“green construction” with Cement?

Kurt Rhyner, Architect, PhD, Professor
innovations in concrete
the alternatives
UN-Habitat promotes the use of green building materials in the context of urban upgradings, large-scale affordable housing, social housing, and reconstruction in developing and transitional countries. UN-Habitat supports the adoption of green materials in mainstream building by assessing affordability and capacity to withstand the dimensions of sustainability. UN-Habitat also encourages governmental support for alternative building materials, which may include adaptations to building codes and financing schemes.

resources
information and guidance: "Using Caster A Handbook of Sustainable Housing Practices in Developing Countries.
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green building with concrete
UN-Habitat promotes the use of green building materials in the context of urban upgradings, large-scale affordable housing, social housing, and reconstruction in developing and transitional countries. UN-Habitat supports the adoption of green materials in mainstream building by assessing affordability and capacity to withstand the dimensions of sustainability. UN-Habitat also encourages governmental support for alternative building materials, which may include adaptations to building codes and financing schemes.

Concrete is a versatile material that is widely used in construction due to its durability, strength, and ability to adapt to various environments. It is a primary component in the construction of buildings, roads, and infrastructure worldwide. Although concrete is a versatile material, its sustainability and environmental impact are often overlooked.

Concrete is one of the most widely used building materials, and its widespread use has contributed to significant environmental impacts. The production of concrete is energy-intensive, with the majority of energy consumed in the production of cement. In addition, concrete is a non-renewable resource, as it is produced from the extraction of materials such as sand, gravel, and limestone.

However, the concrete industry has been working on developing more sustainable alternatives to traditional concrete. One such alternative is the use of recycled materials in concrete production. Recycled concrete, for example, is produced by mixing recycled aggregates with fresh concrete. This process not only reduces the environmental impact of concrete production by decreasing the demand for natural aggregates but also provides a sustainable solution for waste management.

Another innovation in concrete is the use of alternative binders, such as fly ash or slag, which replace traditional cement in concrete mixtures. These alternative binders reduce the carbon footprint of concrete production, as they require less energy to produce and release fewer greenhouse gases.

In conclusion, while concrete is a versatile and durable material, its environmental impact cannot be ignored. However, through the use of alternative materials and sustainable practices, the concrete industry can reduce its environmental impact and contribute to a more sustainable built environment.
Concrete is the material we use most in construction, approximately 1 cubic metre yearly per habitant of the planet.
Production of Portland Cement in 2002 was about 1,750,000,000 tons. And it grows and grows........
Cement production is responsible for almost 6% of worldwide greenhouse gas emission.

Aggregate mining is another threat to the environment.
Radical improvement of efficiency in using concrete (factor four or ten?)...
Optimize cement and aggregate consumption with lightweight solutions

OUR ACTION COULD BE
Ferrocrete panels are easy to produce locally, very well suited to emergency actions.
FERROCRETE WALLING AND ROOFING SYSTEM

Optimize relation of cement / steel / aggregate to produce self supporting Wall and roof elements

REPUBLICA DOMINICANA, 2013
Embodied energy in walls

Calculation is based on house construction complying with earthquake resistance standards according to Nicaraguan laws and ASTM

<table>
<thead>
<tr>
<th>walling system</th>
<th>cement</th>
<th>Sand</th>
<th>Steel rods</th>
<th>Soil</th>
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</thead>
<tbody>
<tr>
<td>Hollow blocks 15 cm, with structure of reinforced concrete</td>
<td>47.98</td>
<td>215.63</td>
<td>8.83</td>
<td>0.00</td>
</tr>
<tr>
<td>Soil cement blocks with structure of reinforced concrete</td>
<td>52.08</td>
<td>144.51</td>
<td>8.83</td>
<td>224.55</td>
</tr>
<tr>
<td>Handmade solid clay bricks with structure of reinforced concrete</td>
<td>40.13</td>
<td>146.34</td>
<td>8.83</td>
<td>195.52</td>
</tr>
<tr>
<td>Ferrocement wall panels, including wire mesh</td>
<td>37.46</td>
<td>111.20</td>
<td>7.10</td>
<td>0.00</td>
</tr>
</tbody>
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MICROCONCRETE ROOFING TILES

The micro concrete formula and good workmanship result in a low ecological footprint.
LIME POZZOLANA CEMENT

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<tbody>
<tr>
<td><strong>Normal Concrete</strong></td>
<td>15 - 35 MPa</td>
<td>Up to 50% puzolana</td>
</tr>
<tr>
<td><strong>Medium resistance</strong></td>
<td>35 - 60 MPa</td>
<td>15% - 35% puzolana</td>
</tr>
<tr>
<td><strong>concrete</strong></td>
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This practice is used sometimes since the eighties....
The EcoSur network has produced some 5,000 tons of lime-pozzolana cement with natural pozzolanas and fly ash.

It was used to produce blocks, foundations and plaster.

However, it was not economically viable.
NEW DEVELOPMENTS

Trial productions in Cuba and India are underway.

Low Carbon Cement (LCC), an innovative blended Portland cement with addition of metakaolin and limestone. Reduces the quantity of clinker in cement.
NEW DEVELOPMENTS

Traditional cement vs composed cement

Production capacity grows by 56% without additional greenhouse gas emission
It is our mission to interchange information and knowledge with all interested organizations.

We offer support in technologies and specific equipment for “green technologies”.

EcoSur is a founding member of the UN-habitat network.