Update on Groundwork Carried out in Preparation of the Construction Industry Transformation Map (ITM)

24 Feb 2017

Presented by:
Karen Tan
Strategic Planning Office
BCA
Scope

i. Aim of Presentation

ii. ITM Overview

iii. Groundwork Carried out in Preparation of the ITM
Aim of Presentation

• To seek the CIJC’s comments and feedback on the groundwork undertaken by BCA and the industry in preparation for the development of the Construction ITM
Scope

i. Aim of Presentation

ii. ITM Overview

iii. Groundwork Carried out in Preparation of the ITM
An integrated and sector-focused approach to industry development

- Fosters **stronger partnerships** between government, industry and other stakeholders

- Promotes **growth and competitiveness**
Built Environment (BE) Cluster

5 Sectors

Real Estate

Security

Environmental Services (formerly Cleaning) - renamed to include waste management

Built Environment Cluster

Construction

Landscape
Built Environment (BE) Cluster

Lead Agencies

- Council for Estate Agencies (CEA)
- BCA (Construction)
- National Environment Agency
- National Parks Board

Security

Environmental Services (formerly Cleaning) - renamed to include waste management

Cluster Lead Agency: BCA

Real Estate

Built Environment Cluster

Landscape
<table>
<thead>
<tr>
<th>Cluster</th>
<th>S/N</th>
<th>Sector</th>
<th>Lead Agency</th>
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<tbody>
<tr>
<td>1 Manufacturing</td>
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<td>Energy &amp; Chemicals (incl. PCM)</td>
<td>EDB (Cluster lead)</td>
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<td>2</td>
<td>Precision Engineering</td>
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<td>Marine &amp; Offshore</td>
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<td>Electronics</td>
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<td>2 Built Environment</td>
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<td>Construction</td>
<td>BCA (Cluster lead)</td>
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<td>Real Estate</td>
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<td>3 Trade &amp; Connectivity</td>
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<td>Logistics</td>
<td>EDB (Co-cluster lead with MOT)</td>
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<td>CAAS</td>
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<td>MPA</td>
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<td>IES</td>
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<td>4 Essential Domestic Services</td>
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<td>5 Modern Services</td>
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<td>Professional Services^</td>
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<td>Financial Services</td>
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<td>6 Lifestyle</td>
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</table>

*Council for Skills, Innovation and Productivity
Key Components

Growth, Competitiveness, and Transformation

Growth & Transformation Enablers

1. Innovation
2. Productivity
3. Job & Skills
4. Collaboration
5. Regulation
6. Internationalisation
Consultation Approach

Consultation Plan with Key Stakeholders in the Sector

3 Levels of Consultation

^CSIP Sub-committee

Key platform to validate strategies

*CPSTC

Platform to reach out to associations and address consolidated feedback

Associations/ Focus groups

Gather feedback from the ground

^Council for Skills, Innovation and Productivity

*Construction Productivity and SkillsFuture Tripartite Committee
Consultation Plan with Key Stakeholders in the Sector

Supported approach to consult industry stakeholders

1/2017
^CSIP BE Cluster Sub-Committee Meeting

Seek comments

Gather feedback from the ground

Consultation with CIJC, associations and focus groups discussions with Young Leaders

Discuss collated feedback and develop draft

Seek comments and endorsement

2/2017
^CSIP BE Cluster Sub-Committee Meeting

1/2017
^CSIP

^Council for Skills, Innovation and Productivity

*Construction Productivity and SkillsFuture Tripartite Committee
Scope

i. Aim of Presentation

ii. ITM Overview

iii. Groundwork Carried out in Preparation of the ITM
Ground work undertaken in preparation of the Construction ITM

**Growth, Competitiveness, and Transformation**

**Growth & Transformation Enablers**

1. Innovation
2. Productivity
3. Job & Skills
4. Collaboration
5. Regulation
6. Internationalisation
Ground work undertaken in preparation of the Construction ITM

**Growth & Transformation Enablers**

1. **Innovation**
   - R&D Roadmaps
     - 1. Building Energy Efficiency
     - 2. Green Buildings (On-going)
     - 3. Construction Productivity

2. **Productivity**
   - 1. 1st and 2nd Construction Productivity Roadmaps

3. **Job & Skills**
   - 1. Sectoral manpower plan (including rebranding roadmap)

4. **Internationalisation**
   - 1. Profiling and facilitation efforts
   - 2. Broad approaches by the internationalisation taskforce

**Key Enablers**

4. **Collaboration**
   - 1. Facilitative engagement (e.g. SCPW, SGBW, IPEs)
   - 2. Building key capabilities (e.g. Overseas Learning Journey, BCA Academy)

5. **Regulation**
   - 1. BIP and IACC to facilitate pro-enterprise regulatory regime
   - 2. Pro-active regulations
   - 3. Facilitative procurement initiatives
<table>
<thead>
<tr>
<th>Key channels of co-development and engagement with stakeholders</th>
</tr>
</thead>
</table>

**Construction Productivity and SkillsFuture Tripartite Committee (CPSTC)**
- Construction productivity roadmaps
- Sectoral manpower plan

**Institutes of Higher Learning (IHLs)**
- Construction productivity R&D roadmaps
- Green building-related roadmaps and programmes
- Sectoral manpower plan

