning - rural extension sites | | 150 | 0 |
| Total estimated supply | | 1,500 | 2,650 |
| | | 4,150 | |

**Table 6 Sources of housing supply (Government of Jersey, 2021)**

# Section 4
# Methodology

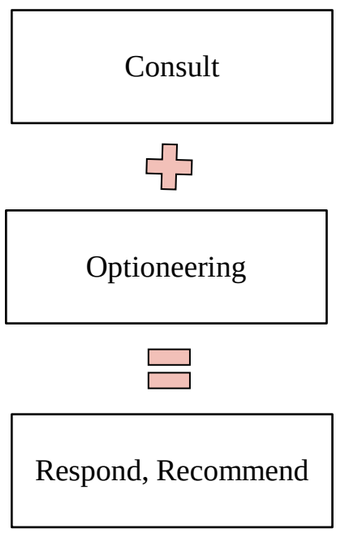
## OUR APPROACH

In term of our approach to this body of work, firstly, we started by consulting.

Consultation included both members of the Government of Jersey and industry representatives. This included local contractors, developers, suppliers and UK based MMC manufacturers.

We then commenced an optioneering exercise. Exploring the ‘art of the possible’ in relation to the adoption of MMC in the context of Jersey.

Through consultation and optioneering, we were then able to answer the key lines of enquiry and provide recommendations (including next steps).




## KEY LINES OF ENQUIRY

Our methodology is centred around responding to four key lines of enquiry:

1. **What do industry believe are the technical opportunities and challenges for MMC in Jersey?**

   We have utilised both expertise and consultation with key industry players (where available) to answer.

2. **What do the public think about living in homes that use MMC?**

   We have conducted research and gather feedback from key industry players (where available) to answer.

3. **Where are MMC being effectively implemented and what can Jersey learn from these schemes?**

   We have used existing connections (where available) to research & gather feedback from key industry players.

4. **What action can GoJ take to maximise the identified opportunities and address known challenges?**

   We have investigated and utilised expertise to conduct high level due diligence in relation to cost, scale, collaboration / partnerships and opportunities to provide thoughts in relation to how the government can support.

Image 4 - ilke Homes, Exmouth Junction Scheme from Eutopia Homes

# Section 5
# Optioneering

## OPTIONEERING

During consultation, numerous options were discussed. These ranged from continuing with business as usual through to development of a flexible space. This could be in the form of a construction and innovation hub. It would not only be used as a staging post for MMC suppliers (delivering the short and medium term need for housing) but also as an innovation centre and support facility for other key infrastructure developments. Ultimately supporting the wider needs of the island.

The following pages describe the options considered. Based on consultation, we have also provided a ‘mini’ SWOT analysis to summarise key points.

As a summary, the following common opportunities and challenges were discussed. These then formed consideration points for our optioneering process. Many of the opportunities and challenges were subjective and could be construed as opinions. Where possible we have tried to filter and validate claims, however items will remain that require further work and ultimately validation.

## KEY CONSIDERATIONS

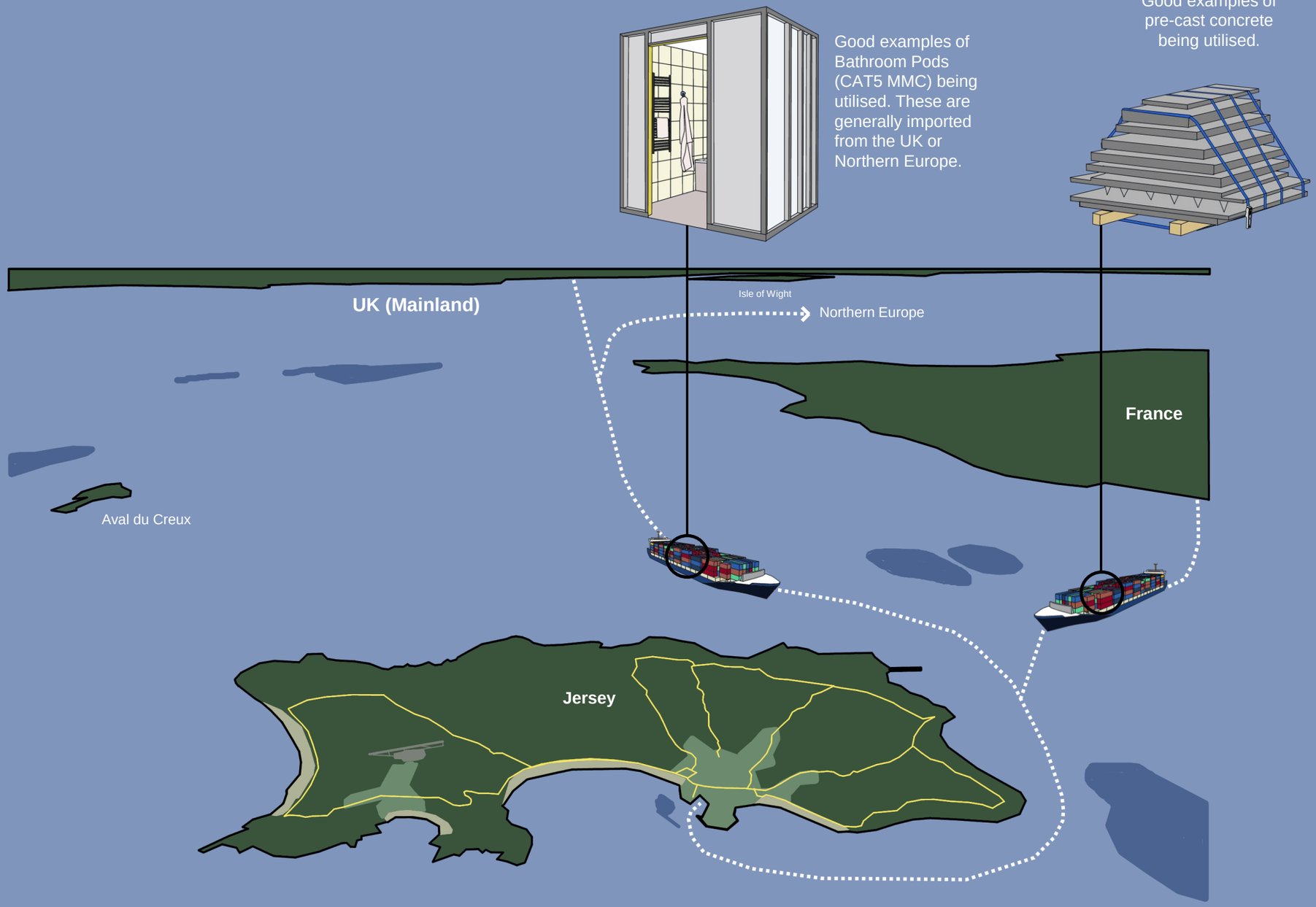
- Skills shortages and cost of labour on the island.
- Global materials shortages.
- Net Zero carbon becoming key driver.
- Cost of bought in materials and logistics
- On island logistics – e.g. 20 ft trailer restriction.
- Volumetric is too expensive because it involves “shipping air”.
- Lack of accommodation for workforce to deliver the housing need.
- Good to have on-island facility to support construction related needs.
- Need to mandate MMC in order to secure investment from suppliers.

**Image 5, 6, 7 - Credits: Ilke Homes**

**OPTIONEERING**

# OPTION 1 – BUSINESS AS USUAL

Island uses pre-fab, some pods from UK / northern Europe. Elements of MMC are already being used which is positive to see. Timber and steel frame construction has been used and supplied through Norman Limited. This could be accelerated if building needs are aligned to the capabilities of the systems that Norman Limited are familiar with. Capacity to assemble on site may prove to be the biggest constraint.




**STRENGTHS**

- There are elements of MMC already utilised.
- Established relationships with limited number of suppliers.

**WEAKNESSES**

- Limitations on labour.
- Limitations on current facility capacity.
- Current reliance on concrete – high embodied carbon.
- Bad weather will halt works.

**OPPORTUNITIES**

- Opportunities to extend the scope of supply within the existing suppliers. To add more value.
- Add more suppliers to strengthen supply / broaden the possibilities.
- Select new innovative products that reduce carbon emissions (i.e. alternative to concrete / cement).

