Materials & Resources for Green Buildings in Malaysia

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Building Carbon Footprint

- Building industry generates as much as **30% construction waste**, and it is expected to reach 2.2 billion tons of waste annually worldwide by 2025.
- Building sector contribute to **39% of energy-related CO_2 emissions** globally.
- Demand of construction is expected to grow further especially in developing countries.
- Malaysia estimates the construction industry to expand by **10.3% per annum**.
- The industry demonstrates strong correlation with economic development (GDP).

Image source: https://www.epa.gov/

Building Carbon Footprint

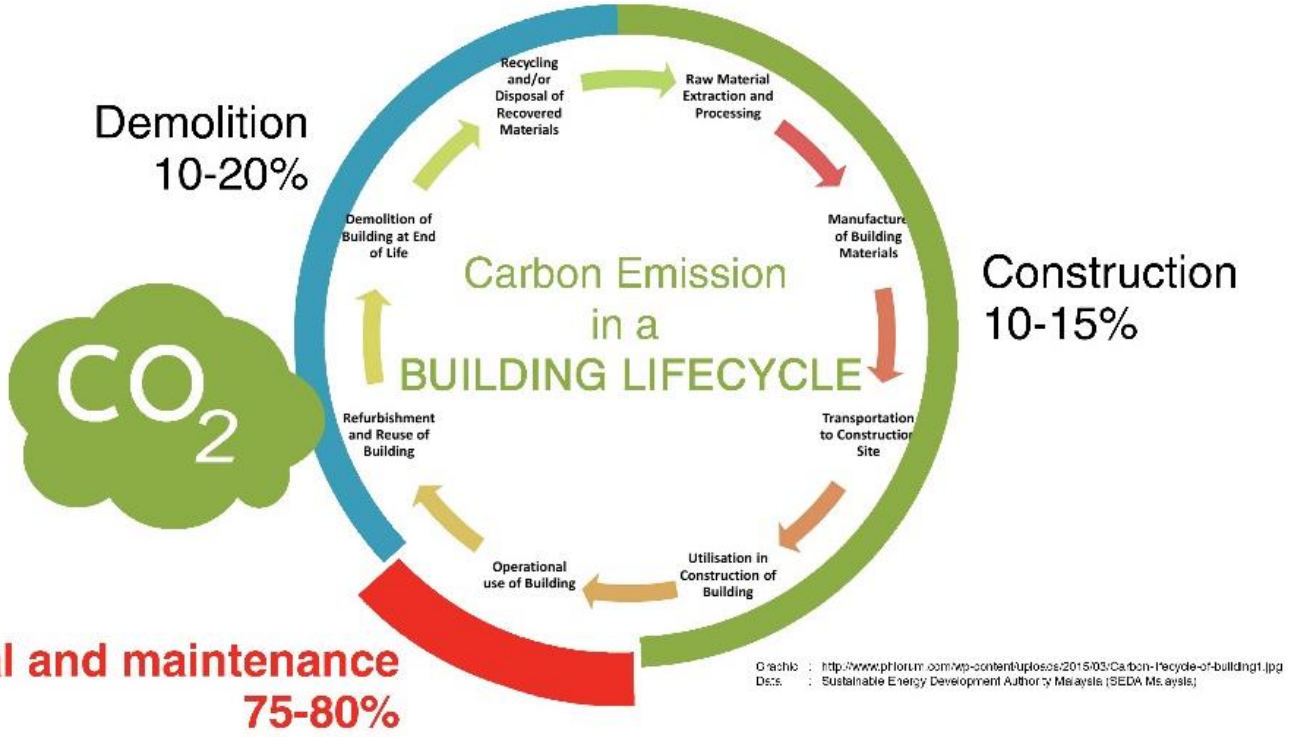
ISSUE

Carbon Emission from Buildings

Building Sectors:

Commercial	Residential	Industrial
Shopping Mall	Landed Housing	Light Industries
Shop Offices	Apartments	Factory
Hotel	Condominium	Heavy Industries