**International Panel of Experts (IPEs)**
- Construction productivity roadmaps
- Green building masterplans

**Construction Industry Joint Committee (CIJC)**
- Construction productivity related roadmaps and programmes
- Green building-related roadmaps and programmes
Sector’s Economic and Social Contributions

**Economic Contribution**

- **2014 Nominal GDP**
  - Contractors: S$19 bil (5% of total GDP)
  - Consultants: S$3 bil (0.8% of total GDP)

- **2014 Operating Receipts**
  - Contractors: S$73 bil (Construction output: S$34 bil, due to sub-contracting)
  - Consultants: S$8 bil

- Delivers essential infrastructure integral to nation building

**Workforce Contribution**

- **498,000 employees in 2014:**

  **Contractors**
  - Foreign RnF: 71% (335,000)
  - 469,000 employees (13% of national stock)

  - **Local**
    - PME: 5%
    - TAP: 4%
    - RnF: 4%

  - **Foreign**
    - PME: 11%
    - TAP: 14%
    - RnF: 13%

- **Consultants**
  - 29,000 employees (1% of national stock)

  - **Local**
    - PME: 41%
    - TAP: 22%
    - RnF: 11%

  - **Foreign**
    - PME: 4%
    - TAP: 4%
    - RnF: 71%

**Scope for more local employment:**
- Good jobs in consultancy firms
- Good PMET jobs in construction firms

Source: BCA annual survey (2014), DOS

Source: MOM admin data
Value Chain Comprises Multiple and Diverse Stakeholders

**Construction Value Chain**

- Developers
- Consultants
- Main Contractors
- Specialist/Sub-Contractors
- Suppliers
ITM strategies will directly influence these key stakeholders

**Sub-Sectors of Consultants***

- Architectural Services
- Quantity Services
- Land Surveying Services
- General Building
- Infrastructure Engineering and Consultancy Services

Key firms in sub-sector:

- CPG
- S J
- ST Architects & Engineers Pte Ltd

**Sub-Sectors of Contractors***

- Construction of Buildings
- Civil Engineering
- Specialised Construction Activities

Key firms in sub-sector:

*Based on 2015 Singapore Standards Industrial Code (SSIC)
Positive Domestic Outlook Ahead

Sustained Domestic Construction Demand till 2021

Construction Demand Forecast till 2021

Moderation in private sector construction demand propped up by **strong pipeline of public sector projects**

Major upcoming CE projects

- New MRT Lines (e.g. Circle Line Stage 6, Cross-Island line)
- Deep Tunneling Sewage System

*Average of upper and lower bound projections
Key Trends Shaping the Sector Worldwide

Drive towards **Digital Revolution**

- **Advancements in digital engineering technologies** can be key enablers of industry transformation
- **Smart buildings set to grow** as they boost operational efficiency, achieve energy savings, improve capital planning and reduce carbon footprints

Rapid **Urbanisation** and Increasing **Manpower Squeeze**

- Moving towards **advanced and less labour intensive construction technologies (e.g. DfMA)** to build faster and better so as to enable going “taller, deeper and denser” amidst rapid urbanisation and manpower squeeze

Emphasis on **Climate Change, Global Warming** and **Energy Security**

- **Greater focus on sustainability practices** to support COP 21’s commitment to reduce pollutants
- **Green building initiatives** to reduce significant carbon emissions from buildings
Key Transformation Areas for the Built Environment

Aligns with smart nation initiatives with smart buildings at the core

Transformation across the Life Cycle of Buildings

Design

Increase adoption of Digital Engineering (with focus in BIM/VDC)

Build

Change the way we build through Design for Manufacturing and Assembly (DfMA)

Operate

Lead globally in green buildings with special expertise in tropics and sub-tropics
Desired Broad Outcomes for Key Transformation Areas

1) 80% of building stock to be greened by 2030

2) > 80% improvement of key discrepancies resolved before construction through VDC by 2025 from 2015 level

2) Increase adoption rate of VDC to 70% by 2025 for all projects above 5000m²

Increase adoption of Digital Engineering (with focus in BIM/VDC)

1) 20-30% site productivity improvement by 2020 from 2010 level

2) ↑ adoption rate to 70% by 2025

↓ cost premium by 50% by 2025

Lead globally in green buildings with special expertise in tropics and sub-tropics

Change the way we build through Design for Manufacturing and Assembly (DfMA)
Beyond 2020:-
Potential growth areas for the built environment

- More complex projects and underground developments as we build taller, deeper and denser to meet land constraints, including coast protection capabilities.
- Need for *more inclusive and accessible infrastructure* in view of the aging population.
- *Smart buildings* to achieve greater energy efficiency and user-centricity with improvement in technology.
Transformation Framework

Vision for the Sector

A **highly integrated, technologically advanced and innovative** construction sector, led by **progressive firms**, and supported by a **skilled and competent workforce**, well-poised to **capture regional and global opportunities**.