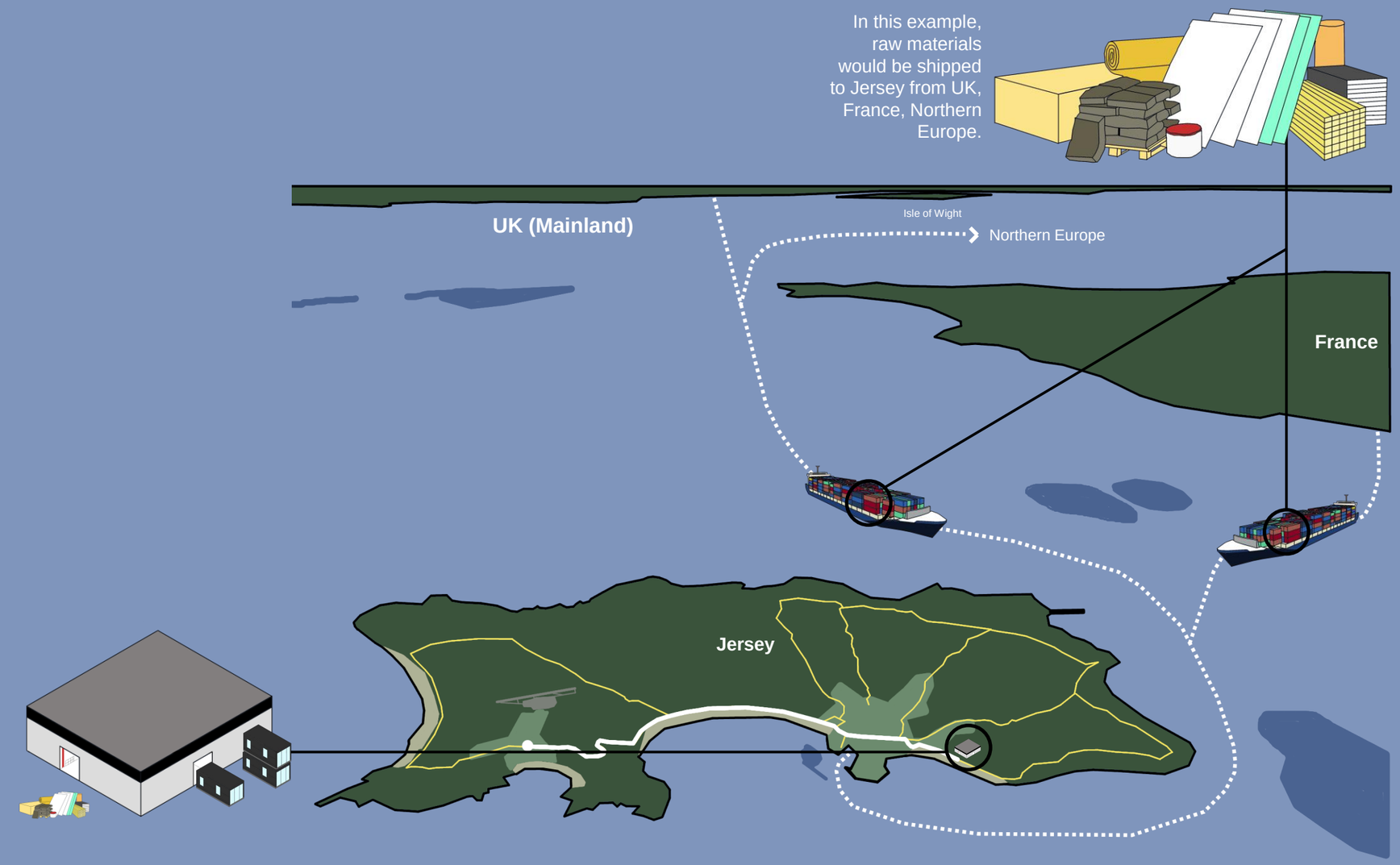
**THREATS**

- Escalating materials and logistics costs.
- Further drain on skilled trades available on-island.
- MMC is growing in popularity globally, risk that Jersey may not be a priority market for increased supply.
- Damage in transit (sea crossing)

# OPTION 2 – SETUP ON ISLAND (VOLUMETRIC)

Realistically developing a stand alone MMC manufacturing capability to meet the immediate needs of the island is not going to be possible. Designing and accrediting the product will take time and establishing a standalone manufacturing capability will take 3-5 years to setup.

A manufacturing facility on-island would be required to convert raw materials into full volumetric modules. Once manufactured these would be transported to construction sites on-island.




**STRENGTHS**

- Ability to cater for own demands.
- Faster than traditional build (once up and running).
- Reduced disruption on-island.
- Better health and safety.

**WEAKNESSES**

- Realistic setup time - 3-5 years. Will not meet immediate demand.
- Limitations on labour. Lack of manufacturing experience.
- c.£20m investment required.
- Long lead time for manufacturing equipment.
- Long lead time for testing and accreditation (BOPAS, NHBC).

**OPPORTUNITIES**

- Partnership with established manufacturer and establish a satellite factory.
- Flexibility to ramp down to steady state once established.

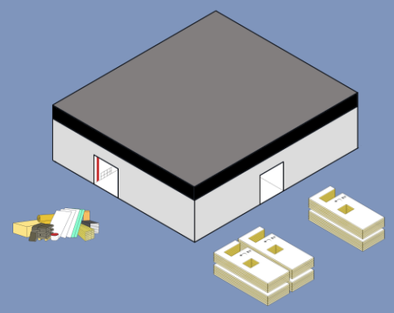
**THREATS**

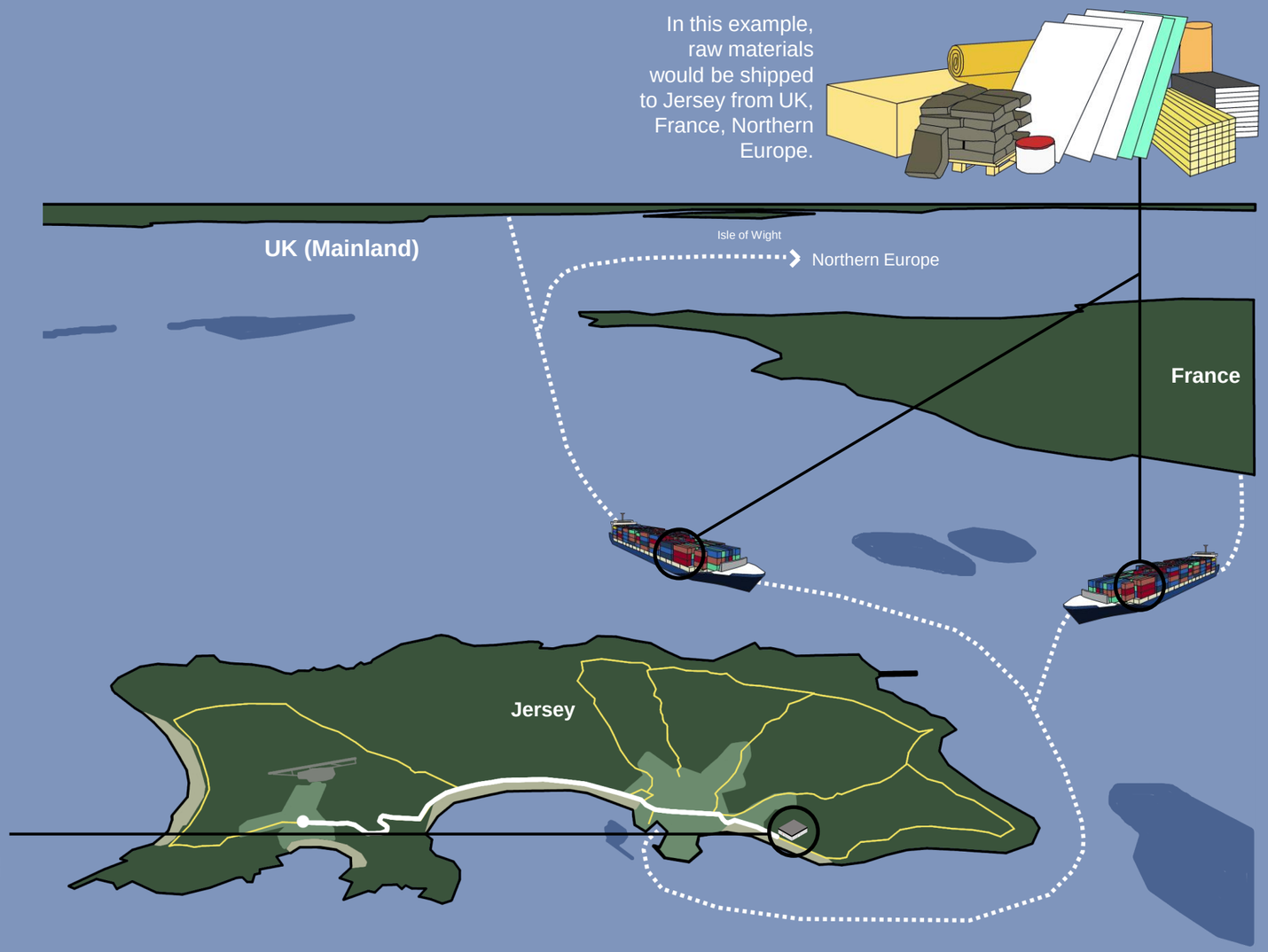
- Full size volumetric poses logistical challenges on-island.
- Escalating materials and logistics costs. Cost of importation - high.
- MMC is growing in popularity globally, risk that Jersey may not be a priority market for increased supply.

# OPTION 3 – SETUP ON ISLAND (PANELISED)

As with volumetric, setting up a two-dimensional panelised system from scratch is not practical to meet the short-term needs. However, a pre-designed system with either the panels pre-manufactured and shipped or a kit of parts which could be assembled in flexible manufacturing / assembly space on the island could be possible (see later options).

A manufacturing facility on-island would be required to convert raw materials into panels. Once manufactured these would be transported to construction sites on-island.






**STRENGTHS**

- Ability to cater for own demands.
- Faster than traditional build.
- Reduced disruption on-island.
- Better health and safety.

**WEAKNESSES**

- Realistic setup time – 18 months min. Risk it may not meet immediate demand.
- Limitations on labour. Lack of manufacturing experience.
- Element of skilled labour required. Currently skills shortage.
- c.£10m investment required.
- Long lead time for manufacturing equipment.
- Long lead time for testing and accreditation (BOPAS, NHBC).

