ARCASIA COMMITTEE ON GREEN & SUSTAINABLE ARCHITECTURE (ACGSA)

PROPOSAL TO ESTABLISH A SHARING PLATFORM

1) Innovation for Sustainable Environment

i) Proposal by Chairman
To use SIA's Position Paper on 'Attributes of a Sustainable Built Environment (ASBE)' as a starting point of sharing.

- Request: for ACGSA members to upload creative sustainable design and solutions (built or unbuilt) in their respective countries based on relevant attributes as in ABSE.
- Examples
  - ASA/ can share good proposal on results of sufficiency plan (championed by His Royal Highness)
  - VAA/ Bamboo architecture
  - IAI/ Green school in Bali, Indonesia
  - PAM/ evolution of the green building index scheme to address macro planning/design issues i.e. township

ii) PAM (Secretariat for ARCASIA) to consider to upload to ARCASIA website.
- Would like to propose ARCASIA Secretariat to create a site for ACGSA to upload the files.

2) Examples of Innovative Sustainability Solutions

I. Poh Ern Shih Temple (Singapore)

- *A ground-up labor of love by Brother Boon to realize his vision of a sustainable place of worship and refuge where devotees could see the inter-relationship between man and nature, and its delicate balance.*

a. http://www.pohernshih.info/index.php?option=com_content&view=section&layout=blog&id=4&Itemid=4 *(NB: website is presented in Chinese)*

b. Solar energy cells on rooftop: to heat water and for night lighting
c. Wind generator: to convert wind to electricity
d. Mirrors: to reflect sunlight into premises for natural lighting in basement, storeroom and toilets.
e. Rainwater recycling: to water plant
f. Rainwater as “hydro” power: To collect rainwater from the highest floor of temple and to pass through hydroelectric-generators, electricity generated is used to recharge batteries for in-house motorized wheelchairs.
g. Rainwater: A purification system is installed, so that the collected rainwater can be filtered and made potable

II. Gardens by the Bay (Singapore)

- *State-of-the-art botanical gardens celebrating the diverse planting habitats of different microclimatic zones. The buildings displayed the inter-relationship between technology and biology.*

a. https://www.gardensbythebay.com.sg/en/the-gardens/about-the-gardens.html#!/sustainability-efforts
b. Photovoltaic cells on the Supertrees’ canopies to harvest solar energy for lighting the Supertrees up at night
c. Supertrees are integrated with the Conservatories and serve as air exhaust receptacles
d. Minimising Solar Heat Gain
    - The two conservatories are fitted with specially selected glass that allows optimal light in for plants, but reduces a substantial amount of heat. The roof is fitted with a sensor-operated retractable sails that opens automatically to provide shade to the plants when it gets too hot.
e. Cooling only the occupied zones
    - The Conservatories apply the strategy of cooling only the lower levels, thus reducing the volume of air to be cooled. This is achieved through thermal stratification – ground cooling by chilled water pipes cast within the floor slabs enabling cool air to settle at the lower occupied zone while the warm air rises and is vented out at high levels.
f. De-humidifying the air before cooling

- To reduce the amount of energy required in the cooling process, the air in the Flower Dome is de-humidified by liquid desiccant (drying agent) before it is cooled. This desiccant is recycled using the waste heat from the burning of the biomass

g. Generating energy and harnessing waste heat
   - Electricity is generated on-site to run the chillers that cool the Conservatories. At the same time, waste heat is captured in the process to regenerate the liquid desiccant. This co-generation of energy is achieved by the use of a Combined Heat Power (CHP) steam turbine that is fed by horticultural waste from the Gardens and other parks around Singapore. This reduces dependency on the electrical grid.

III. Puala Semakau (Singapore)

- Regeneration of a brown "island" to a haven for biodiversity in ecological system.

a. http://app2.nea.gov.sg/semakaulandfill.aspx
b. http://www.nea.gov.sg/cms/wmd/SL%20Brochure.pdf
c. Semakau Landfill has a landfill capacity of 64 million cubic metres. To create the required landfill space, a 7km perimeter rock bund was built to enclose a part of the sea off Pulau Semakau and Pulau Sakeng.
d. The bund is lined with impermeable membrane and a layer of marine clay to ensure that leachate from the refuse is contained within the landfill area and treated at the leachate treatment plant. Other ancillary facilities were also built on the island to ensure self-sustainability of the landfill operation.
e. Through planting and landscaping, western coast of Semakau is now a scenic and idyllic recreational destination with pristine water, fresh air and a green natural environment thriving with vibrant and rich biodiversity