Key Transformation Areas

1. Lead globally in **green buildings**
2. Increase adoption of **Digital Engineering** (focus in BIM/VDC)
3. Change the way we build through **Design for Manufacturing and Assembly (DiMA)**

Approaches to Enable Transformation

1. Innovation
2. Productivity
3. Job & Skills
4. Internationalisation

Key Enablers

4. Collaboration
5. Regulation
Innovation Approaches

Vision for the Sector

A highly integrated, technologically advanced and innovative construction sector, led by progressive firms, and supported by a skilled and competent workforce, well-poised to capture regional and global opportunities.

Key Transformation Areas

1. Lead globally in green buildings
2. Increase adoption of Digital Engineering (focus in BIM/VDC)
3. Change the way we build through Design for Manufacturing and Assembly (DfMA)

Approaches to Enable Transformation

1. Innovation
   1. Formulate Roadmaps to direct RD&D framework
   2. Translate RD&D framework towards adoption and deployment
2. Productivity
3. Job & Skills
4. Collaboration
5. Regulation
6. Internationalisation

Key Enablers
Innovation Efforts in **Green Buildings**

**Overall Target:** To improve building energy efficiency performance by 40% to 60% over current best-in-class buildings by 2030

Formulate roadmaps to direct research, development & deployment (RD&D) framework

- **Building Energy Efficiency R&D Roadmap**
- **Green Buildings R&D Roadmap**
  (towards positive-energy low-rise, zero-energy medium-rise, super low-energy high-rise buildings)

Translate RD&D framework into adoption & deployment

- **Green Building Innovation Cluster**
- **BCA Skylab**
Innovation - Formulate Roadmaps
to direct Research, Development & Deployment (RD&D) framework

1. **Building Energy Efficiency (BEE) R&D Roadmap**
   - Identified **key solutions within 4 focus areas:**
     1. Integrated Design Approach & Tools
     2. Building Management & Information Systems
     3. Air conditioning and mechanical ventilation Systems
     4. Building Envelop and Façade Systems

   Developed with stakeholders

2. **Green Building R&D Roadmap**
   - To complement the review of 3rd Green Building Masterplan and realise positive-energy low-rise, zero-energy medium-rise, super low-energy high-rise buildings
   - Innovation key to meet **target of 80% of buildings to be green by 2030**
     - As of Jan 2017: >33%
     - By 2030: 80%
   - **Upcoming Initiative**
     - Develop **positive energy schools** with MOE
   - To co-develop with industry
Singapore ranked 2\textsuperscript{nd} in Green Building Performance Index against other advanced global cities.

Singapore ranked 1\textsuperscript{st} in following assessment areas:
- Green certification
- Energy performance certificates and minimum energy
- Incentives for green retrofit
- Planning
- Green leases
1 Innovation – Adoption & Deployment
Translate RD&D framework into adoption & deployment

A Green Building Innovation Cluster (GBIC)

• A one-stop hub to **develop solutions** leading towards **adoption and deployment**:

  3 Primary Activities

  - **Deepen capability** in the focused areas under the BEE R&D Roadmap to develop solutions
  - **Testbed and showcase** innovative solutions with the aim of wider deployment
  - **Collect and analyse data** under GBIC demo to develop solutions

Examples:

- Open IoT platform with SUTD, KTP Hospital
- The United World College of South East Asia (UWCSEA)’s 3for2 Project

• **S$52 mil programme** to facilitate RD&D:
  - **Awarded S$8.4 mil to 8 applications** for development of sustainable solutions

B BCA Skylab

• Test-bedding facility to demonstrate novel solutions in real-world setting

Examples:

- Chilled Beam
- Thermochromic Glass
1 Innovation Efforts in **Productivity**

**Overall Target:** To improve productivity at technology or system levels by at least 20% from current best practice

Formulate roadmaps to direct research, development & deployment (RD&D) framework

A Construction Productivity R&D Roadmap

Developed in partnership with > 300 stakeholders

Translate RD&D framework into adoption & deployment

A Productivity Innovation Cluster (*exploring*)

B Centre for Lean & Virtual Construction

C NUS Centre of Excellence in BIM Integration
Innovation - Formulate Roadmaps
to direct Research, Development & Deployment (RD&D) framework

Construction Productivity R&D Roadmap

- Identified solutions within 7 key clusters:
  - DfMA (Design for Manufacturing and Assembly)
  - Automated Equipment
  - Infocomm Technology (ICT)
  - Building Information Modelling and Virtual Design and Construction (BIM/VDC)
  - 3D Printing
  - Advanced Construction Materials
  - Civil Engineering Works
  - Advanced Construction Materials
Innovation – Adoption & Deployment
Translate RD&D framework into adoption & deployment

A Productivity Innovation Cluster

- To develop solutions leading towards adoption and deployment

1. Grant Call
   - Build R&D capabilities through thematic grant calls and iGrant approach

2. Joint Lab
   - Encourage R&D collaboration among Key stakeholders

3. Consortium
   - Enables timely development and market penetrable solutions

B Centre for Lean & Virtual Construction

- Experiment lean and virtual construction and build up expertise

Examples:

- Alps Residences
- High Park Residences

C NUS COE in BIM Integration

- Augment the BIM capabilities
- Facilitate BIM adoption

Examples:

- Research collaboration agreement with Graphisoft
Innovation – Funding Schemes throughout RD&D Lifecycle

- **Industry-IHL Partnership (IIP)**
  - NRF

- **Industry Alignment Fund (Industry Collaboration Projects) (IAF-ICP)**
  - NRF