RELEASE



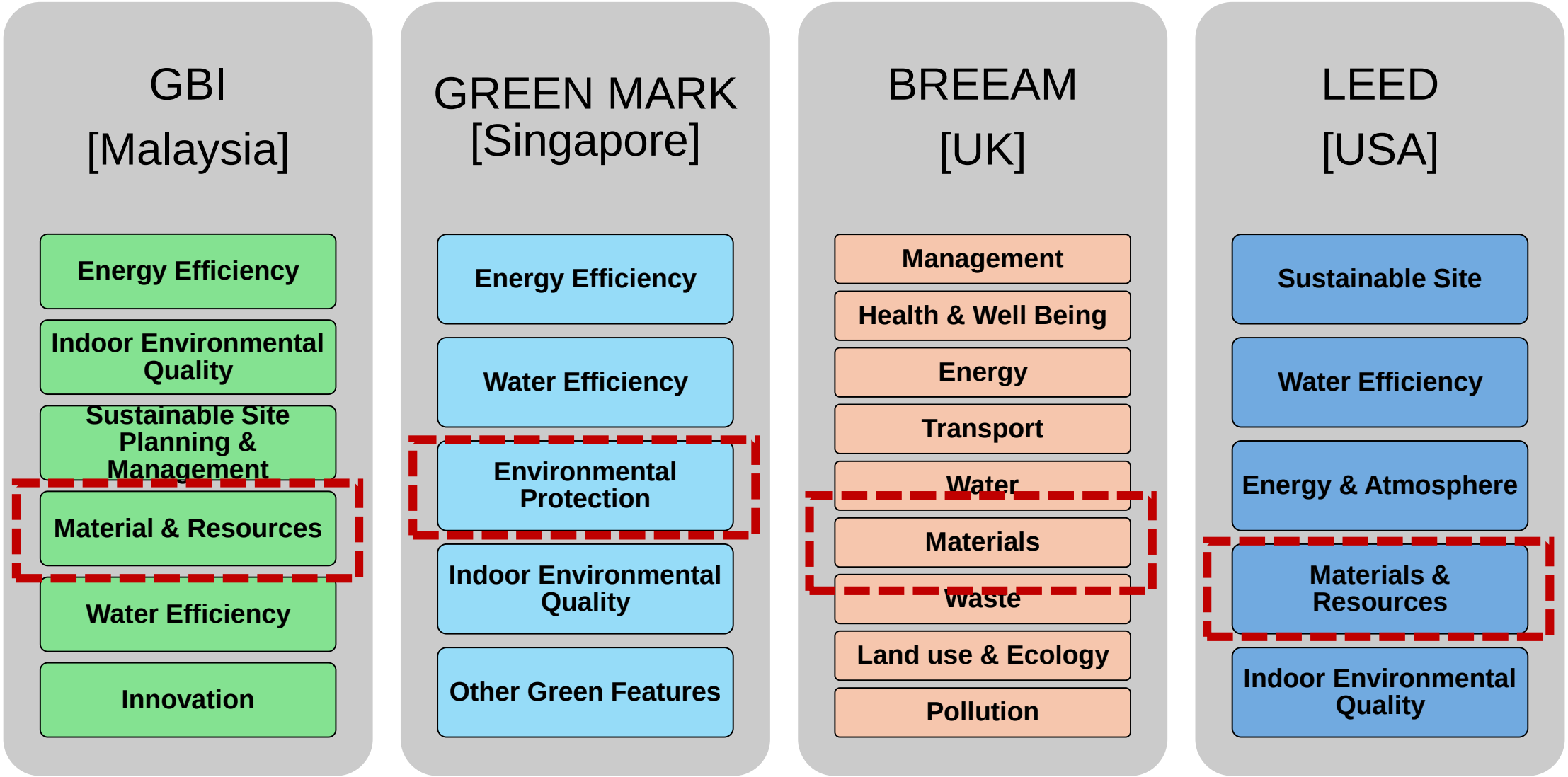
Sustainability in building sector requires urgent attention throughout the entire **building lifecycle**, starting from pre-construction phase until operation and maintenance

Examples of Green Building Assessment

CASBEE®

BREEAM®

Examples of Green Building Assessment



Materials & Resources (MR) in GBI

	MR	MATERIALS & RESOURCES		
4	**Reused & Recycled Materials**			11
	MR1	Materials reuse and selection	2	
	MR2	Recycled content materials	2	
	Sustainable Resources			
	MR3	Regional Materials	1	
	MR4	Sustainable Timber	1	
	Waste Management			
	MR5	Storage & Collection of recyclables	1	
	MR6	Construction waste management	2	
	Green Products			
	MR7	Refrigerants & Clean Agents	2	

Sustainable Low Carbon Material

- Materials that are environmentally friendly and reduce carbon emissions.
- Include recycled materials, natural materials, and materials that are carbon-negative.
- Examples: recycled wood, timber, bamboo, stone, recycled/ green concrete, natural materials, etc.
- Materials with low embodied carbon.
- Materials with green certification (e.g. MyHijau).