**OPPORTUNITIES**

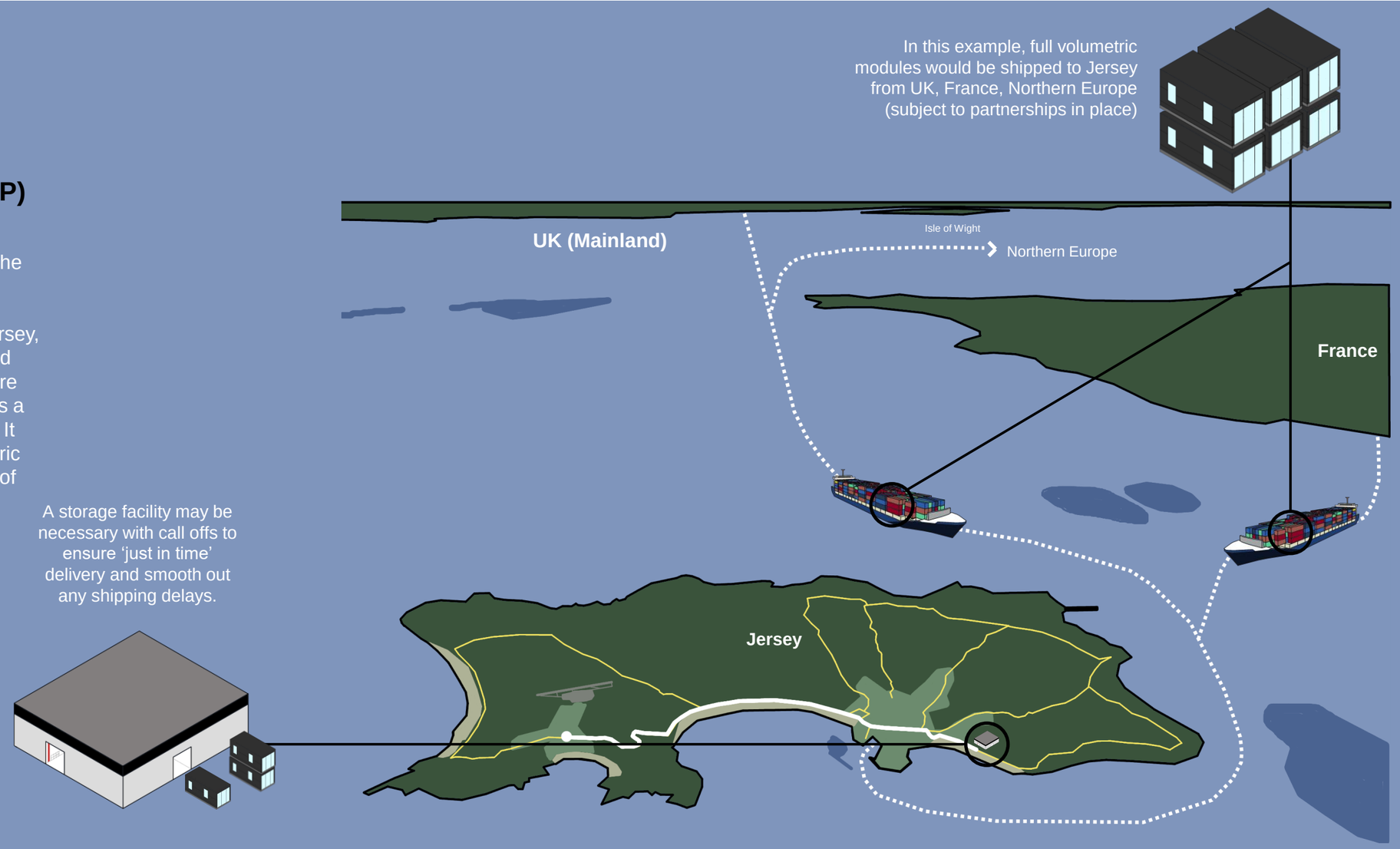
- Partnership with established manufacturer/ pre-designed system and establish a satellite assembly facility may be possible.
- Flexibility to ramp down to steady state once established.

**THREATS**

- Transporting full size volumetric poses logistical challenges on-island.
- Escalating materials and logistics costs. Cost of importation – high.
- MMC is growing in popularity globally, risk that Jersey may not be a priority market for increased supply.

# OPTION 4 – IMPORT VOLUMETRIC (PARTNERSHIP)

Volumetric modules could be shipped to the island. We have spoken to one UK manufacturer already who is currently investigating similar for Guernsey. For Jersey, there are limitations on the application and where this could be used. The modules are typically 8-10m in length and this presents a logistical challenge for the island's roads. It may be possible to use imported volumetric for some of the need but further analysis of cost and application will be necessary.




**STRENGTHS**

- Faster than traditional build.
- Reduced disruption on-island.
- Better health and safety.
- Pre-established product.
- Meets regulations and accreditations.
- Proven concept.
- Ability to meet immediate demand. Switch on, switch off.
- Installation teams organised by manufacturers. Not reliant on on-island skills.
- Low / no capital investment.

**WEAKNESSES**

- Full size volumetric poses logistical challenges on-island.
- Cost of supply – needs further validation.

**OPPORTUNITIES**

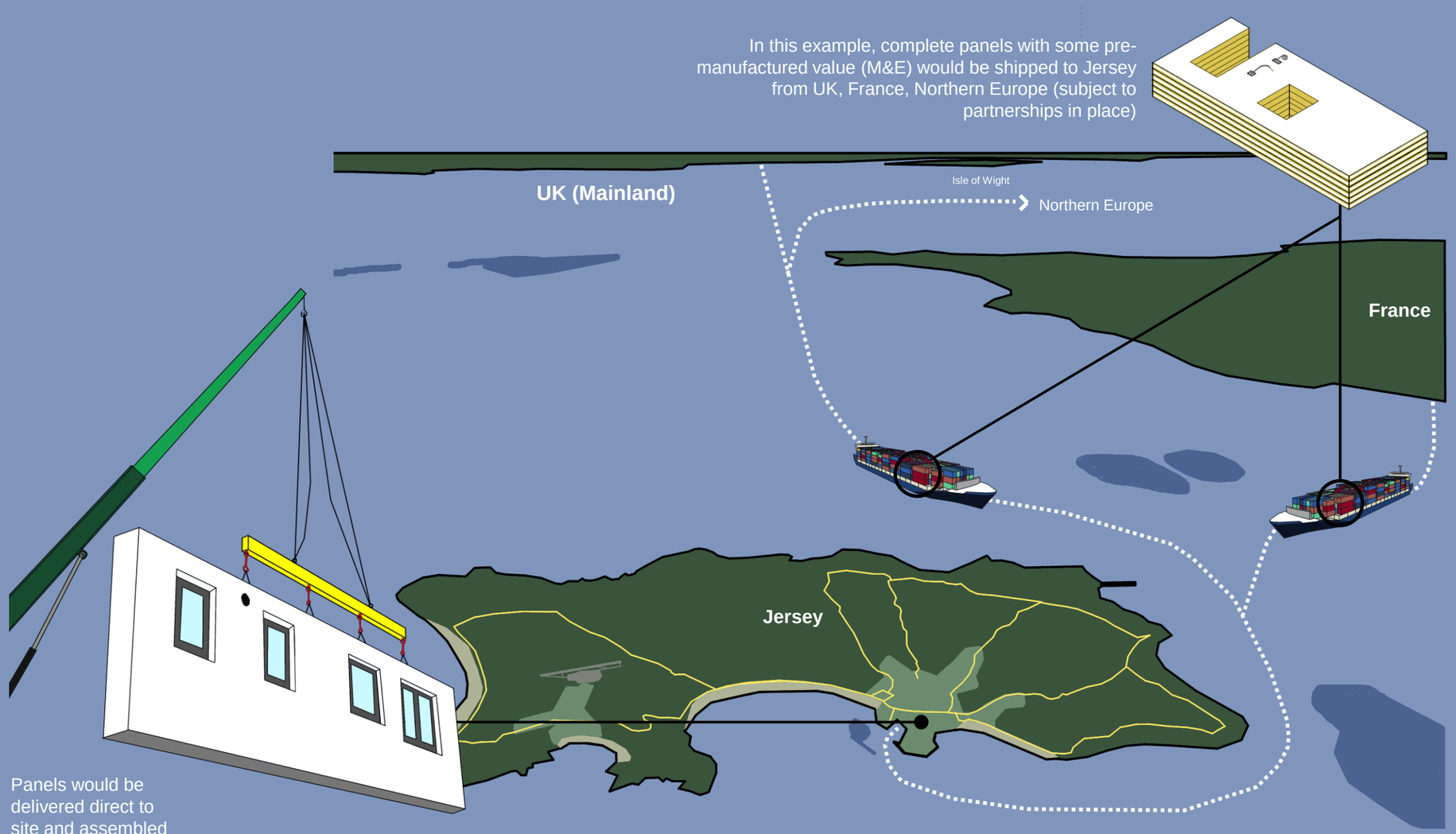
- Multiple sources – framework opportunities and ability to create competition.
- Could service houses, low and mid rise developments.
- Storage facility for 'just in time' delivery.
- Can be tailored for island condition. Durability in coastal environment.
- Ability to charter shipping / vessels to reduce logistic costs (economies of scale).

**THREATS**

- Cost of importation - high.
- MMC is growing in popularity globally, risk that Jersey may not be a priority market for increased supply.
- Weather – ability to meet programme on-site. There has been examples of 8 day periods where ships couldn't sail.
- Ability to meet bye-laws. Needs further validation with selected products.
- Damage in transit – sea crossing.
- Susceptibility to sea / weather conditions.

# OPTION 5 – IMPORT PANELISED & ASSEMBLE (ON-SITE)

Partnering with established two-dimensional manufacturers is possible and Norman Limited have done this for recent developments.