- **Industry Alignment Fund (Prepositioning Programmes)**
  - NRF

- **Research Incentive Scheme for Companies (RISC)**
  - EDB

- **Technology Enterprise Commercialisation Scheme (TECS)**
  - SPRING

- **Partnerships for Capability Transformation (PACT)**
  - EDB & SPRING

- **Collaborative Industry Projects (CIP)**
  - SPRING

- **iGrant**
  - BCA

- **SPRING SEEDS**
  - SPRING

- **Capabilities Development Grant (CDG)**
  - SPRING

- **Centralised Gap Funding**
  - NRF

- **Pre-Project Innovation Consortia (PPIC)**
  - EDB

Legend:
- Project
- Financing
- Collaborative
**Transformation Framework**

**Vision for the Sector**

A *highly integrated, technologically advanced and innovative* construction sector, led by *progressive firms*, and supported by a *skilled and competent workforce*, well-poised to *capture regional and global opportunities*.

**Key Transformation Areas**

- **Lead globally in green buildings**
- **Increase adoption of Digital Engineering (focus in BIM/VDC)**
- **Change the way we build through Design for Manufacturing and Assembly (DfMA)**

**Approaches to Enable Transformation**

1. **Innovation**
   - Productivity
     - 1. Build higher quality workforce
     - 2. Encourage higher capital investment
     - 3. Enhance integration of value-chain

2. **Job & Skills**

3. **Internationalisation**

4. **Collaboration**

5. **Regulation**

**Key Enablers**

- **1. Innovation**
- **2. Collaboration**
- **3. Job & Skills**
- **4. Internationalisation**
- **5. Regulation**
Impetus to Keep Construction Cost Low
to attract foreign investment and deliver affordable housing

Lowest construction cost among key developed cities

High Rise, Premium Offices

Source: Arcadis (Singapore, Hong Kong costs in $/CFA), RLB (London, Sydney, New York costs in $/GFA)

Lowest wages across key developed countries contributes to low construction cost

Monthly average construction wages in 2014

Source: Boston Consulting Group’s Average Weekly Wages chart cited in its 2014 Benchmarking report on Restructuring the Singapore Built Environment to Achieve Higher Productivity;

Foreign workers growth in tandem with output as sector is labour intensive

Number in thousands

Foreign Contractor RnF and Construction Output

Source: Arcadis
Impetus to Keep Construction Cost Low for Strategic Objectives

Low construction cost to attract foreign investment and deliver affordable housing

Lowest construction cost among developed cities

High Rise, Average Standard Apartments

Source: Arcadis (Singapore, Hong Kong costs in $/CFA), RLB (London, Sydney, New York costs in $/GFA)
Low construction wages discourage capital investment in productive technology.

**Correlation between labour productivity and capital**

- Investments have real impact on productivity.
- At least $2.8 - $3bil of additional capital investment needed (BCA’s estimate).

1. Productivity index base lined at 1995=100 from EU KLEMS
2. Capital services index base lined at 1995=100 from EU KLEMS

Note: Capital services refer to the flow of productive services provided by an asset that is employed in production. Capital services reflect a (physical) quantity.
Low Construction Cost Contributed to Low VAP

Construction Cost correlates to Construction VAP

Construction Productivity vs Unit Construction Cost

Lower construction costs, lower construction VAP

Higher construction costs, higher construction VAP

Singapore

Australia (Sydney)

Japan (Tokyo)

US (New York)
Progress Update on Site Productivity

Overall Target: *Average annual 2-3%* site productivity improvement by 2020
*(20% - 30% cumulative productivity improvement from 2010 levels by 2020)*

**Year-on-Year Improvement** in Site Productivity

*Building Works*

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<tr>
<th>Year</th>
<th>Improvement in Site Productivity (m² per man-day)</th>
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<td>2009</td>
<td>0.380</td>
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<tr>
<td>2010</td>
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<td>2014</td>
<td>0.411</td>
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<td>2015</td>
<td>0.419</td>
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*Final figures for 2016 subject to changes*

**Productivity Growth Targets**
*(year-on-year)*

- **1.5% – 2%**
  - from 2011 – 2015
- **2.5% – 4%**
  - from 2016 – 2020

*Final figures for 2016 subject to changes*
Key Strategies in 2nd Construction Productivity Roadmap

Higher Quality Workforce

Doing More with Less
Ensuring workers have:

- Correct Skills Set
- Adequate Skills Level

Local workforce to be covered under Job & Skills

Higher Capital Investment

Enhance collaboration across all stakeholders along construction value chain

Design for Manufacturing & Assembly (DfMA)

- Lotus Root System
- Precast-Steel Hybrid
- Structural Steel
- Advanced Precast/Precast-steel Hybrid/Structural Steel
- Mass Engineered Timber (MET)
- Prefab Plant
- Prefab MEP
- Prefab MEP Deck
- PPVC

Mid-term review to be done in consultation with industry.
Productivity – Build Higher Quality Foreign Workforce

Raise Skill Level

A. Requiring minimum % of higher skilled R1 workers

- Upgrade 5%
- Maintain 10%

2015 2016 2017

B. Providing 4 key upgrading pathways

- Coretrade
- Multi-skilling (Trade-based or Safety-related)
- Market-Based Recognition Framework
- Direct R1

