In the late 21st century Earth was diseased, polluted and vastly overpopulated.
THE EARTH: A WORLD OF... SCARCITY!

Every 3.6 seconds a person dies of hunger
75% of them are children.
CITIES & POPULATION: Mega Cities

World Population: 7,247,376,588
(as of 17.07.2014, 13:44)

POPULATION & RESOURCES: Overshoot?

1960-2008
- Ecological Footprint

2008-2050, Scenarios
- Moderate business-as-usual
- Rapid reduction

How many Chinas does it take to support China?

<table>
<thead>
<tr>
<th>Country</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHINA</td>
<td>2.5</td>
</tr>
<tr>
<td>France</td>
<td>1.6</td>
</tr>
<tr>
<td>India</td>
<td>1.8</td>
</tr>
<tr>
<td>U.S.A.</td>
<td>1.9</td>
</tr>
<tr>
<td>Egypt</td>
<td>2.4</td>
</tr>
<tr>
<td>Greece</td>
<td>3.1</td>
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<tr>
<td>U.K.</td>
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<tr>
<td>Italy</td>
<td>4.0</td>
</tr>
<tr>
<td>Switzerland</td>
<td>4.2</td>
</tr>
<tr>
<td>Qatar</td>
<td>5.7</td>
</tr>
<tr>
<td>Japan</td>
<td>7.1</td>
</tr>
<tr>
<td>World</td>
<td>1.5</td>
</tr>
</tbody>
</table>

y-axis: number of planet earths, x-axis: years

Global Footprint Network
MALAYSIA: Water Woes...

<table>
<thead>
<tr>
<th>Location</th>
<th>Water Loss (2010/2012)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Singapore</td>
<td>5% (2010)</td>
</tr>
<tr>
<td>Bangkok</td>
<td>25% (2012)</td>
</tr>
<tr>
<td>E. Manila</td>
<td>11% (2011)</td>
</tr>
<tr>
<td>Dhaka</td>
<td>29% (2010)</td>
</tr>
</tbody>
</table>

### Amount of piped water lost in 2012

- **36.4%** lost from **5.474 trillion litres of piped water produced**

#### States

<table>
<thead>
<tr>
<th>States</th>
<th>Piped water produced (billion litres)</th>
<th>Amount lost (billion litres)</th>
<th>Non-revenue water (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Penang</td>
<td>352.8</td>
<td>62.1</td>
<td>17.6</td>
</tr>
<tr>
<td>Labuan</td>
<td>21.1</td>
<td>4.3</td>
<td>20.4</td>
</tr>
<tr>
<td>Malacca</td>
<td>173.4</td>
<td>41.2</td>
<td>23.8</td>
</tr>
<tr>
<td>Johor</td>
<td>561.0</td>
<td>155.7</td>
<td>27.8</td>
</tr>
<tr>
<td>Sarawak</td>
<td>397.1</td>
<td>116.8</td>
<td>29.4</td>
</tr>
<tr>
<td>Perak</td>
<td>422.7</td>
<td>127.3</td>
<td>30.1</td>
</tr>
<tr>
<td>Selangor</td>
<td>1,578</td>
<td>521.6</td>
<td>33.1</td>
</tr>
<tr>
<td>Terengganu</td>
<td>224.5</td>
<td>82.5</td>
<td>36.8</td>
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<tr>
<td>N. Sembilan</td>
<td>269.1</td>
<td>108.7</td>
<td>40.4</td>
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<tr>
<td>Sabah</td>
<td>386.0</td>
<td>192.8</td>
<td>49.9</td>
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<tr>
<td>Kedah</td>
<td>471.6</td>
<td>238.4</td>
<td>50.6</td>
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<tr>
<td>Kelantan</td>
<td>148.6</td>
<td>80.1</td>
<td>53.9</td>
</tr>
<tr>
<td>Pahang</td>
<td>395.0</td>
<td>214.0</td>
<td>54.2</td>
</tr>
<tr>
<td>Perlis</td>
<td>73.1</td>
<td>48.6</td>
<td>66.4</td>
</tr>
</tbody>
</table>

Water losses are due to:
1. Faulty pipes (75%-80%)
2. Theft and inaccurate water meters (15%-20%)

Source: Malaysian Water Association
RESOURCE EFFICIENCY – By Definition

"RESOURCE EFFICIENCY means the reduction in the total environmental impact of the production & consumption of goods & services, from raw material extraction to final use & disposal."

UNEP
RESOURCE EFFICIENCY – “Prevention Better Than Cure”

- **Prevention**
  - Efficient Use of Materials; Longer Durability; Less Harmful Material Compositions, etc.