Panels would be delivered direct to site and assembled on-site.

## STRENGTHS

- Faster than traditional build.
- Reduced disruption on-island.
- Better health and safety.
- Pre-established product.
- Meets regulations and accreditations.
- Proven concept.
- Ability to meet immediate demand. Switch on, switch off.
- Installation teams organised by manufacturers. Not wholly reliant on on-island skills.
- Low / no capital investment.
- Smaller loads for transportation than full volumetric. Better product / space densities.
- Integration with PassivHaus aspirations.

## WEAKNESSES

- Full size panels may poses logistical challenges on-island.
- Cost of supply.
- More vulnerable to weather conditions.
- On-site assembly – reduction in programme benefit compared to volumetric and assembly off-site.

## OPPORTUNITIES

- Multiple sources – framework opportunities and ability to create competition.
- Could service houses, low and mid rise developments.
- Storage facility for ‘just in time’ delivery.
- Can be tailored for island condition. Durability in coastal environment.
- Ability to charter shipping / vessels to reduce logistic costs (economies of scale).
- Some additional added value on-island – depending on level of supply. Could add cladding on-site as example or windows and doors.

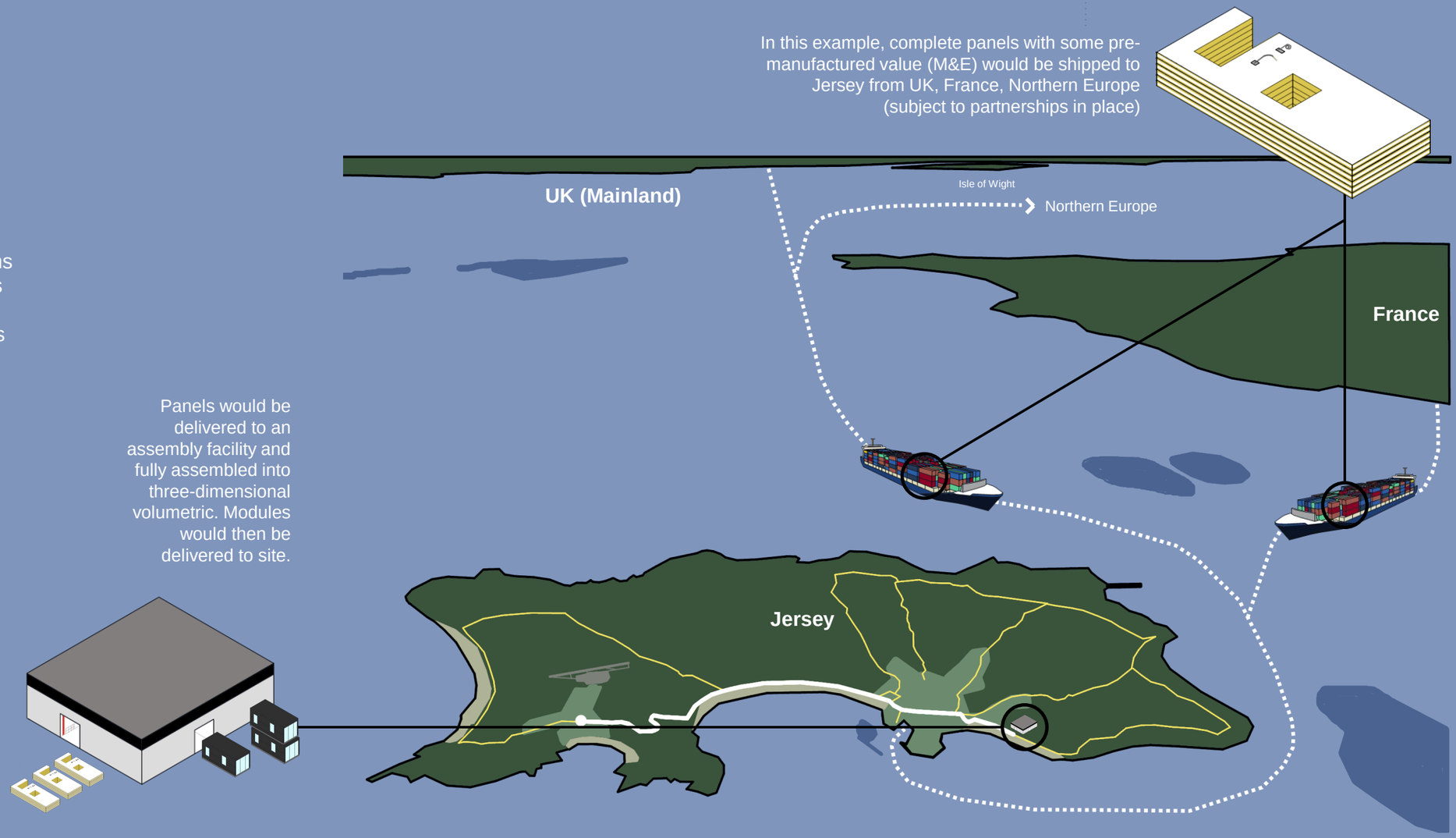
## THREATS

- Cost of importation - high.
- MMC is growing in popularity globally, risk that Jersey may not be a priority market for increased supply.
- Weather – ability to meet programme on-site. There has been examples of 8 day periods where ships couldn’t sail.
- Ability to meet bye-laws. Needs further validation with selected products.
- Damage in transit – sea crossing.
- Susceptibility to sea / weather conditions.

# OPTION 6 – IMPORT PANELISED & ASSEMBLE (OFF-SITE)

This could be possible using existing systems available in the UK and Europe, however, as previously noted the size of full volumetric modules presents a challenge for the islands roads.

In this example, complete panels with some pre-manufactured value (M&E) would be shipped to Jersey from UK, France, Northern Europe (subject to partnerships in place)




Panels would be delivered to an assembly facility and fully assembled into three-dimensional volumetric. Modules would then be delivered to site.

## STRENGTHS

- Faster than traditional build.
- Reduced disruption on-island.
- Better health and safety.
- Pre-established product.
- Meets regulations and accreditation.
- Proven concept.
- Ability to meet immediate demand. Switch on, switch off.
- Low capital investment. Large shed to assemble.
- Smaller loads for transportation than full volumetric (preassembly). Better product / space densities.

## WEAKNESSES

- Full size volumetric (once assembled) poses logistical challenges on-island.
- Cost of supply.
- More vulnerable to weather conditions prior to assembly.
- Labour / skills shortage for assembly purposes on-island.

## OPPORTUNITIES

- Multiple sources – framework opportunities and ability to create competition.
- Could service houses, low and mid rise developments.
- Storage facility for ‘just in time’ delivery.
- Can be tailored for island condition. Durability in coastal environment.
- Ability to charter shipping / vessels to reduce logistic costs (economies of scale).
- Some additional added value on-island – depending on level of supply. Could add cladding as example or windows and doors.

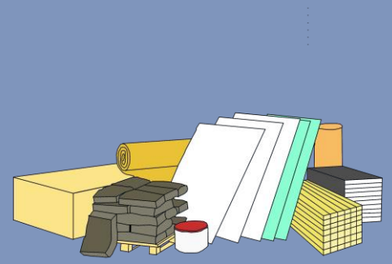
## THREATS

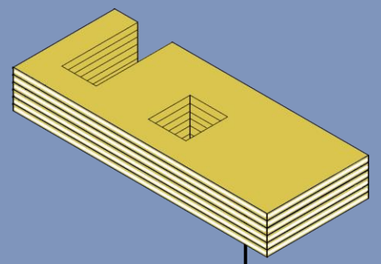
- Cost of importation - high.
- MMC is growing in popularity globally, risk that Jersey may not be a priority market for increased supply.
- Weather – ability to meet programme on-site. There has been examples of 8 day periods where ships couldn’t sail.
- Ability to meet bye-laws. Needs further validation with selected products.
- Damage in transit – sea crossing.
- Susceptibility to sea / weather conditions.