IV. BCA Academy - Zero Energy Building (Singapore)

a. http://www.bcaa.edu.sg/zero_energy_building.aspx
b. Energy Efficient Envelop
    a. Low-e glass - unlike normal clear glass, it has a special low emissivity coating. This increases the energy efficiency of windows by reducing the transfer of solar radiation through glass.
    b. Shading devices - with strategically placed shading devices, there is a significant reduction of solar heat gain and improvement of the quality of natural lighting within ZEB.
c. Fully powered by Sun
    a. All 1G, 2G & 3G generation of photovoltaic systems will be installed to harness energy from the sun to generate electricity and power all appliances and lighting in the ZEB.
    b. 1G
        i. Cells made from silicon wafer
        ii. Types: monocrystalline silicon, polycrystalline silicon
        iii. High efficiency and requiring less surface area to generate electricity but more expensive to manufacture
        iv. Suitable for rooftops and integration into building façade and skylight
    c. 2G
        i. Thin-film deposits of semiconductors
        ii. Types: amorphous silicon, copper indium selenide/sulphide
        iii. Flexible, lightweight, less silicon intensive and aesthetically pleasing
        iv. Suitable for rooftops and integration into building façade and skylight
    d. 3G
        i. Departure from 1G/2G which are silicon-based technologies, promising new approach currently under commercial development
        ii. Flexible, lightweight and aesthetically very pleasing
        iii. Types: Dye-sensitised solar cells, polymer solar cells, photo electrochemical cells, nanocrystal cells

iv. Suitable for integration into building façade and skylight

V. Green Mark v4.1 (Singapore)

a. http://apex.sia.org.sg/xshare/GMv4.1_Std2013.pdf
b. Green building rating system to evaluate a building for its environmental impact and performance.
c. New Buildings: developers and design teams are encouraged to design and construct green, sustainable buildings which can promote energy savings, water savings, healthier indoor environments as well as the adoption of more extensive greenery for their projects.
d. Existing buildings: the building owners and operators are encouraged to meet their sustainable operations goals and to reduce adverse impacts of their buildings on the environment and occupant health over the entire building life cycle.
e. Certified Green Mark buildings are required to be re-assessed every three years to maintain the Green Mark status. New buildings certified will subsequently be re-assessed under the existing buildings criteria. Existing buildings will be re-assessed under the existing buildings criteria.

VI. SIA Position Paper on Underground Storage in Singapore (works-in-progress)

a. News article on underground petroleum storage: http://www.stproperty.sg/articles-property/industrial/jtc-digging-for-more-space-on-jurong-island/a/58781
b. News article on underground petroleum storage: http://www.nytimes.com/2011/02/21/business/energy-environment/21iht-renoilstore21.html?_r=0
c. Built 2.1km of tunnels at a depth of about 120 meters below the Banyan Basin off Jurong Island, a mostly artificial land-reclamation zone.
d. "…. underground storage was more secure and more space-efficient than surface tanks." – JTC

VII. Solar Water Heating by Nepalese Architect Debesh Bhattarai (Nepal)

- *A low-cost practical DIY solar water heater innovation developed by a Nepalese architect, to enable hot water enjoyment to the villagers.*

a. https://www.youtube.com.sg/user/debeshbhattarai
b. https://www.youtube.com/watch?v=4c5H3J3Egk8
c. Use of very basic material (container, clear level pipe, bucket and Styrofoam box)

VIII. Green Austrian Embassy (Indonesia)

a. http://www.sia.org.sg/xshare/AustrianEmbassyInIndonesia.pdf
b. Photovoltaic generators on rooftop (96msq) generate 22% of annual electric power
c. Collection of rainwater to be used for toilet flushing and garden irrigation.

IX. National Green Building Code and Rating System (Philippines)

a. One of Philippines' senators has filed a bill for the establishment of a National Green Building Code and Rating System in the Philippines.
b. SBN-410: Philippine Green Building Act: An Act Establishing a National Green Building Code and Rating System, and for Other Purposes Filed on July 3, 2013 by Marcos, Ferdinand "Bongbong" R

X. Green Movement lead by GBI (owned by PAM and ACEM) and MGBC (Malaysia)

a. http://www.greenbuildingindex.org/index.html
b. A platform for sharing information including PAM's green rating tools

XI. Green Building Index – latest update (Malaysia)

a. http://apex.sia.org.sg/xshare/GBI_Update_Jul2013_BoonCW.pdf
b. Residential version 3 launched on 11 Jul 2013

For reference:

ACGSA Plan presented to ARCASIA Chairman

Short Term

- Sustainability By Design Survey for UIA (completed, consolidated info disseminated to ACGSA Members via email on 16 Jan 2013)

Medium Term

- 5th Roundtable Discussion on Sustainable approach to Design and Construction (host by IAP on 2 October 2013)
- To invite speakers to Regional Events

Long Term

- ARCASIA Interactive Website
- Facebook to dialogue on issues / topics on Sustainability

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