- **Re-use**
  - Processes involved to prepare Recycled Materials for Reuse

- **Recycling**
  - Material / Waste Conversion into New Products

- **Energy Recovery**
  - Incineration with Energy Recovery, Anaerobic Digestion; Pyrolysis with Energy Production

- **Disposal**
  - Typical Land-filling & incineration (without any energy recovery)
RESOURCE EFFICIENCY – Demand Trends

Demand for most resources has grown strongly since 2000, a trend that is likely to continue to 2030.

- **Real GDP**
  - 1980: $22 trillion
  - 1990: $30 trillion
  - 2000: $39 trillion
  - 2010: $50 trillion
  - 2020: $69 trillion
  - 2030: $95 trillion

- **Primary energy**
  - 1980: 287 QBTU
  - 1990: 349 QBTU
  - 2000: 398 QBTU
  - 2010: 492 QBTU
  - 2020: 568 QBTU
  - 2030: 654 QBTU

- **Steel**
  - 1980: 567 Million tonnes
  - 1990: 649 Million tonnes
  - 2000: 761 Million tonnes
  - 2010: 1,270 Million tonnes
  - 2020: 1,850 Million tonnes
  - 2030: 2,290 Million tonnes

- **Food**
  - 1980: 1,433 Million tonnes
  - 1990: 1,696 Million tonnes
  - 2000: 1,868 Million tonnes
  - 2010: 2,276 Million tonnes
  - 2020: 2,550 Million tonnes
  - 2030: 2,900 Million tonnes

- **Water**
  - 1980: 3,200 Cubic kilometers
  - 1990: 3,600 Cubic kilometers
  - 2000: 4,000 Cubic kilometers
  - 2010: 4,500 Cubic kilometers
  - 2020: 5,500 Cubic kilometers
  - 2030: 6,350 Cubic kilometers

1 Only cereals.

SOURCE: Global Insight; IEA; UN Environment Program (UNEP); FAO; World Steel Association; McKinsey analysis.

source: McKinsey Global Institute
**RESOURCE EFFICIENCY – The Challenges**

- Middle-class consumers expected to be in the global economy by 2030.

- Rise in steel demand projected from 2010 to 2030.

- Increase in real commodity prices since turn of century.

- Increase in average cost to bring new oil well on line.

*source: McKinsey Global Institute*
## RESOURCE EFFICIENCY – Key Indicators

<table>
<thead>
<tr>
<th>Indicator</th>
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</thead>
<tbody>
<tr>
<td>Environmentally-Weighted Material Consumption</td>
</tr>
<tr>
<td>Energy Intensity</td>
</tr>
<tr>
<td>Production-Based CO₂ Productivity</td>
</tr>
<tr>
<td>Sustainable Process Index</td>
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<tr>
<td>Water Consumption</td>
</tr>
<tr>
<td>Water Abstraction Rate &amp; Water Stress</td>
</tr>
<tr>
<td>Corporations’ Turnover &amp; Exports of The Environmental Goods &amp; Services Sector</td>
</tr>
<tr>
<td>Resources Productivity</td>
</tr>
<tr>
<td>Total Material Consumption</td>
</tr>
<tr>
<td>Ecological Footprint</td>
</tr>
</tbody>
</table>
RESOURCE DECOUPLING – Relative Decoupling

- Economic Growth
- Resource Use
- Environmental Impacts
- Resource Decoupling
- Impact Decoupling
- Double Decoupling
RESOURCE DECOUPLING – Absolute Decoupling

- Economic Growth
- Resource Use
- Impact Decoupling
- Environmental Impacts
- Resource Decoupling
- Double Decoupling

time
RESPONSIBLE SOURCING – By Definition

“RESPONSIBLE SOURCING is the promotion and support of responsible practices throughout the supply chain demonstrated by actions and behavior consistent with responsible sourcing principles.”
RESPONSIBLE SOURCING – BES 6001 Requirements

Organizational Management

✓ Responsible Sourcing Policy
✓ Legal Compliance
✓ Quality Management System
✓ Supplier Management System

Supply Chain Management

✓ Material Traceability through the supply chain
✓ Environmental management systems in the supply chain
✓ Health & safety management systems in the supply chain

Environmental & Social

✓ Greenhouse gas emissions
✓ Energy Management
✓ Resource use
✓ Waste prevention & management
✓ Water extraction
✓ Life Cycle Assessment (LCA)
✓ Ecotoxicity
✓ Transport impacts
✓ Employment & skills
✓ Local communities
✓ Business ethics
RESPONSIBLE SOURCING – Sustainability Factors

Reduce consumption of Natural Materials

Conserve & Reuse Materials

Reduce Packaging to Reduce Waste

Reduce Transportation Requirements

Reduce Emission of Pollutants

Reduce Consumption

50% Reduction over the past 5 years

- Hazardous Waste
- Greenhouse Gas Emissions
- Water Consumption
- Energy Consumption

17th July 2014
“SMART” RESOURCING?

THE WORLD’S MOST RESOURCE-EFFICIENT OFFICE...