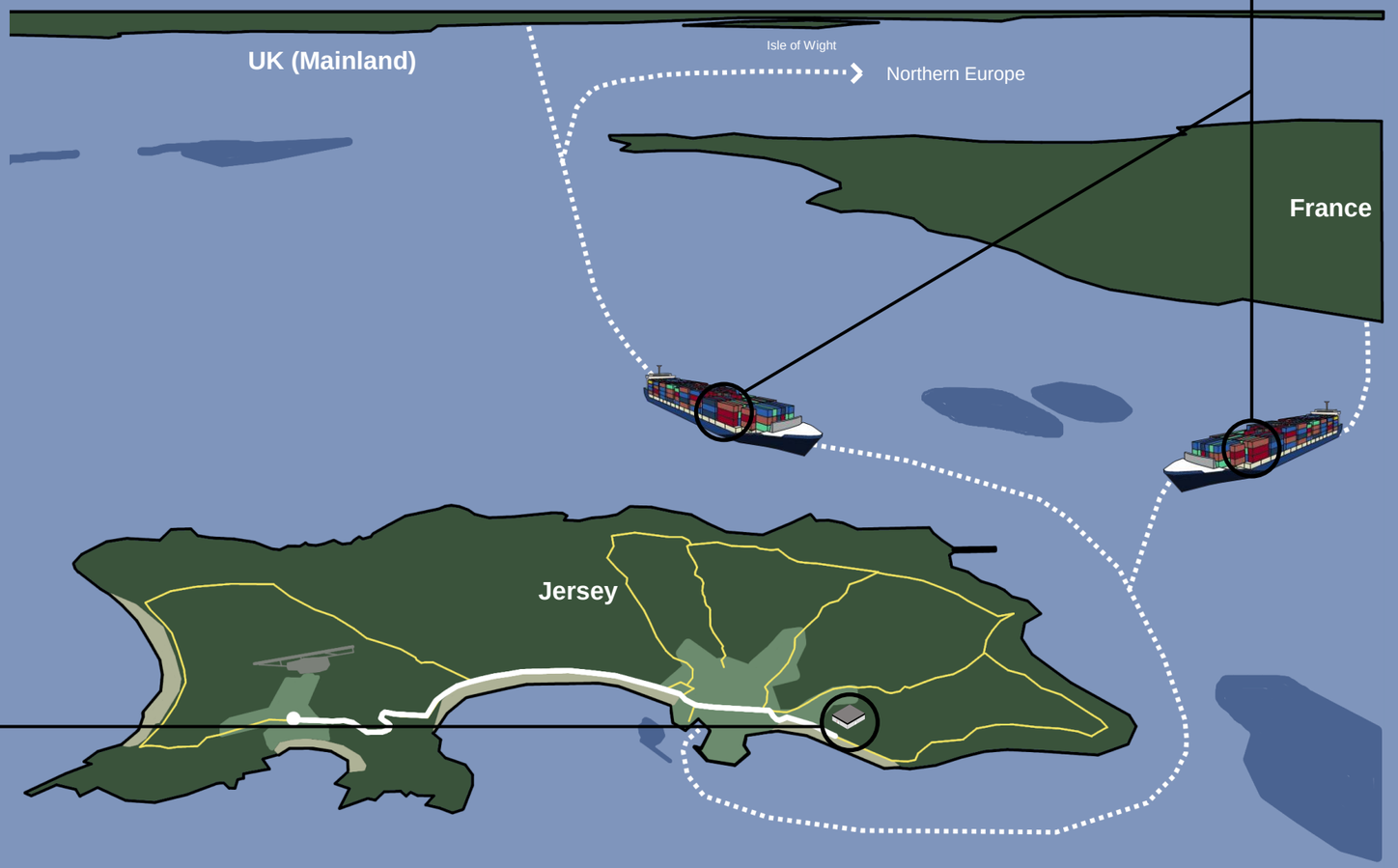
# OPTION 7 – MANUFACTURE ON-ISLAND

On-island assembly of mini volumetric pods such as kitchen and bathroom modules is possible. The pods have a higher value-added work content than, for example, bedrooms and living areas. The sub assembly off-site would reduce the burden on skills required on-site and allow for improved efficiency when coupled with panelised elements / kits to form the structural elements of the pods.

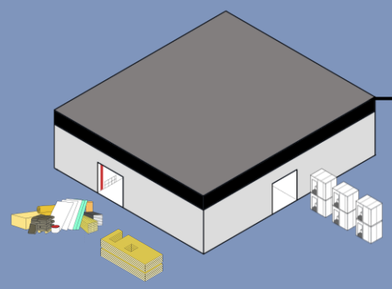
In this example, raw materials, panelised elements and kits would be shipped to Jersey from UK, France, Northern Europe.








A manufacturing facility would be required on-island to receive raw materials, kits and assemble into mini volumetric pods. This may typically include kitchens and bathrooms.



STRENGTHS

- Ability to cater for own demands.
- Faster than traditional build.
- Reduced disruption on-island.
- Better health and safety.
- Low CAPEX.
- Minimal equipment required – gantry crane.

**WEAKNESSES**

- Limitations on labour. Lack of manufacturing experience.
- Element of skilled labour required. Currently skills shortage.

**OPPORTUNITIES**

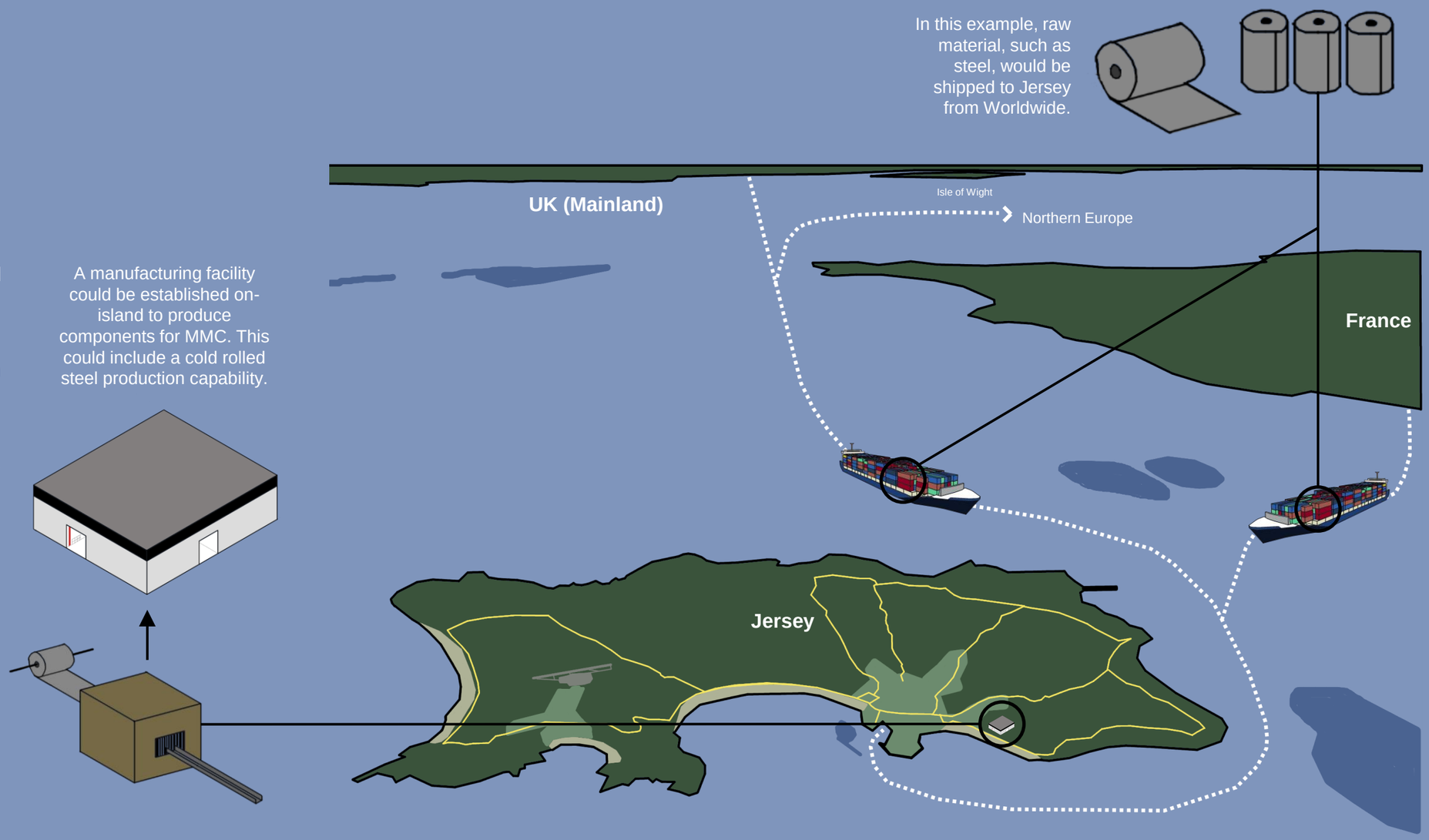
- Partnership with established manufacturer/ pre-designed system and establish a satellite assembly facility may be possible.
- Flexibility to ramp down to steady state once established.
- Purchase structural members as kits.

**THREATS**

- Cost of importation - high.
- MMC is growing in popularity globally, risk that Jersey may not be a priority market for increased supply.
- Weather – ability to meet programme on-site. There has been examples of 8 day periods where ships couldn't sail.
- Ability to meet bye-laws. Needs further validation with selected products.
- Damage in transit – sea crossing.
- Susceptibility to sea / weather conditions.

# OPTION 8 – ENABLER

This option could be an enabler for other options. In its simplest form this may entail lightweight steel structural elements. However, extrusion / pultrusion elements for DfMA is a key growth area. These are clipped together to form hybrid pods and panelised systems. We are aware of a number of new systems under development that reduce reliance on conventional MMC materials such as timber and steel. These could be of interest in the medium to long-term as IP and know how may be valuable to the island. However, this is not likely to enable the short-term need.




**STRENGTHS**

- Access to new technologies.
- Ability to couple with Option 9 – Innovation Hub.
- Combines Jersey's strong financial institution with highly scalable global demand for MMC products.
- Ability to cater for own demand.
- Not reliant on shipping of structural members / systems.

**WEAKNESSES**

- Unlikely to meet immediate demand.
- Significant capital investment.
- Labour shortages. Although very minimal to operate machinery.
- Restricted by road network / infrastructure. e.g. can only make what can be transported.
- Long lead on equipment – needs further exploration.