Bamboo
Image source: www.bamboogrove.com

Laminated Timber
Image source: www.thinkwood.com

Green Concrete
Image source: www.worldconstructiontoday.com/

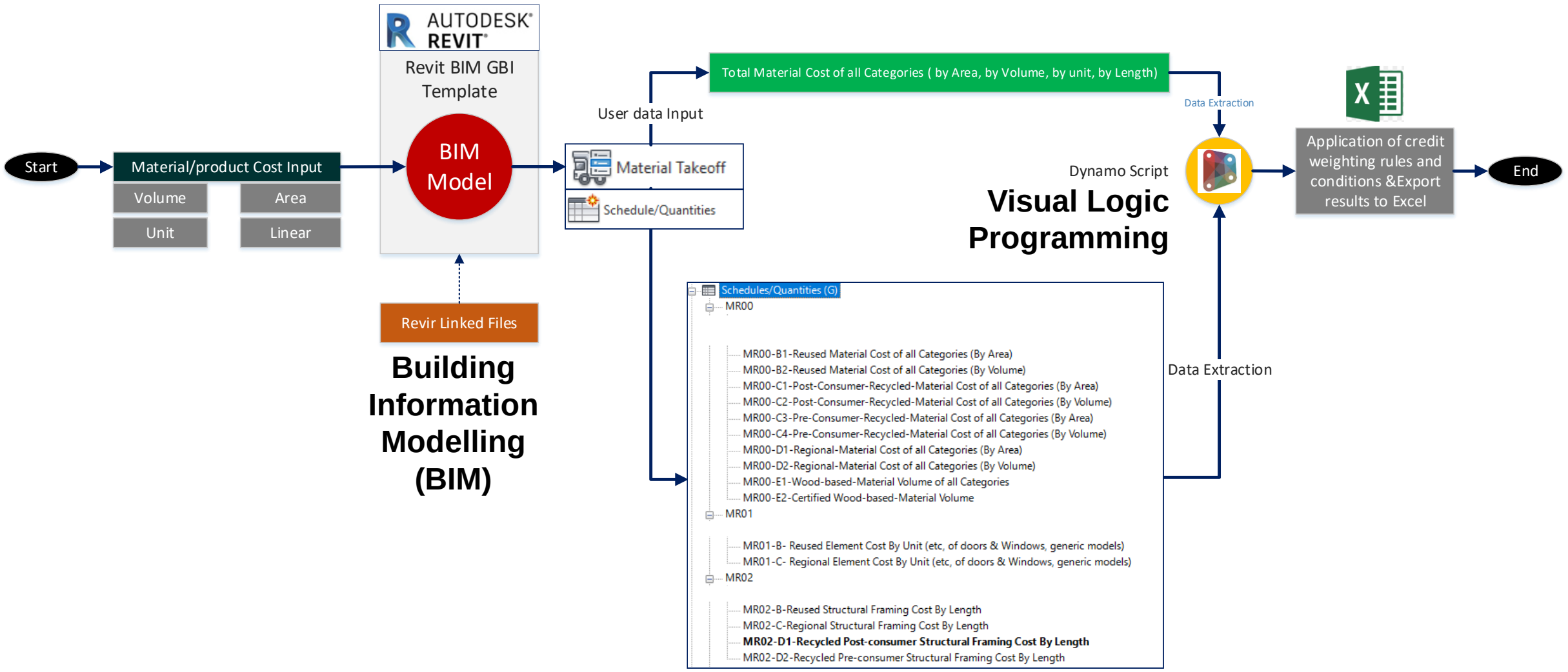
Timber as Sustainable Material

- Timber is a sustainable material in many respects:
  - **Renewable**: Timber can grow back
  - **Low carbon footprint**: Timber stores carbon until it's burned or deteriorates
  - **Energy efficient**: Timber requires less energy to process than other materials (low embodied energy)
  - **Recyclable**: Timber can be reused in other construction projects
- Timber is a **natural product** that gives people the feeling of being close to nature. It promotes a sense of **well-being**, which is crucial for places where people live and work.

Glulam Gallery, Johor Bahru

A16 TLDM, Lumut

MR Assessment using BIM & VLP



MR Assessment using BIM

MR00-B1-Reused Material Cost of... | MR00-A1-Total Material Cost of...