GREENEST BUILDING: USING SINGLE SOURCE OF MATERIAL...
THE GBI TOOLS – Relevant Credits

ENERGY EFFICIENCY (EE)
Improve energy consumption by optimising building orientation, minimizing solar heat gain through the building envelope, harvesting natural lighting, adopting the best practices in building services including use of renewable energy, and ensuring proper testing, commissioning and regular maintenance.

INDOOR ENVIRONMENT QUALITY (EQ)
Achieve good quality performance in indoor air quality, acoustics, visual and thermal comfort. These will involve the use of low volatile organic compound materials, application of quality air filtration, proper control of air temperature, movement and humidity.

SUSTAINABLE SITE PLANNING (SM)
Selecting appropriate sites with planned access to public transportation, community services, open spaces and landscaping. Avoiding and conserving environmentally sensitive areas through the redevelopment of existing sites and brownfields. Implementing proper construction management, storm water management and reducing the strain on existing infrastructure capacity.

MATERIALS & RESOURCES (MR)
Promote the use of environment-friendly materials sourced from sustainable sources and recycling. Implement proper construction waste management with storage, collection and re-use of recyclables and construction formwork and waste.

WATER EFFICIENCY (WE)
Rainwater harvesting, water recycling and water-saving fittings.

INNOVATION (IN)
Innovative design and initiatives that meet the objectives of the GBI.

MR1: Materials Reused & Selection
MR2: Recycled Content Materials
MR3: Regional Materials
MR4: Sustainable Timber

Environmental impact of materials:
- Main Building Elements
  - External Walls
  - Internal Walls
  - Roof
  - Floor Finishes
  - Windows
  - Floor Slabs
- Hardscape & Boundary Protection
- Insulation

Responsible sourcing of materials:
- Basic Building elements
- Finishing elements (including all external & internal doors)

Designed for environmental, climate suitability, and robustness
**INTENT:** To encourage designers to specify the usage of reused building materials in new buildings.

**REQUIREMENTS:** Where Reused Products / Materials constitutes > [Tools Dependant] of the project’s total material cost value.

<table>
<thead>
<tr>
<th>GBI Tools:</th>
<th>RNC</th>
<th>NRNC</th>
<th>NRNC DC</th>
<th>NRNC Retail</th>
<th>NRNC Hotel</th>
<th>NRNC Resort</th>
<th>INC</th>
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<tbody>
<tr>
<td><strong>Materials Reuse &amp; Selection</strong></td>
<td>1Pt: ≥ 2%</td>
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<th>NREB Hotel</th>
<th>NREB Resort</th>
<th>IEB</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Materials Reuse &amp; Selection</strong></td>
<td>1Pt: ≥ 20%</td>
<td>1Pt: ≥ 20%</td>
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</table>

GBI PROFESSIONAL SERIES 2014
- Responsible Sourcing

17th July 2014
MATERIALS REUSE & SELECTION – Methodology

PRE-DESIGN:
Calculation of baseline construction cost, with estimation of construction material costing.

DESIGN DEVELOPMENT:
Identification of reusable & salvaged materials; integrating into design & insert into specifications.

DA SUBMISSION:
Tabulation of (Reused Products & Materials / Total Construction Materials) for DA submission.

CVA SUBMISSION:
Revisit both entire project & Reused / Salvaged Materials used; and measure against project’s goal.

MATERIALS TRACKING:
Tracking of actual Reused / Salvaged Materials on-site (with Worksheets); & re-assess as necessary.

REUSED MATERIALS (%):
Total Reused Materials (in RM) / Total Materials (in RM)
MATERIALS REUSE & SELECTION - Advantages

**Virgin Materials:** Prevention of pollutions / greenhouse gas emissions by reducing needs to harvest raw / virgin materials.

**Product Lifecycle:** Allows products to be used to fullest extent of lifecycle.

**Cost Reduction:** Reduction of project cost through avoidable waste disposal cost; avoidance of new material purchase; etc.

**Landfill Waste:** Reduction of landfill waste generation.

**Heritage:** Preservation of architectural heritage / local culture by salvaging unique materials.
MATERIALS REUSE & SELECTION - Typical Materials

- System Formwork
- Scaffolding
- Granite Rock / Boulders
- Crushed Marble
- Salvaged Timber
- Salvaged Door Frame
**MR2: RECYCLED CONTENT MATERIALS**

**INTENT:** To encourage designers to specify the usage of recycled content materials in new buildings.

**REQUIREMENTS:** Where use of materials with recycled content is such that the sum of **Post-Consumer Recycled + One-Half of Pre-Consumer Content** constitutes > [Tools Dependant] (based on cost) of the total value of the materials in the project.