**OPPORTUNITIES**

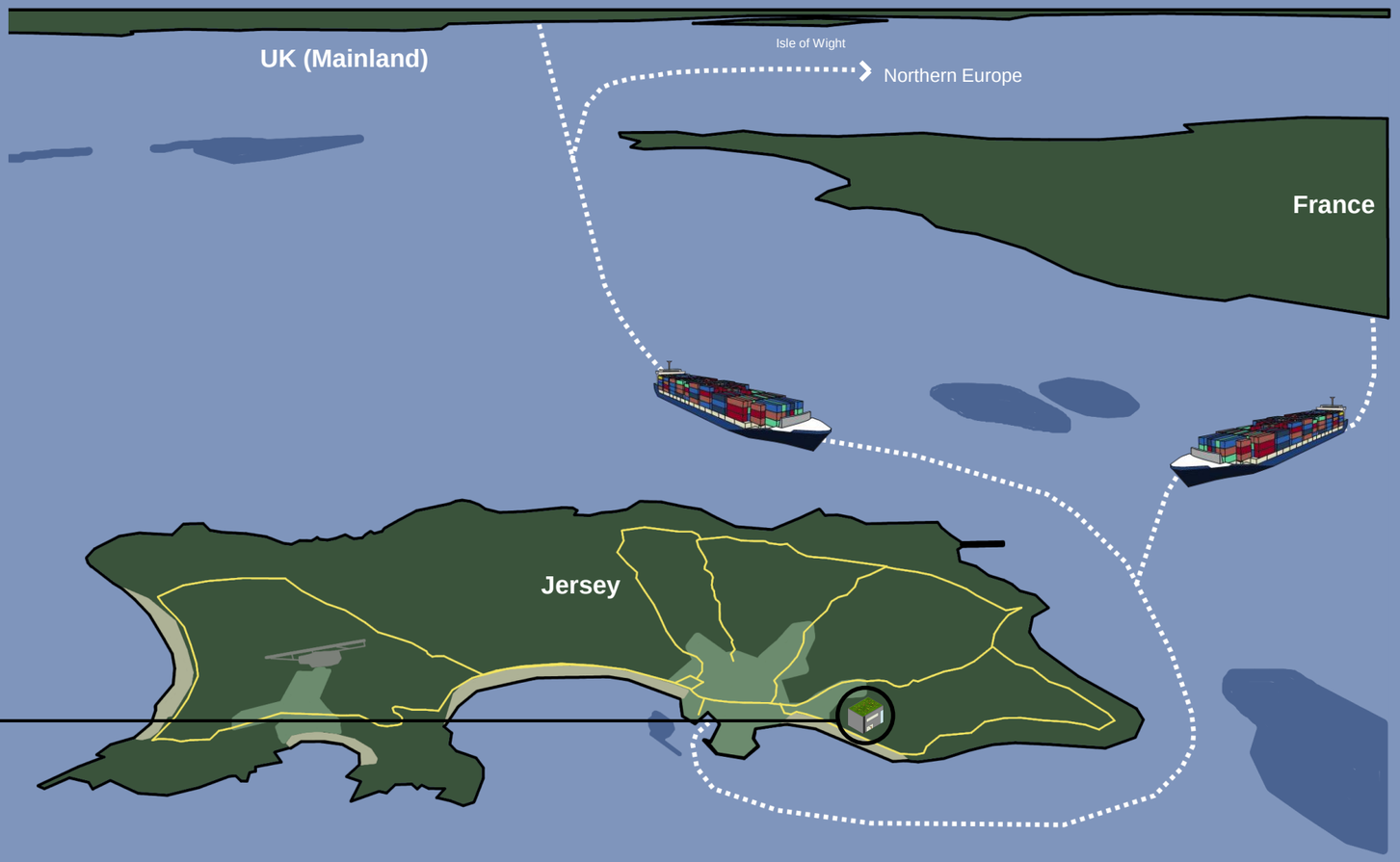
- New technology adoption
- New materials – that could be of interest in medium to long term.
- IP / know how could be valuable to island.
- Opportunity to export – product / IP.

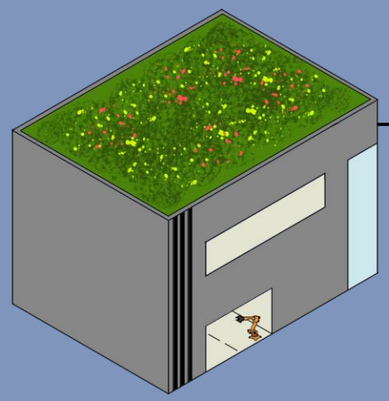
**THREATS**

- Material costs – steel price fluctuations.
- Cost of shipping.
- Ability to retain staff. Cost of living.

# OPTION 9 – CONSTRUCTION INNOVATION HUB

Following on from Option 8, there are new technologies under development that use clip together composite materials to provide the structural elements of buildings. The technologies may be of interest to Jersey's investment community and allow Jersey to accommodate an innovation hub to develop products to meet it's needs along with Intellectual Property (IP) / know how that could be exported. The innovation hub would not be limited to residential applications and could be configured as a flexible facility to meet a range of needs.



Example – an innovation and research hub exploring innovative and emerging technologies in relation to construction, addressing the sectors performance and productivity challenges.

**STRENGTHS**

- Access to new technologies.
- Ability to couple with Option 8 – Enabler
- Combines Jersey's strong financial institution with highly scalable global demand for MMC products.
- Ability to cater and design products for own demand.
- Educational benefit – link to Universities / higher education.

**WEAKNESSES**

- Doesn't contribute to immediate demand.
- Significant capital investment.
- Long lead on equipment – needs further exploration.

**OPPORTUNITIES**

- New technology adoption
- New materials – that could be of interest in medium to long term.
- IP / know how could be valuable to island.
- Opportunity to export – product / IP.

**THREATS**

- Ability to retain staff. Cost of living.

# Section 5
# Optioneering

## SUMMARY

| Option | Description | Key Comments | Recommendation | Immediate Activities (For Discussion) | Preliminary Ranking |
|---|---|---|---|---|---|
| **1** | Business as usual - existing systems and pods. | The additional MMC suggested are supplementary it should not affect BAU. Note – Jersey requires additional interventions in order to meet housing demand. | Continue | No immediate activities. | **1** |
| **2** | Establish new on island MMC capability (volumetric). | Not really viable economically and in consideration of immediate need. It will take 3-5 years to establish a new system. | No | N/A | **X** |
| **3** | Establish new on island MMC capability (panelised). | Not really viable economically and in consideration of immediate need. It will take 18 months min. to establish a new system. | No | N/A | **X** |
| **4** | Import volumetric partnering with manufacturers / suppliers. | Viable and examples of such on Guernsey. Will need to evaluate on-island logistics and investigate further with potential partners. | Investigate further | 1. Establish and agree evaluation criteria for preferred partners.<br>2. Site visit / tour of facilities.<br>3. Explore Option 8. | **2** |
| **5** | Import panelised and install on site | Viable and suppliers willing to support (requires site trades). | Investigate further | 1. Hold until Option 4 & 6 are explored. | **3** |
| **6** | Import panelised and assemble off site | Viable and suppliers willing to support (less trades required). | Investigate further | 1. Establish and agree evaluation criteria for preferred partners.<br>2. Site visit / tour of facilities.<br>3. Explore Option 8. | **2** |
| **7** | On-island assembly – pods, kitchen and bathroom. Items with high mechanical, electrical and plumbing (MEP) content. | Would potentially work with off-island suppliers and with ‘Option 8 ENABLER’. | Investigate further | 1. Conduct feasibility study in conjunction with Option 5 & 6.<br>2. Explore existing facilities or explore in conjunction with Option 8 (New). | **2** |
| **8** | Flexible on-island manufacturing facility (enabler facility) | Recognised as a benefit by all stakeholders. Could allow more than just housing. | Investigate further | 1. In conjunction with Option 5 & 6, explore sites, funding and benefits available. | **1** |
| **9** | Construction Innovation Hub | Works well with ‘Option 8 ENABLER’ and attracts investment. | Investigate further | 1. In conjunction with Option 8, explore sites, funding and benefits available. | **2** |

**Table 7 - High level first evaluation for discussion only.**

**Image 8 - ilke Homes Limited**

Section 6
# Response

## What do industry believe are the technical opportunities and challenges for MMC in Jersey?

The following section aims to respond to the above line of enquiry by summarising the consultations to date with industry representatives.

A summary has been included on Page 28.

The Arup team attended Jersey on 3rd February 2022 to meet face-to-face with Camerons, JDC and Andium Homes.

The remaining consultations took place virtually throughout February and March 2022.

**The content associated with consultation (Pages 24, 26 and 28) may be considered confidential. If this is to be shared publicly we would ask that this is anonymised.**

**No response to invitation:**

- Legendre
- Dandara
- ROK
- Castle Tree Group Ltd
- Grange Developments
- Hacquoil & Cook Limited

### Camerons

Contractor

Camerons have recent examples of Category 3 and 5 MMC. This includes bathroom pods and precast concrete panelling. As a company they want to be part of Jersey's "MMC journey".

#### OPPORTUNITIES

- Supportive of the creation of an on-island facility / capability for assembly / manufacture. Could be limited to Mechanical & Electrical (M&E) initially. Purpose after short-term demand, post-2025?
- MMC – increased capacity and speed of delivery (on-site time reduced by 1/3). Reduced disruption.
- Doesn't have to be limited to houses. MMC could be utilised on other key infrastructure – hospitals, schools.
- Planning legislation could mandate the use of MMC.
- Being able to share the financial risk of MMC would open up opportunities (cannot be entirely with the contractor).
- Opportunity to integrate with PassivHaus?

#### CHALLENGES

- Volumetric – the cost of shipping air makes it cost prohibitive.
- No real factories on-island – lack of manufacturing skillset.
- Programme delays – bad weather, unable to import.
- Road network – height and width restrictions.
- Cashflow issues (type of contracts utilised / available).