Reduce Reliance & Encourage Technology Adoption

A. Raising levy for less experienced workers

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<th>July 2015</th>
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<th>July 2017</th>
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<td>MYE Quota</td>
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<td>MYE Waiver</td>
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</table>

^Singapore Contractors Association Ltd
Productivity – Encourage Higher Capital Investment

**Raise Public Sector Demand**

- **Productivity Gateway Framework**
  - GPEs to achieve 25% to 30% productivity improvement from 2010 levels

  **Key GPEs:**
  - Housing & Development Board
  - JTC
  - IRIS
  - PUB
  - National Environment Agency

- **Tendering Advantage in Public Projects**
  - Significant productivity weightage:
    - 10% for construction projects
    - 20% for consultancy projects

**Raise Private Sector Demand**

- **Construction Productivity and Capability Fund**
  - Supported > 9,000 firms
  - Benefitted > 100,000 personnel

- **Government Land Sales (GLS) Programme**
  - Stipulating technology adoption as a land sales condition

**Build Up Local Capacity**

- **2020**
  - 10 ICPHs (for all DfMA technologies)
  - 5 ICPHs*

- **Dec 2016**

  **Examples:**
  - Tiong Seng Prefab Hub
  - SEF SpaceHub
  - Straits Construction

*Integrated Construction and Prefabrication Hubs (ICPHs) are facilities for **precast component production, fully-automated storage and retrieval** of precast components.
Productivity – Support Schemes for SMEs

1. **Mechanization Credit**
   - Defray cost to adopt automation solutions to raise productivity
     - Supported *more than >5,000 applications and >1,300 firms*

2. **Productivity Improvement Project**
   - Build capability and make process improvements through project delivery
     - Supported *more than >1,000 applications and >400 firms*

3. **Workforce Training and Upgrading**
   - Upskill the workforce of firms through training courses and skills assessment (*up to 90% support*)
     - Supported *more than >100,000 personnel*

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**BCA CPCF Clinic**

- One-to-one consultation sessions on productivity issues and CPCF schemes
2 Productivity – Enhance Integration of Value Chain

Push for BIM/VDC Adoption

- **Oct 2017**: BIM e-Submissions of building plans for all projects > 5,000 m²
- **2015**: Arch. and Eng. BIM submission for new projects > 5,000 m²

Build up BIM/VDC capabilities

- **A**: Funding support for collaborative BIM projects
  - 75 -100 projects by 2018
- **B**: Incorporate collaborative BIM requirements into contracts
  - > 20 GPEs adopted
- **C**: Centre For Lean & Virtual Construction (CLVC)
- **D**: BIM/VDC courses at BCA Academy
  - > 10 BIM/VDC programmes at all levels:
    - CEOs: VDC Leadership Programme
    - Middle Mgmt: VDC programme for Project Teams
    - Technical: BIM Scheduling and Process Management
Transformation Framework

Vision for the Sector

A highly integrated, technologically advanced and innovative construction sector, led by progressive firms, and supported by a skilled and competent workforce, well-poised to capture regional and global opportunities.

Key Transformation Areas

1. Lead globally in green buildings
2. Increase adoption of Digital Engineering (focus in BIM/VDC)
3. Change the way we build through Design for Manufacturing and Assembly (DfMA)

Approaches to Enable Transformation

1. Innovation
2. Productivity
3. Job & Skills
   1. Attract and retain locals in the workforce
   2. Equip workforce with future skills
   3. Enhance quality of foreign workforce
4. Collaboration
5. Regulation
6. Internationalisation

Key Enablers
**Sectoral Manpower Plan to Achieve Desired Workforce Profile**

**Desired 2020 Workforce Profile**

- **PMET**
- **R1** (at least 40% by 2020)
- **R2**

**Reduction of 20-30%**

**Sectoral Manpower Plan**

- **Attract and Retain Locals**
  - Rebranding Roadmap
  - Scholarship/Sponsorships
  - Career Progression

- **Equipping Locals with Future Skills**
  - Pre-employment Training
  - Continuous Education and Training
  - Reskill workers from other Sectors

**Enhance quality of foreign workforce**

- Upgrading Requirements/Pathways
- Levy Differential

**Build strong local PMET core**
- Upskill and create jobs
- **Reduce reliance on foreign RnF:**
  - Reduce R2 by 20-30%
  - Increase R1 proportion
Job & Skills - Attract and Retain Locals in the Workforce

- To attract more local talent in the sector
  - E.g. To partner WiSER and MOE ECG in outreach

- To retain locals by enhanced HR practices
  - Promote adoption of good HR practices
  - Attract HR practitioners
  - Raise HR capabilities

Rebranding Roadmap

Clear Career Progression

- Vertical progression
- Horizontal development into specialization
- Versatile in deployability between contractors and consultants

Scholarship/Sponsorships at all levels

- Undergraduate Scholarship (Full-Time)
- Undergraduate Sponsorship (Full-Time)
- Undergraduate Sponsorship (Part-Time)
- Diploma Scholarship (Full-Time)
- Diploma Sponsorship (Part-Time)
- Diploma Scholarship (Supervisor)
- Bldg Specialist Sponsorship (Foreman)
- Bldg Specialist Sponsorship (Supervisor)
- Postgrad Sponsorship (Part-Time)