<table>
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<tr>
<th>GBI Tools:</th>
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</thead>
<tbody>
<tr>
<td>Recycled Content Materials</td>
<td>1Pt: ≥ 10%</td>
<td>1Pt: ≥ 10%</td>
<td>1Pt: ≥ 10%</td>
<td>1Pt: ≥ 10%</td>
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<td>2 Pts: ≥ 30%</td>
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<th>NREB Resort</th>
<th>IEB</th>
</tr>
</thead>
<tbody>
<tr>
<td>Recycled Content Materials</td>
<td>1Pt: ≥ 20%</td>
<td>1Pt: ≥ 20%</td>
<td>1Pt: ≥ 20%</td>
<td>1Pt: ≥ 20%</td>
<td>1Pt: ≥ 20%</td>
<td>1Pt: ≥ 20%</td>
</tr>
</tbody>
</table>
RECYCLED CONTENT MATERIALS – Methodology

PRE-DESIGN:
Calculation of baseline construction cost, with estimation of construction material costing.

DESIGN DEVELOPMENT:
Identification of materials with Recycled Content; integrating into design & insert into specifications.

DA SUBMISSION:
Tabulation of (Recycled Content Materials / Total Construction Materials) for DA submission.

CVA SUBMISSION:
Revisit both entire project & Recycled Content Materials used; and measure against project’s goal.

MATERIALS TRACKING:
Tracking of actual Recycled Content Materials on-site (with Worksheets); & re-assess as necessary.

RECYCLED CONTENT (%):
Total Recycled Content (in RM) / Total Materials (in RM)
The ISO developed standards for 3 types of environmental claims on goods & services...

**ISO 14024 (1999):** Environmental Labels & Declarations – Type I Environmental Labeling – Principles & Procedures... based on 3rd-party certification

**ISO 14021 (1999):** Environmental Labels & Declarations – Type II Self-Declared Environmental Claims... based on environmental claims without 3rd-party certifications

**ISO 14025 (2006):** Environmental Labels & Declarations – Type III Environmental Labeling – Guiding Principles & Procedures... based on life-cycle impacts
**ISO 14021 (1999) – Key Terminologies**

**RECYCLED MATERIAL:** Material that has been reprocessed from recovered (reclaimed) material by means of a manufacturing process & made into a final product or into a component for incorporation into a final product.

**PRE-CONSUMER MATERIAL:** Material diverted from the waste stream during the manufacturing process.

[note: excluded is the reutilization of materials such as rework, regrind or scrap generated in a process & capable of being reclaimed within the same process that generated it]

**POST-CONSUMER MATERIAL:** Material generated by households or by commercial, industrial, & institutional facilities in their role as end-users of the product that can no longer be used for its intended purpose.

[note: this includes returns of materials from the distribution chain]

**RECYCLED CONTENT:** Proportion, by mass, of recycled material in a product or packaging. Only pre- and post-consumer materials shall be considered as recycled content.

Calculations shall be converted to cost for GBI submission purposes.

- Energy generation
- Other use or sale
- Other use or sale
- Primary material ($B$)
- Manufacturing process
- Recycled material ($A$)
- Recycled material ($A$)
- Final product ($P$)

Recycled content of product ($X\%$) = ($A/P$) x 100

source: ISO 14021
RECYCLED CONTENT MATERIALS – Typical Materials

- Aggregates: 90%
- Flooring: 70%
- Lightweight Block: 65%
- Cement: 65%
- Glass-wool: >80%
- Plasterboard: 80%
RECYCLED CONTENT MATERIALS - Perceived Barriers

**COST:** The higher the Recycled Content of a material, the higher the cost.

**PERFORMANCE:** Products with higher Recycled Content are of lesser quality & performance.

**AVAILABILITY:** Recycled Content Materials are very difficult to source.

**JUSTIFICATION:** It is an onerous task to measure actual Recycled Content in Materials.

**CREDIT-SCORING:** Very difficult to achieve 10% - 30% Recycled Content for GBI Point-Scoring.
**MR3: REGIONAL MATERIALS**

**INTENT:** To encourage sourcing of regional materials to reduce environmental impacts due to transportation.

**REQUIREMENTS:** Use building materials or products that have been extracted, harvested or recovered, as well as manufactured, within 500km radius of the project site for [Tools Dependant] (based on cost) of the total material value.

<table>
<thead>
<tr>
<th>GBI Tools:</th>
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<th>NRNC</th>
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</tr>
</thead>
<tbody>
<tr>
<td><strong>Regional Materials</strong></td>
<td>1Pt ≥ 50%</td>
<td>1Pt ≥ 20%</td>
<td>1Pt ≥ 20%</td>
<td>1Pt ≥ 20%</td>
<td>1Pt ≥ 20%</td>
<td>1Pt ≥ 20%</td>
<td>1Pt ≥ 20%</td>
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<tr>
<td>2 Pts: ≥ 75%</td>
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</tr>
</thead>
<tbody>
<tr>
<td><strong>Regional Materials</strong></td>
<td>- n/a -</td>
<td>- n/a -</td>
<td>- n/a -</td>
<td>- n/a -</td>
<td>- n/a -</td>
<td>- n/a -</td>
</tr>
</tbody>
</table>
REGIONAL MATERIALS - Methodology

PRE-DESIGN:
Calculation of baseline construction cost, with estimation of construction material costing.