### Jersey Development Company (JDC)

Developer

JDC have recent examples of Category 3, 5 and 6 MMC. This includes bathroom pods, precast concrete panelling, Insulated Concrete Forms (ICFs) and prefabricated unitised facades (via Germany). The adoption of MMC comes down to financial viability.

#### OPPORTUNITIES

- Opportunity to drive zero carbon agenda. This will require changes to the bye-laws to support.
- Shipping offer – needs attention, more options required that support MMC.
- "affordable" – could entail a financial product rather than house type.

#### CHALLENGES

- Doubly hit by COVID and BREXIT (exit of European labour). Material costs remain high. Labour costs remain high with property rental costs increasing.
- Labour affordability – examples of labourers jumping from company to company for more money.
- Need for long-term projections (steady state housing requirements).
- Skilled worker issues (not being able to return).
- General decline in hotel numbers, making the accommodation of labour difficult.
- Financial viability of shipping – shipping air.
- Shipping is a big challenge – JDC have examples of shipping granite. The cost from China to UK was equal to the cost of UK to Jersey.

### Andium Homes

Developer

Andium have recent examples of Category 3, 5 and 6 MMC. This includes a number of trials of timber frame construction, precast concrete (via Italy), ICF, Hadley Steel / Norman Limited Collaboration (lightweight steel panels and timber roof trusses). Andium have a strong experimental appetite for MMC including exploring full volumetric (not at scale initially).

#### OPPORTUNITIES

- Pods - reduces skilled labour elements.
- Namely utilise design and build contracts (typically standard form). Good mechanism to performance specify MMC approaches / products.
- Standardise kitchen specification within affordable housing. Design appropriately for quick manufacture / assembly.
- Opportunity for Ronez (on island aggregates) to explore cement alternatives – drive two agendas – carbon and MMC.
- Supportive of some form of innovation facility on-island. Exploring new and innovative materials / construction techniques.

#### CHALLENGES

- Port and road constraints. Narrow roads with restrictions.
- Shipping is a big challenge – shipping air is cost prohibitive.
- Multi tenanted / mid rise may rule out use of timber (reference fire implications).


**Image 9 - TopHat Modular Limited**

# Section 6
# Response

## Norman Limited

Construction Supplier

Norman's Group CEO is fully supportive of MMC. Lots of MMC within parent company (Saint Gobain). Examples of MMC light gauge steel panels (Hadley Steel), roof trusses on-island. Have assembly facility already. Support of facility on island with accommodation / homes for staff (?), planners need to introduce MMC target for designers.

### OPPORTUNITIES

- Normans are keen to explore the construction innovation hub and on island manufacturing centre.
- They already have relationships with steel and timer frame suppliers as well as pod manufacturers.
- They are part of Saint Gobain so new potential suppliers are available through the group and with group CEO support.
- Existing facility at 'Five Oaks' can be adapted for other systems.

### CHALLENGES

- Current limitations with their own facility at the port.

## ilke Homes

Volumetric, Modular Home Manufacturer

ilke are one of the UK's leading volumetric house builders. They have a range of designs that can be adapted to meet the local vernacular including Net Zero homes already available. All their products meet UK regulations, they are BOPAS and NHBC accredited. In addition, ilke are currently planning a development of around 300 homes for the island of Guernsey.

### OPPORTUNITIES

- ilke can build at competitive rates and are able to engage immediately to tailor supply to the islands needs.
- The homes would be manufactured in the existing factory in Yorkshire using manufacturing labour which is lower cost and more efficient than using skilled trades. It would be installed on site using established teams. As a result, they state that the efficiency savings provide opportunity to ship the modules to Jersey at competitive cost.

### CHALLENGES

- Volumetric modules may not be suitable for a number of the island's development needs due to logistical constraints. So, a more detailed feasibility study will be required.

## M-AR Offsite

Modular, Off-site Manufacturer (Volumetric)

Smaller than ilke, M-AR are an established volumetric builder with experience in a range of building typologies not limited to housing. They are based in Hull and as ilke use manufacturing labour and manufacturing efficiencies to drive down cost. They too are confident that logistic costs to the island can be accommodated assuming shipping in batch and using existing installation teams to complete the houses.

### OPPORTUNITIES

- M-AR can build at competitive costs.
- Their homes are BOPAS and NHBC accredited
- M-AR can build both low rise and apartments up to 6 stories.
- They are keen to explore the possibilities of using and on island facility for staging and optimising delivery of their modules.
- Can ship directly from the port of Hull to the island.

### CHALLENGES

- Volumetric modules may not be suitable for a number of the island's development needs due to logistical constraints. So, a more detailed feasibility study will be required.

## Laing O'Rourke

Modular, Off-site Manufacturer

Laing O'Rourke is a multinational construction company. It is the largest privately owned construction company in the UK and its Chairman and CEO has a house on the island. Laing are a committed pioneer of Design for Manufacture and Assembly (DfMA) using MMC. At the moment they are focussed on taller modular systems but are interested in exploring how they could support development using their precast modular panel system.

### OPPORTUNITIES

- Keen to engage and are supportive of creating an innovation hub / assembly facility on island
- Opportunities may be limited to taller apartments 6-8 stories, but the innovation centre opens up broader possibilities for DfMA in other aspects of island infrastructure.

### CHALLENGES

- Laing O'Rourke's low rise housing system is currently on hold pending increased pipeline in demand on the mainland.


**Image 10 - ilke Homes Limited**

# Section 6
# Response

## Stewart Milne Group

2D Panel, MMC Manufacturer

Stewart Milne Group is a major house builder in Scotland and the north of England. Stewart Milne Timber Systems (SMTS) is the UK's leading timber systems solutions provider to the housebuilding and commercial sectors. The business is in the process of being sold and projections are that the business will double in size over the next 5 years. The SMTS team are keen to explore the opportunity to deliver housing in Jersey. Their systems are two-dimensional panel systems which provide around 40-50% of the building. The remainder is finished on site with traditional trades.

### OPPORTUNITIES

- Keen to explore options particularly in conjunction with the suggested innovation centre.
- Opportunity to ship kits in containers either assembled in the factory in Oxfordshire or for assembly in an on-island assembly facility supported by SMTS.

### CHALLENGES

- Does not significantly reduce build times.
- Still reliant on traditional trades.

## SUMMARY

### SHARED OPPORTUNITIES

- Some form of on-island facility is favoured by all stakeholders that supported the use of MMC. The uses for the facility have been suggested as opportunities for staging and scheduling delivery of the housing to site, supporting sub assembly of volumetric modules and pods, potentially assembly of two-dimensional panels from kits allowing for higher value to be added off-site.
- The facility could be shared and scheduled to accommodate operations for different housing type suppliers. It could also be used to support other island infrastructure needs such as schools, hospitals and commercial buildings.

### SHARED CHALLENGES

- Shipping costs and programme delays due to bad weather periods.
- Unknown site conditions pending further investigations.
- Local transport logistics considering narrow roads and turning restrictions will require analysis of suggested sites and tailored logistic plans.
- Accommodation for installation teams.
- Specific architectural styles will need to consider DfMA.
- Government support will be required to ensure sufficient volume to ensure return on investment.
- Need to check on port capacity and appropriate staging areas to create efficient logistics and site scheduling plans.

### CONFLICTING POINTS

- Shipping air is prohibitive. Volumetric is therefore not viable.
- Shipping volumetric is viable we are already doing it. Factory efficiencies and use of manufacturing labour reduces the cost of skilled labour and offsets the shipping cost.
- Some stakeholders approached stated that MMC was not something that they would consider.
- Other stakeholders are actively recruiting MMC specialists and are keen to engage in ventures to modernise construction on island.


**Image 11 - Laing O'Rourke – Explore**

# Section 6
# Response

## RESPONSE

### What do the public think about living in homes that use MMC?

Whilst Jersey utilises aspects of MMC there are other marketplaces with larger housing crisis resulting in a greater need for uptake and widespread adoption. This adoption has subsequently generated research, which we can draw upon, in terms of what the public think about living in modular homes (featuring MMC).

### UK MARKET

The UK have faced a housing crisis for many years, missing its housing targets by 1.3 millions homes since 2004. Modular homes, as well as wider MMC, is thought to be a contributory solution. However, many controlling factors such as higher initial investment, incomplete industry supply chain and importantly **public perception** have had a major impact on uptake.

The HOME Group, a housing association and one of the UK's largest providers, commissioned a survey by YouGov Market Research to find out the public perception of modular homes. It managed to gain the opinions of over 2,000 people throughout the UK (HOME group, 2018).

The research showed that:

1. The public failed to recognise the difference between modular and traditional construction types. Only 11% were able to identify correctly an image of a modular home.
2. Around 70% of respondents associated modular homes with shipping container homes.
3. Nearly half the people surveyed believed that modular homes are less durable than those that use traditional methods.
4. 52% of respondents said they would not live in a modular home.

In relation to Point 3, however, Booth (2017) offers an argument that differs from the perception, which states, "When people question the quality of a modular house an argument can be made that 100 workers on an indoor production line will bring more quality than the same amount on a muddy building site out in the elements". Past research such as Nanyam et al 2017, Steinhardt and Manley 2016, Švajlenka and Kozlovská 2018, also support this statement.

Its fair to surmise, the UK's perception is based largely on historic experience of prefabricated housing and not the high-quality products that are currently available (i.e. the inconspicuous products that the public failed to recognise as modular housing).