<MR00-A1-Total Material Cost of all Categories (By Area)>

A	B	C	D	E	F	G	H	I
Material: Name	Material: Exclude	Material: Cost by volume (if checked)	Material: Cost	Material: Area	Total Material Cost (RM)	Material: Reused	Material: Recycled	Material: Regional
Brick, Common	☑	☑	100.00	105 m²	10521.6	☐	☐	☑
Vapour Retarder	☐	☐	35.00	105 m²	3682.56	☐	☐	☐
Gypsum Wall Board	☐	☐	45.00	105 m²	4734.72	☑	☑	☐
Cavity Fill	☐	☐	0.00	105 m²	0	☐	☐	☐
Brick, Common	☐	☐	100.00	95 m²	9478.4	☐	☐	☑
Vapour Retarder	☐	☐	35.00	95 m²	3317.44	☐	☐	☐
Gypsum Wall Board	☐	☐	45.00	95 m²	4265.28	☑	☑	☐
Cavity Fill	☐	☐	0.00	95 m²	0	☐	☐	☐
Default Floor	☐	☐	0.00	111 m²	0	☐	☑	☐
Grand total: 9					36000			

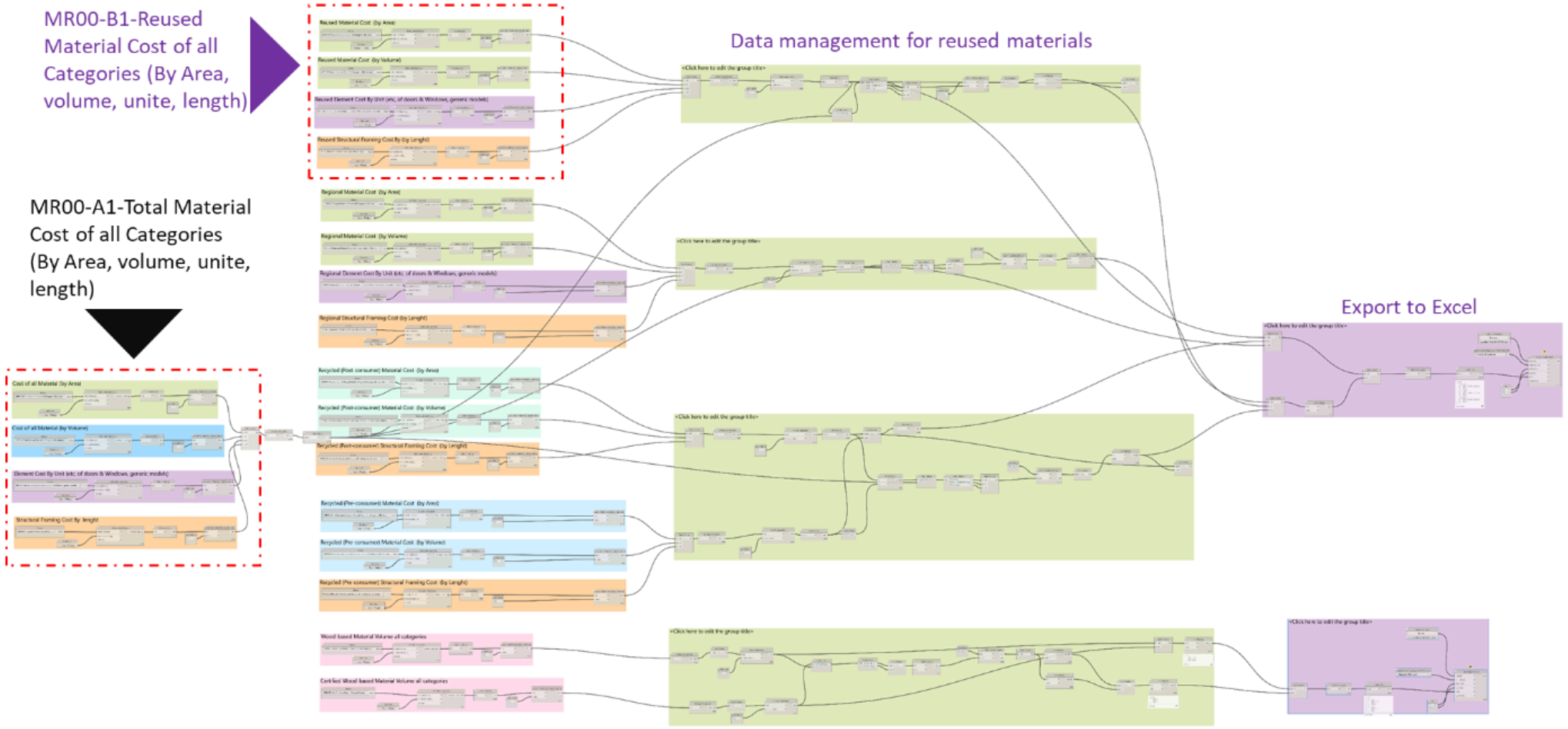
Revit Material Take-off schedule MR00-A1-Total Material Cost of all Categories (By Area)