DESIGN DEVELOPMENT:
Identification of materials available regionally; integrating into design & insert into specifications.

DA SUBMISSION:
Tabulation of (Regional Materials / Total Construction Materials) for DA submission.

REGIONAL MATERIALS (%):
Total Regional Materials (in RM)
Total Materials (in RM)

CVA SUBMISSION:
Revisit both entire project & Regional Materials used; and measure against project’s goal.

MATERIALS TRACKING:
Tracking of actual Regional Materials on-site (with Worksheets); & re-assess as necessary.
REGIONAL MATERIALS – Key Benefits

Transportation

- Reduction of costs (i.e. for the materials), energy, pollution (i.e. greenhouse gas emissions) associated with transportations.

Pollution

Local

- Support / sustainability of use for localized building & architectural design.

Design

Economy

- Support of local / regional businesses and material resource base, i.e. local economy driver.

Buy Local

Jobs

- Creation, stimulation & supporting local labor opportunities.
REGIONAL MATERIALS – Local Manufacturers

- **Rebars**
  - Source: KLANG

- **Glass**
  - Source: PUCHONG

- **BRC**
  - Source: PENANG

- **AAC**
  - Source: SENAiwANG

- **Ceiling**
  - Source: PETALING JAYA

- **Doors**
  - Source: BALAKONG

- **Paints**
  - Source: SHAH ALAM

- **Sealant**
  - Source: RAWANG

- **Glass-wool**
  - Source: MELAKA

- **Cement**
  - Source: KANTHAN

- **Tiles**
  - Source: PETALING JAYA

- **Aggregates**
  - Source: NILAI
MR4: SUSTAINABLE TIMBER

**INTENT:** To promote responsible forest management.

**REQUIREMENTS:** Where ≥ [Tools Dependant] of Wood-Based Materials & Products are appropriately certified. These components include, but are not limited to, structural framing & general dimensional framing, flooring, sub-flooring, wood doors & finishes. Include wood materials permanently installed & also temporarily purchased for the project. Materials must comply with the FSC OR MTCC requirements.

<table>
<thead>
<tr>
<th>GBI Tools:</th>
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<tbody>
<tr>
<td>Sustainable Timber</td>
<td>1Pt: ≥ 50%</td>
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<td>2 Pts: ≥ 75%</td>
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<td>1Pt: ≥ 75%</td>
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</table>
### SUSTAINABLE TIMBER - Methodology

**PRE-DESIGN:**
Calculation of baseline construction product volumes, with estimation of wood-based products.

**DESIGN DEVELOPMENT:**
Identification of available FSC & MTCC materials; integrating into design & insert into specifications.

**DA SUBMISSION:**
Tabulation of \( \frac{\text{FSC & MTCC Materials}}{\text{Total Wood Materials}} \) for DA submission.

**CVA SUBMISSION:**
Revisit both entire project & Wood-based Materials used; and measure against project’s goal.

**MATERIALS TRACKING:**
Tracking of actual Wood-based Materials on-site (with Worksheets); & re-assess as necessary.

**SUSTAINABLE TIMBER (%)**:

\[
\text{SUSTAINABLE TIMBER} = \frac{\text{Total FSC & MTCC Materials (in volume)}}{\text{Total Wood Materials (in volume)}}
\]
SUSTAINABLE TIMBER – Real Value of Forests

2/3 LIVING SPECIES

60m INDIGENOUS PEOPLE

CRITICAL CO₂ SINK

USD100b WOOD REMOVALS/YEAR

source: STA
SUSTAINABLE TIMBER – Environmental Impacts

Land Use Conversion

Deforestation

Forest Degradation

[Images of land use conversion, deforestation, and forest degradation]
“SUSTAINABLE FOREST MANAGEMENT, as a dynamic and evolving concept, aims to maintain & enhance the ECONOMIC, SOCIAL & ENVIRONMENTAL values of all types of forests, for the benefit of present and future generations”

United Nations, 2007
SUSTAINABLE TIMBER – International Certifications

Internationally, 2 main Forest Certification Schemes exist & are widely recognized:

FOREST STEWARDSHIP COUNCIL (FSC):
International not for-profit, multi-stakeholder organization established in 1993 to promote responsible management of the world’s forests.

PROGRAMME for the ENDORSEMENT of FOREST CERTIFICATION (PEFC):
International, non-profit, non-governmental organization founded in 1999 to promote sustainable forest management through independent third party certification.