>2,500 students benefitted
**Future Skills for Construction Sector**

**Green Design and Engineering**
- Green Mark Professionals – Architects, Engineers, Facility Managers
- Green Mark Associates

**Digital Engineering**
- BIM Director/Manager
- BIM Specialist
- BIM Modeller

**DfMA**
- DfMA Designer
- DfMA Production Manager
- DfMA Plant Operator

- Personnel trained at IHLs and BCA Academy

**Launch of Green Building Masterplan**

**Launch of BIM Roadmap**

**Launch of 1st Construction Productivity Roadmap**

**Launch of 2nd Construction Productivity Roadmap**

- 2006
- 2010
- 2015
- 2017
- 2020
- 2025

**Target**
- 20,000 Green personnel by 2025
- 13,000 BIM personnel by 2025
- 14,000 DfMA personnel by 2025

*-trained* to date
A. Pre-Employment Local Training

- Enhancing BE-related courses with future skills

Phase 1

Form IHL-BCA-Industry Taskforce taskforce to update curriculum

Phase 2

Continuous updating of curriculum through IHLs’ academic advisory panel

B. Continuous Education and Training for Existing Local Workforce

- BCA Academy of the built environment as key training platform
- To roll out more CET courses through the IHL-BCA Industry taskforce

C. Re-skill Workers from Other Sectors

- Mid-career professionals can be re-skilled through the Professional Conversion Programme (PCP)

- M&E Engineers
- BIM/VDC modeller
- IT professionals

- Factory controller
- Manufacturing background

Types of Jobs:

- Green building
- Digital Engineering
- DfMA

To co-develop with industry and IHLs
Vision for the Sector

A highly integrated, technologically advanced and innovative construction sector, led by progressive firms, and supported by a skilled and competent workforce, well-poised to capture regional and global opportunities.

Key Transformation Areas

- Lead globally in green buildings
- Increase adoption of Digital Engineering (focus in BIM/VDC)
- Change the way we build through Design for Manufacturing and Assembly (DfMA)

Approaches to Enable Transformation

1. Innovation
2. Productivity
3. Job & Skills
4. Collaboration
5. Regulation
   1. Facilitative pro-enterprise regulatory regime
   2. Pro-active regulations
   3. Facilitative procurement initiatives
6. Internationalisation

Key Enablers

- Facilitative engagement
- Building key capabilities
### 4 Key Enablers: Collaboration

#### Facilitate engagement with stakeholders

**A Stakeholder engagement for key reviews**
- Co-develop Construction ITM with *Construction Productivity Skillsfuture Tripartite Committee (CPSTC)*
- **International Panel of Experts** reviewed 2nd Construction Productivity Roadmap and 3rd Green Building Masterplan

**B MOUs to build and strengthen strategic ties**
- Encourage local adoption of BIM
- Overseas collaboration on green building

**C Key communications and outreach events**
- Singapore Green Building Week
- Singapore Construction Productivity Week

#### Build key capabilities in firms and personnel

**A Learning from the best**
- Overseas Learning Journey
- International Panel of Experts (IPEs)
- Distinguished Speaker Series

**B Continuous education and training**
- Comprehensive training programmes at BCA Academy

**C Minimum training requirements**
- Impose CET requirements for firms taking on public sector works
5 Key Enablers: Regulations

Pro-Enterprise Regulatory Regime

A Building Innovation Panel
To facilitate innovative technologies that can improve project productivity

Pro-Active Regulations

A Minimum Standards
- **Buildability** score to drive productivity
- **Environmental sustainability** standards

B GLS/IGLS requirements

Facilitative Procurement Initiatives

A Public Sector Taking the Lead
- **Environmental Sustainability** PSTLES to achieve high green building standards and adopt green procurement
- **Productivity Gateway Framework**
Key Enablers: Regulations

Inter-Agency efforts to review regulatory hurdles

A Inter-Agency DfMA Taskforce
- Resolved major regulatory hurdles impeding DfMA adoption toward building a robust eco-

Key Examples of Regulatory Issues Resolved

✓ Reviewed Height Limit of Mass Engineered Timber (MET) Buildings
  - MET buildings can go beyond 24m (except healthcare facilities)
  - Based on performance-based approach

✓ Relaxed escort requirements for heavy vehicles transporting PPVC modules
  - Increased maximum width limit from 3m to 3.4m

B Inter-Agency Coordinating Committee (IACC)
- Standing committee to review conflicting regulatory requirements and policies

✓ A key platform for industry to surface issues by different agencies
✓ Key agencies and associations collaborate for speedy resolution

To seek feedback from members on issues on inter-agency requirements

Regulating Agencies

Other Agencies

Industry Assoc
Transformation Framework

Vision for the Sector

A highly integrated, technologically advanced and innovative construction sector, led by progressive firms, and supported by a skilled and competent workforce, well-poised to capture regional and global opportunities.