<MR00-B2-Reused Material Cost of all Categories (By Volume)>

A	B	C	D	E
Material: Name	Material: Reused	Material: Cost by volume (if checked)	Material: Volume	Total Material Cost
Concrete Masonry Units	☑	☑	14.73 m³	810.16
Concrete Masonry Units	☑	☑	13.27 m³	729.84
Grand total: 2				1540

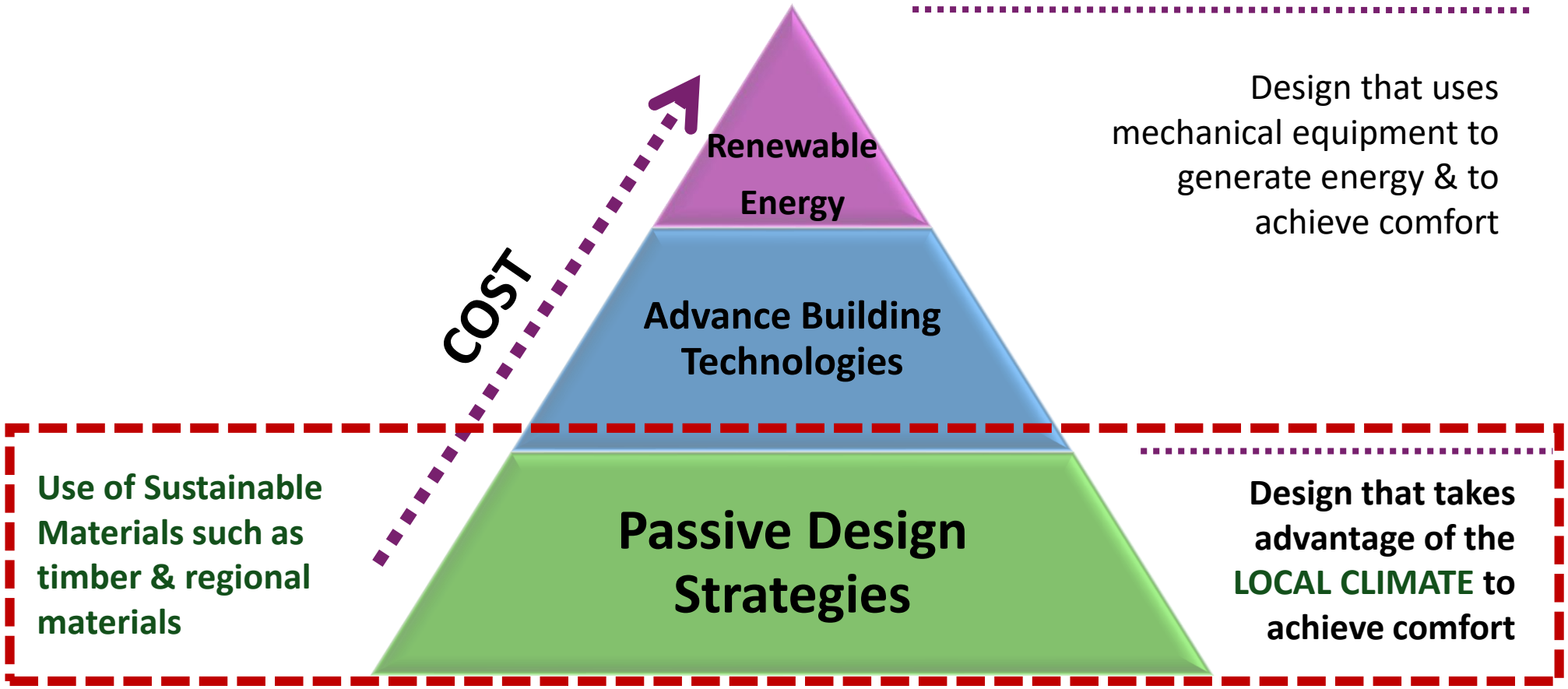
Revit Material Take-off schedule MR00-B2-Reused Material Cost of all Categories (By Volume)

MR Assessment using BIM & VLP



Dynamo visual programming script for BIM-GBI MR

Conclusion



Sustainable Low Carbon Design Strategies in relation to Cost