Most Sustainable Timber Procurement Policies in the world accept EITHER ONE or BOTH labels as a way of demonstrating compliance with the sustainability requirements.
SUSTAINABLE TIMBER – Chain-of-Custody (CoC)

- **Chain-of-Custody or CoC**: Is a mechanism for tracking certified material from the forest to the final product.
- CoC requires a **chain of information** as well as a process of **material separation** from a clearly identified source up to a defined point in the value added chain.
- It establishes a **connection between the origin forest and the statement of sustainability** for the final product.
SUSTAINABLE TIMBER – Authentication Method

Purchasers generally do not need to worry about the rest of the supply chain, as the supplier’s certificates ensure that it is covered.

C-o-C Certificates **DO NOT** guarantee that the products purchased are certified; it is evidence that the company has a process to identify and sell certified products.

Invoices & DO

CoC Certificate

Forest Management Certificate

Source: cpet
SUSTAINABLE TIMBER – MTCC Certificate Holders

### CASE STUDY No. 1 – NRNC Tool for Material Reuse

**Project:** Mixed Commercial + Residential Development @ Jalan Ipoh, Kuala Lumpur

<table>
<thead>
<tr>
<th>No.</th>
<th>Materials</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Total Construction Cost</td>
<td>RM 110,963,963.60</td>
</tr>
<tr>
<td>2</td>
<td>(-) M&amp;E work</td>
<td>RM 21,063,357.00</td>
</tr>
<tr>
<td>3</td>
<td>Total Construction Cost (excl. M&amp;E work)</td>
<td>RM 89,900,606.60</td>
</tr>
<tr>
<td>4</td>
<td>Material Cost estimated by QS</td>
<td>45%</td>
</tr>
<tr>
<td>5</td>
<td>Total Project Material Cost ([(3) \times (4)])</td>
<td>RM 40,455,272.97</td>
</tr>
<tr>
<td>6</td>
<td><strong>MATERIAL REUSE: FORMWORK</strong> (Total Cost)</td>
<td>RM 5,486,147.05</td>
</tr>
<tr>
<td>7</td>
<td>FORMWORK (Material Cost only)</td>
<td>RM 3,565,995.58</td>
</tr>
<tr>
<td>8</td>
<td><strong>MATERIAL REUSE:</strong> Costing ([ (7) \div (5) \times 100% ])</td>
<td>8.81%</td>
</tr>
</tbody>
</table>
## CASE STUDY No. 2 – RNC Tool for Material Reuse

**Project:** Residential Development @ Persiaran Raja Chulan, Kuala Lumpur

<table>
<thead>
<tr>
<th>No.</th>
<th>Materials</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Total Construction Cost</td>
<td>RM 77,440,248.58</td>
</tr>
<tr>
<td>2</td>
<td>(-) M&amp;E work</td>
<td>RM 12,008,000.00</td>
</tr>
<tr>
<td>3</td>
<td>Total Construction Cost (excl. M&amp;E work)</td>
<td>RM 65,432,248.58</td>
</tr>
<tr>
<td>4</td>
<td>Material Cost estimated by QS</td>
<td>45%</td>
</tr>
<tr>
<td>5</td>
<td>Total Project Material Cost [(3) x (4)]</td>
<td>RM 29,444,511.86</td>
</tr>
<tr>
<td>6</td>
<td><strong>MATERIAL REUSE: FORMWORK</strong> (Material Cost only)</td>
<td>RM 2,300,000.00</td>
</tr>
<tr>
<td>7</td>
<td><strong>MATERIAL REUSE:</strong> Costing [(7) / (6)] x 100%</td>
<td>7.81%</td>
</tr>
</tbody>
</table>

Under RNC Tool, ≥ 5% 2 Points Achievable
# CASE STUDY No. 3 – RNC Tool for Recycled Content (RC)

**PROJECT:** Residential Development @ Ipoh, Perak Darul Ridzuan

<table>
<thead>
<tr>
<th>No.</th>
<th>Materials</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Total Material Cost (QS-estimated)</td>
<td>RM 90,000,000.00</td>
</tr>
<tr>
<td>2</td>
<td><strong>RC MATERIAL:</strong> Steel</td>
<td>RM 8,268,750.00</td>
</tr>
<tr>
<td>3</td>
<td><strong>RC MATERIAL:</strong> Aluminium</td>
<td>RM 2,160,000.00</td>
</tr>
<tr>
<td>4</td>
<td><strong>RC MATERIAL:</strong> Glass</td>
<td>RM 1,575,000.00</td>
</tr>
<tr>
<td>5</td>
<td><strong>RC MATERIAL:</strong> Others (i.e. Concrete, Marble, Tiles, Composite Timber, Mat, etc.)</td>
<td>RM 911,000.00</td>
</tr>
<tr>
<td>6</td>
<td>Total RC Material Cost [sum of (2) to (5)]</td>
<td>RM 12,914,750.00</td>
</tr>
<tr>
<td>7</td>
<td><strong>MATERIAL REUSE:</strong> Costing [(6) / (1)] x 100%</td>
<td><strong>14.35%</strong></td>
</tr>
</tbody>
</table>