Key Transformation Areas

1. Innovation
2. Productivity
3. Job & Skills
4. Collaboration
5. Regulation
6. Internationalisation

Approaches to Enable Transformation

1. Target key markets that demand niche competencies
2. Build scale and offer integrated solutions
3. Provide deeper intelligence and financial support

Key Enablers

Lead globally in green buildings
Increase adoption of Digital Engineering (focus in BIM/VDC)
Change the way we build through Design for Manufacturing and Assembly (DfMA)
Sector is domestically orientated

But set to change as we transform the Sector

**Domestic Construction Demand and Export Contract Value**

Source: BCA Export Survey and BCA Annual Survey (2014)

- **Total Construction Demand**
- **Export Contract Value**

*S$ billion*

- 2020 target: To be firmed under the ITM

*S$1.6 bil*

*Forecast of total demand for 2017-2020 is the average between upper and lower bound*
Internationalisation as the Next Engine of Growth

Significantly larger construction output in key export countries

Key export countries

<table>
<thead>
<tr>
<th>Country</th>
<th>Construction GDP (US$ billion)</th>
<th>Share of Key Export Countries^ from 2011-2015</th>
</tr>
</thead>
<tbody>
<tr>
<td>China</td>
<td>US$1598 bil</td>
<td>35%</td>
</tr>
<tr>
<td>India</td>
<td>US$132 bil</td>
<td>22%</td>
</tr>
<tr>
<td>Indonesia</td>
<td>US$13 bil</td>
<td>10%</td>
</tr>
<tr>
<td>Malaysia</td>
<td></td>
<td>20%</td>
</tr>
<tr>
<td>Myanmar</td>
<td></td>
<td>6%</td>
</tr>
<tr>
<td>Vietnam</td>
<td></td>
<td>7%</td>
</tr>
<tr>
<td>Singapore</td>
<td></td>
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</tr>
</tbody>
</table>

Outlook in Key Export Countries (US$ billion)

<table>
<thead>
<tr>
<th>Country</th>
<th>Construction GDP (US$ billion)</th>
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</thead>
<tbody>
<tr>
<td>Indonesia</td>
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<td>US$13 bil</td>
</tr>
<tr>
<td>Malaysia</td>
<td></td>
</tr>
</tbody>
</table>

Source: BCA Export Survey and IHL economics (2015)

^Based on no. of projects clinched

Key China developments:
- Sino-Singapore Tianjin Eco City
- Guangzhou Knowledge City

Key India developments:
- Andhra Pradesh New Capital City
- 100 Smart Cities

6% Myanmar
7% Vietnam
10% Indonesia
20% India

Myanmar
Vietnam
Indonesia
Malaysia
China

Source: BCA Export Survey and IHL economics (2015)
### 2009-2016 Facilitation and Profiling Achievements

#### DIRECT FACILITATION EFFORTS

<table>
<thead>
<tr>
<th>Event</th>
<th>Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overseas Mission Trips</td>
<td>160</td>
</tr>
<tr>
<td>Local Seminar</td>
<td>460</td>
</tr>
<tr>
<td>Direct Facilitation Efforts</td>
<td>71</td>
</tr>
</tbody>
</table>

#### DIRECT PROFILING EFFORTS

<table>
<thead>
<tr>
<th>Event</th>
<th>Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>Singapore Companies</td>
<td>30</td>
</tr>
<tr>
<td>Overseas Green Pavilions</td>
<td>36</td>
</tr>
<tr>
<td>Singapore Companies</td>
<td>30</td>
</tr>
<tr>
<td>Overseas Green Forums</td>
<td>32</td>
</tr>
<tr>
<td>Local &amp; International editions</td>
<td>4</td>
</tr>
<tr>
<td>E-Newsletter</td>
<td></td>
</tr>
</tbody>
</table>

- *Started from 2015*

<table>
<thead>
<tr>
<th>Event</th>
<th>Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>Delegates</td>
<td>1240</td>
</tr>
<tr>
<td>Briefings for Overseas Delegates</td>
<td>202</td>
</tr>
<tr>
<td>Overseas Papers Presented</td>
<td>67</td>
</tr>
</tbody>
</table>
Enhance Export Strategies via a more Targeted Approach

Internationalisation Strategies

- Target key markets that demand niche competencies
- Build scale and offer integrated solutions
- Provide deeper intelligence and financial support

Among 725 larger/specialist contractors*

- 2009–14: 12%
- 2015: 18%
- 2020: 55%

To be firmed under ITM

Among 205 larger/specialist consultants*

- 2009–14: 55%
- 2015: 67%
- 2020: To be firmed under ITM

*Represent firms with significant capacity and capabilities to export:
Contractors: (B2 to A1, L5 to L6, Specialist Contractors)
Consultants: (P1 to P2, Green Consultants)
Internationalisation

Two pronged approach to enhance firms’ value proposition

Target key markets that demand niche competencies

Build Niche Skillsets in Exporting Firms

Niche Skillsets Identified

- Green Buildings and Sustainable Design
  - Green Master-Planning (township development)
  - Green Building Consultancy and Technologies

- High Quality and Pre-fabricated buildings
  - DfMA
  - High Construction Quality

- Digital Engineering in Buildings and Construction
  - BIM/VDC
  - Smart Building

Enhance facilitation and profiling efforts in high potential countries

- Facilitate access of firms to high potential countries through BCA’s direct facilitation efforts