Year-on-year trends would indicate perception is improving. It is anticipated this will continue to improve since the exposure to MMC is becoming the norm. Moreover, the industry is at the point where it has no other option but to change; due to the huge demand on houses and the limitations of its current supply (Shah et al., n.d.).

### GERMAN MARKET

Modular housing in Germany has a good public perception, being associated with high quality of construction. However, this was not the case in the 1980s; the industry has regained its position through the development of quality standards and certification schemes and consistent promotion of the merits of modular housing.

### JERSEY

In terms of Jersey, the wider perception is unknown at this stage. It is therefore recommended some form of perception survey is commissioned / undertaken.

### References

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Image 12 - Gateshead Innovation Village (Credits: Constructing Excellence)

### GATESHEAD INNOVATION VILLAGE

The Home Group have created an accessible and independent live research project, the Gateshead Innovation Village. An open and transparent MMC project that compares many modular products on one site. It actively involves residents in the monitoring and evaluation of these products. The project aims to showcase MMC and allow the public to see first-hand the quality assurance processes and technology involved. Importantly, the public can see how the industry has evolved since the prefab era.


Image 13 - Stewart Milne Group

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RESPONSE

## Where are MMC systems being effectively implemented and what can Jersey learn?

Modular construction is not new, prefabricated buildings were found in the remnants of sunken Roman galleys. However, it is fair to say that housebuilding around the world has been heavily reliant on traditional build methods and local skills for hundreds of years and the methods used vary according to the materials available.

Similarly, MMC encompasses a broad range of offsite manufacturing, onsite techniques and systems that provide alternatives to traditional methods. This includes timber, steel, concrete, volumetric, panelised and hybrid variations of all types. The benefit case varies according to marketplace, at least in relation to the types of MMC, but generally the benefits are quoted as being faster, better and in some cases cheaper than traditionally built alternatives. For most of the UK, drivers for increased uptake also include the cost and availability of labour, supply shortages and regulatory or governmental intervention. The need to improve energy efficiency and reduce the environmental impact of housing is also now recognised as a significant opportunity with increased use of manufactured systems.

### GLOBAL MARKETS

The use of MMC varies significantly from country to country, but the global leaders historically have been Sweden and Japan.

### SWEDISH MARKET

Sweden has the highest penetration rate of MMC, with around 45% of all new homes utilising offsite construction. For single-family homes, it's close to 80%.

### JAPANESE MARKET

By size Japan produces the most MMC homes around 150-180,000 per year. However, unlike the UK, the Japanese housing market is not focussed on return on land and there is a strong replace and rebuild culture. The new build rate pre-covid varied between 900,000 and 1 million for a population of c.135 million people. By comparison, the UK build c.200k homes for c.75 million people.

### EUROPEAN MARKET

The MMC market in Europe was valued around £18 billion in 2021 and is expected to reach £24 billion by 2027. By the end of 2022, an estimated 70,100 units are anticipated to be sold across six Northern European countries, with Germany the largest, particularly for turnkey solutions.

### GERMAN MARKET

In Germany, MMC is now perceived as a higher quality precision manufactured product and is largely tailored to owner developers of low-rise housing. Germany pre-covid were building c.285,000 new homes, over 50% apartments. With manufacture of around 30,000 houses MMC represents around 23% of all low-rise private housing.

### GROWTH MARKETS

There are several countries where 'drivers for change' are in place to support rapid increase in MMC use. In Europe, we expect the UK to see the strongest growth. The country's construction workforce is ageing (a quarter are expected to retire in the next decade), annual housing delivery needs to increase by 24% per annum to meet the need, and regulatory changes around energy efficiency are on the horizon. These will lead to increased adoption over the next decade, and we expect that the proportion of housing built using MMC will rise from around 10% today to closer to 20% by 2030.

In recent years, Singapore has rapidly expanded the use of MMC. The Middle East, especially Saudi Arabia and Dubai, is also set for significant growth.

In the short term, the confluence of labour shortages and the need to increase housing supply will be the main drivers for increased adoption of MMC in markets, such as the UK. However, over the medium to long term, the need to tackle construction's environmental impact will force MMC's adoption globally.

### KEY LESSONS FOR JERSEY:

1. Perceptions of MMC vary globally. In Germany MMC is now perceived as a higher quality precision manufactured product. Scandinavia prefers MMC based on engineered quality and speed of construction/programme benefits considering winter climate restrictions. Japan sees MMC as a way to keep housing stock relevant and current for modern living. The UK still has perception issues relating to 1960-70's prefab.
2. New and currently established MMC housing products receive favourable reviews and demonstrable ESG benefits.
3. UK mandates in favour of MMC - increasing government and industry support.
4. There is no one single MMC solution and the market will evolve with investment and growth to provide better cheaper faster solutions for a range of housing needs.

Image 14 - ilke House - UK

Image 15 - Bien Zenker - Germany

Image 16 - Sekisui House - Japan

# Section 6
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## RESPONSE

**What action can GoJ take to maximise the identified opportunities and address known challenges? including due diligence on cost, opportunities for collaboration/partnerships and government role in support**

The following suggested actions have been deduced through our consultation process and response to key lines of enquiry.

### COLLABORATION / PARTNERSHIPS

A specialist stakeholder group could be convened consisting of logistic and industry specialists, planners, procurement and the members of the treasury initially.

When operational, the group will undertake more detailed assessments of the options proposed.

In terms of partnerships, there are a number of parties already on island who are keen to establish some form of assembly facility. This could be floated as a government backed partnership with industry stakeholders to support delivery of the island's needs.

### MMC STANDARDS

Investigate options to mandate use of MMC in order to attract inward investment. Consider adoption of quality standards and certification schemes.

### HOUSING DEMAND

Whilst the immediate requirement for housing is clear. The supply chain will require certainty on demand. There will need to be sufficient volume to ensure return on investment (e.g. minimum batch quantities, economies of scale and logistics).

### AFFORDABLE HOMES

Given there is a short-term need for 1,500 homes specifically for affordable purchase and affordable rent. There would be efficiencies in designing and developing a standard typology that is able to be mass customised to suit final vernacular.

### ACCESS TO FINANCE

It is important the GoJ helps homebuilders to access finance to build more homes. Funds could be setup specifically to target finance for MMC homebuilders.

Funding schemes should allow homebuilders to access the up-front capital required to invest in innovation and MMC.

In the UK for example, a common belief is that the government needs to support this type of housing with financing packages that encourage the purchase of modular homes and developers to inject more houses in market (Shah et al., n.d.).

### ACCESS TO LAND

Helping homebuilders to access land for development is key. Land needs to be bundled to develop economic packages for the type of development proposed (e.g. minimum batch quantities, economies of scale and logistics).

### PORT & SHIPPING OFFER

A more detailed assessment of the port should be undertaken. Validation of capacity and options for the provision of appropriate staging areas should be made in order to create efficient logistics and site scheduling plans.

### ROAD NETWORK

A feasibility study should be commissioned, centred around the key development areas, to determine viability of logisitics (e.g. What can we get where?). Noting, this may ultimately drive the MMC solutions.

Relaxation of the permitted vehicle dimensions and the ability for road closures during night hours could be explored and where possible be made more readily available for MMC initiatives.

### KEY ACTIONS FOR JERSEY:

1. Collaboration / partnerships – stakeholder group, explore joint ventures.
2. Setout standards for MMC homes, mandating its use.
3. Provide certainty of demand for the supply chain.
4. Investigate a standardised affordable housing design. Develop a typology specific for Jersey.
5. Increase funds and land suitable for MMC housebuilders.
6. Review port and shipping offer.
7. Explore the relaxation of permitted vehicle dimensions and road closures for modular movements and MMC initiatives.

# Section 7
# Recommendations, Next Steps

## RECOMMENDATIONS, NEXT STEPS

This report has been undertaken as an initial pre-curser to identify whether and where the opportunities for MMC on the island of Jersey may exist.

The recommendations are therefore not definitive but do suggest a positive opportunity to use MMC and furthermore to partner with UK and possibly European suppliers to meet the islands housing demand.

### **Next Steps** (GoJ)

- Take independent cost advice in relation to viability of MMC initiatives (Pg. 9).
- Identify options for a construction innovation hub / facility (Pg. 21).
- Commission an MMC Perception Survey (Pg. 30).
- Collaboration / partnerships – stakeholder group, explore joint ventures (Pg. 34).
- Setout standards for MMC homes, mandating its use (Pg. 34).
- Provide certainty of demand for the supply chain (Pg. 34).
- Investigate a standardised affordable housing design. Develop a typology specific for Jersey (Pg. 34).
- Increase funds and land suitable for MMC housebuilders (Pg. 34).
- Review port and shipping offer (Pg. 34).
- Explore the relaxation of permitted vehicle dimensions and road closures for modular movements and MMC initiatives (Pg. 34).

### **Proposed Next Steps** (Arup)

- Support GoJ in their next steps.
- Support GoF in the formation of a stakeholder group.
- Arrange site visits for GoJ to showcase the scale, scope and practicality of MMC delivery.
- Carry out logistics piece – what can we get where on-island? (Pg. 34).
- Support GoJ in the development of a standardise affordable housing design. Develop a typology specific for Jersey. Including potential engagement with Association of Jersey Architects (AJA).

### **Expression of Interest**

During our consultation, the following manufacturers have expressed a clear interest in exploring opportunities further.

**Ilke Homes Limited**

**Laing O'Rourke**

**Stewart Milne Group**

**M-AR Offsite**