**under RNC Tool, ≥ 10%**

**1 Point Achievable**
## CASE STUDY No. 4 – NRNC Tool for Recycled Content (RC)

### PROJECT: High-rise Commercial Development @ Jalan P. Ramlee, Kuala Lumpur

<table>
<thead>
<tr>
<th>No.</th>
<th>Materials</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Total Material Cost (QS-estimated)</td>
<td>RM 167,929,090.80</td>
</tr>
<tr>
<td>2</td>
<td><strong>RC MATERIAL</strong>: Reinforced Bars</td>
<td>RM 11,630,262.36</td>
</tr>
<tr>
<td>3</td>
<td><strong>RC MATERIAL</strong>: Metalwork</td>
<td>RM 8,659,302.48</td>
</tr>
<tr>
<td>4</td>
<td><strong>RC MATERIAL</strong>: Mineral Fiber Board</td>
<td>RM 234,469.05</td>
</tr>
<tr>
<td>5</td>
<td><strong>RC MATERIAL</strong>: Others (i.e. RC, Plasterboard, Carpet, Grass-crete Pavers, etc.)</td>
<td>RM 222,005.08</td>
</tr>
<tr>
<td>6</td>
<td>Total RC Material Cost ([\text{sum of (2) to (5)}])</td>
<td>RM 20,746,038.97</td>
</tr>
<tr>
<td>7</td>
<td><strong>MATERIAL REUSE</strong>: Costing ([\frac{(6)}{(1)} \times 100%])</td>
<td>12.35%</td>
</tr>
</tbody>
</table>

Under NRNC Tool, \(\geq 10\%\)  
1 Point Achievable
**CASE STUDY No. 5 – RNC Tool for Regional Materials**

**PROJECT:** Residential Development @ Ipoh, Perak Darul Ridzuan

<table>
<thead>
<tr>
<th>No.</th>
<th>Materials</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Total Material Cost (QS-estimated)</td>
<td>RM 90,000,000.00</td>
</tr>
<tr>
<td>2</td>
<td><strong>REGIONAL MATERIAL:</strong> Steel Reinforcement from Kuala Lumpur ($\approx 200$ km)</td>
<td>RM 16,875,000.00</td>
</tr>
<tr>
<td>3</td>
<td><strong>REGIONAL MATERIAL:</strong> Glass from Sungai Buloh ($\approx 189$ km)</td>
<td>RM 12,600,000.00</td>
</tr>
<tr>
<td>4</td>
<td><strong>REGIONAL MATERIAL:</strong> Concrete from Tambun ($\approx 0.5$ km)</td>
<td>RM 5,625,000.00</td>
</tr>
<tr>
<td>5</td>
<td><strong>REGIONAL MATERIAL:</strong> Aluminium from Penang ($\approx 145$ km)</td>
<td>RM 3,600,000.00</td>
</tr>
<tr>
<td>6</td>
<td>Total RC Material Cost [sum of (2) to (5)]</td>
<td>RM 38,700,000.00</td>
</tr>
<tr>
<td>7</td>
<td><strong>MATERIAL REUSE:</strong> Costing $\left[\frac{(6)}{(1)}\right] \times 100%$</td>
<td>$43.00%$</td>
</tr>
</tbody>
</table>

under RNC Tool, $\geq 30\%$

1 Point Achievable
## CASE STUDY No. 6 – NRNC Tool for Regional Materials

**PROJECT**: High-rise Commercial Development @ Jalan P. Ramlee, Kuala Lumpur

<table>
<thead>
<tr>
<th>No.</th>
<th>Materials</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Total Material Cost (QS-estimated)</td>
<td>RM 167,929,090.80</td>
</tr>
<tr>
<td>2</td>
<td><strong>REGIONAL MATERIAL</strong>: Reinforced Bars from Kuantan (≈ 260 km)</td>
<td>RM 18,286,576.03</td>
</tr>
<tr>
<td>3</td>
<td><strong>REGIONAL MATERIAL</strong>: Reinforced Concrete from Pasir Gudang (≈ 400 km)</td>
<td>RM 14,000,946.70</td>
</tr>
<tr>
<td>4</td>
<td><strong>REGIONAL MATERIAL</strong>: Bricks from Johor (≈ 400 km)</td>
<td>RM 1,748,444.00</td>
</tr>
<tr>
<td>5</td>
<td><strong>REGIONAL MATERIAL</strong>: Others (i.e. Tiles, Mineral Fiber Board, Paint, Insulation, etc.)</td>
<td>RM 4,752,301.70</td>
</tr>
<tr>
<td>6</td>
<td>Total Regional Material Cost [sum of (2) to (5)]</td>
<td>RM 38,788,268.43</td>
</tr>
<tr>
<td>7</td>
<td><strong>MATERIAL REUSE</strong>: Costing [(6) / (1)] x 100%</td>
<td>23.10%</td>
</tr>
</tbody>
</table>