- To increase awareness and recognition of the Singapore Brand through BCA’s active profiling efforts
Internationalisation—Target key countries that demand key competencies

- By *enhancing profiling and facilitation efforts in high potential countries*
  - Countries with ‘medium’ to ‘medium high’ export demand

![Table showing potential external demand in key export countries]

- High potential due to relatively lower competition
- Strategy to be further developed

### Key Capabilities needed

<table>
<thead>
<tr>
<th>Potential External Demand in key export countries</th>
</tr>
</thead>
<tbody>
<tr>
<td>China</td>
</tr>
<tr>
<td>-------</td>
</tr>
<tr>
<td>High</td>
</tr>
<tr>
<td>High</td>
</tr>
<tr>
<td>High</td>
</tr>
</tbody>
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- Green Buildings and Sustainable Design
  - Green Master-Planning (township development)
  - Green Building Consultancy and Technologies

- High Quality & Pre-fabricated buildings
  - DfMA
  - High Construction Quality

- Digital Engineering in Buildings & Construction
  - BIM/VDC
  - Smart Building

^IMPT: Indonesia, Malaysia, Philippines, Thailand
*CLMV: Cambodia, Laos, Myanmar, Vietnam
Strong Demand of BCA’s Green Mark Scheme Regionally

- BCA’s Green Mark (green building certification scheme) increases awareness, recognition and demand for green building specialists from Singapore

Countries Adopting Green Mark Scheme

- 310 overseas applications*
- 80 Cities*
- 14 countries*

*As of 1 Jan 17
Internationalisation – Build scale and offer integrated solutions

Encourage local firms to form partnerships to increase competitiveness against domestic firms and MNCs:

1) Joint venture (among local firms) to build scale and allow firms to have access to higher value projects

2) Consortium to increase competitiveness by offering integrated solutions at 2 levels:

   a) **Within the Built Environment Cluster** (i.e. Construction, Security, Cleaning, Real Estate and Landscape Sectors)

   b) **Across the construction value chain**
To provide more support for our firms to venture overseas by enhancing collaboration with IE Singapore

<table>
<thead>
<tr>
<th>Barrier of Entry</th>
<th>Approach</th>
</tr>
</thead>
<tbody>
<tr>
<td>Relatively higher cost of financing for overseas projects</td>
<td>To tap on IE Singapore’s scheme - Internationalisation Finance Scheme</td>
</tr>
<tr>
<td>Shortage of good professionals for key positions in overseas projects</td>
<td>To tap on IE Singapore’s scheme – Attraction Talent Development Scheme</td>
</tr>
</tbody>
</table>

• Tapping on existing schemes:

• Providing deeper financial and business intelligence support:

<table>
<thead>
<tr>
<th>Barrier of Entry</th>
<th>Approach</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unfamiliarity with overseas markets (e.g. projects available and reliable local business partners)</td>
<td>To be studied by the Internationalisation taskforce</td>
</tr>
<tr>
<td>High upfront capital outlay (e.g. relatively higher tendering cost)</td>
<td></td>
</tr>
</tbody>
</table>
Approaches to Transform the Construction Sector

Vision for the Sector

A highly integrated, technologically advanced and innovative construction sector, led by progressive firms, and supported by a skilled and competent workforce, well-poised to capture regional and global opportunities.

Approaches to Enable Transformation

1. Innovation
   - Formulate roadmaps to direct RD&D framework
   - Translate RD&D framework towards adoption and deployment

2. Productivity
   - Build higher quality workforce
   - Encourage higher capital investment
   - Enhance integration of value-chain

3. Job & Skills
   - Attract and retain locals in the workforce
   - Equip workforce with future skills
   - Enhance quality of foreign workforce

4. Collaboration
   - Facilitative engagement
   - Building key capabilities

5. Regulation
   - Facilitative pro-enterprise regulatory regime
   - Pro-active regulations
   - Facilitative procurement initiatives

6. Internationalisation
   - Target key markets that demand niche competencies
   - Build scale and offer integrated solutions
   - Provide deeper intelligence and financial support

Key Enablers
<table>
<thead>
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<th></th>
<th>Summary of Approaches In-Development</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><strong>Innovation</strong></td>
</tr>
<tr>
<td>1.</td>
<td>Green Building R&amp;D Roadmap</td>
</tr>
<tr>
<td>2.</td>
<td>Productivity Innovation Cluster</td>
</tr>
<tr>
<td></td>
<td><strong>Productivity</strong></td>
</tr>
<tr>
<td>1.</td>
<td>Mid-term review of the productivity roadmap</td>
</tr>
<tr>
<td></td>
<td><strong>Job &amp; Skills</strong></td>
</tr>
<tr>
<td>1.</td>
<td>Stepping up efforts through rebranding roadmap (e.g. to partner WiSER^ and MOE ECG in outreach)</td>
</tr>
<tr>
<td>2.</td>
<td>Forming of IHL-BCA-Industry taskforce to update curriculum</td>
</tr>
<tr>
<td>3.</td>
<td>Re-skill mid-carrier professions through the professional conversion Programme</td>
</tr>
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<td></td>
<td><strong>Internationalisation</strong></td>
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<tr>
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For CIJC’s comments, please