under NRNC Tool, ≥ 20%

1 Point Achievable
### CASE STUDY No. 7 – Tools for Sustainable Timber

#### PROJECT: Residential Development @ Ipoh, Perak Darul Ridzuan

<table>
<thead>
<tr>
<th>No.</th>
<th>Materials</th>
<th>Volume</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Total Wood-Based Materials &amp; Products Used in Project (in m²)</td>
<td>52,864</td>
</tr>
<tr>
<td>2</td>
<td>FSC + MTCC Certified Material: Engineered Hardwood Flooring (in m²)</td>
<td>45,418</td>
</tr>
<tr>
<td>3</td>
<td><strong>Sustainable Timber:</strong> Percentile (\frac{(2) \times 100}{(3)})</td>
<td><strong>85.91%</strong></td>
</tr>
</tbody>
</table>

under RNC Tool, ≥ 50%

1 Point Achievable

#### PROJECT: High-rise Commercial Development @ Jalan P. Ramlee, Kuala Lumpur

<table>
<thead>
<tr>
<th>No.</th>
<th>Materials</th>
<th>Volume</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Total Wood-Based Materials &amp; Products Used in Project (in total nos.)</td>
<td>1,190</td>
</tr>
<tr>
<td>2</td>
<td>FSC + MTCC Certified Material: Timber Doors (in total nos.)</td>
<td>1,190</td>
</tr>
<tr>
<td>3</td>
<td><strong>Sustainable Timber:</strong> Percentile (\frac{(2) \times 100}{(3)})</td>
<td><strong>100.00%</strong></td>
</tr>
</tbody>
</table>

under NRNC Tool, ≥ 50%

1 Point Achievable
FAQ 6.16 NRNC MR1 & RNC MR2 - Material Reuse: If the reusable system formwork approach is used for compliance, should the material cost be the system formwork cost or the cost of conventional form that the system formwork is substituting?

You may use the cost of the system formwork in conjunction with the explanation given in the Design Reference Guide.

FAQ 9.04 NRNC MR4 - Sustainable Timber: We seek clarification that listing the requirement for ‘certified wood’ in the tenant guidelines will meet the criterion without the compulsory need for tenants to follow, so long as the base building has met this criterion to achieve the point.

Physical compliance with MR4 (and related credits in other GBI rating tools) for Sustainable Timber will be assessed at CVA stage; i.e. wood used for the base building as well as the tenancy fit-outs will all need to meet the credit requirement. As for tenancy areas not fitted out at CVA stage, these will be treated as vacant areas (which will be verified in future for compliance at the GBI certification renewal stage after 3 years). Therefore, the GBIF is advised to include requirement for certified timber in the tenancy/leasing agreement for full compliance if this credit point is to be scored.
FAQ 15.07 RNC MR6 – Sustainable Timber:

(1) We are from a wood flooring supplier in Malaysia and wish to seek clarification on the following criteria; RNC MR6 Sustainable Timber stipulates "Where 50% of wood-based materials and products used are certified". Please elaborate how does GBI justify the 50% of wood-based materials and products? Based on product value or quantity?

(2) These components include, but are not limited to, structural framing and general dimensional framing, flooring, sub-flooring, wood doors and finishes. To include wood materials permanently installed and also temporarily purchased for the project. Compliance with MTCC AND FSC requirements. Can the developer be awarded 2 points under this criteria if say, the wood-based products used in the building are only partly certified. For example, certified cabinet/wardrobe, wood doors and sub-flooring but non-certified wood flooring.

(1) Criteria point in this instance is based on the value (50%) of the total wood-based material used in the project.

(2) Yes, IF at least 50% of the wood-based products used are certified and in compliance with Forest Stewardship Council (FSC) and Malaysian Timber Certification Council (MTCC).
FAQ 15.31 RNC MR6 - Sustainable Timber: In order to score MR6, the timber flooring needs to comply with FSC and MTCC.

Besides that, there are 3 different certificate issues under FSC which are: -
(a) Forest Management,
(b) Chain-of-Custody,
(c) Controlled Wood;

AND 2 different types of certificates are issued under MTCC which are:-
(a) Forest Management,
(b) Chain-of-Custody.

Please advise if the timber flooring specialist needs to produce all the above certificates in order to score under GBI.

All the certificates listed must be furnished at the CVA submission stage.
“Practical Notes for the QS aims to establish a guidance document to assist QS in their submissions for GBI Certification; and Verifying & Certifying GBI Green Incremental Cost for Tax Incentives.”
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- Indoor Environmental Quality;
- Renewable Energy;
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