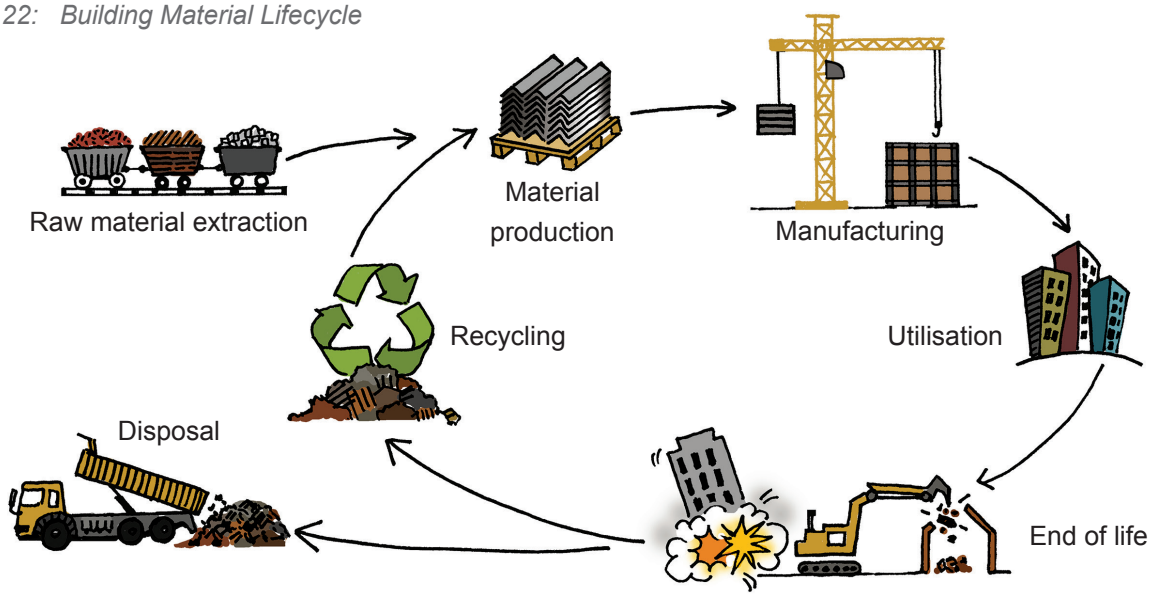
11 Building Materials and Green Procurement

When considering building materials we need to think about both permanent fixtures (such as roof tiles), and items used in the construction of the building (like wooden scaffold boards), because the selection of building materials has upstream and downstream environmental impacts. The lifecycle of a material or product begins at extraction and harvest of the material components. Materials and products can also impact occupant health and the environmental performance of the building.

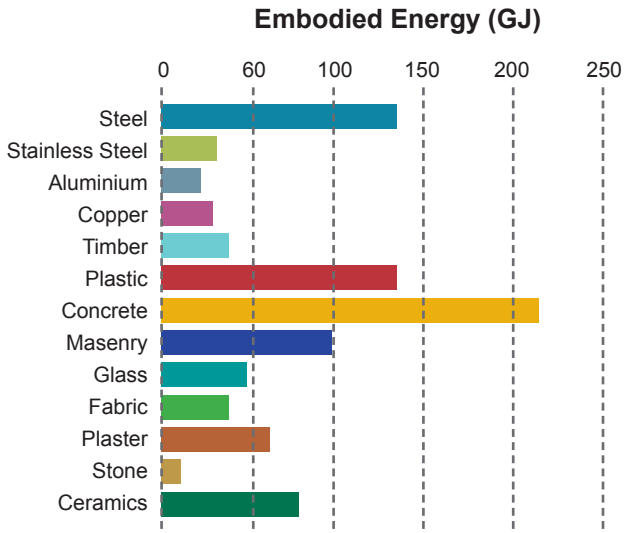
All materials require energy, water and other natural resources to be produced and transported to where they are marketed to consumers. This results in materials having an embodied energy and water even before they are used. The higher the embodied energy and water of a material, the less sustainable it is considered to be.

Figure 22: Building Material Lifecycle



Source: http://www.byggalliansen.no/dokumenter_14/mars/Temamote/Vannbaarne-anlegg_Berget.pdf

Figure 23: Embodied energy of common building materials



Source: http://www.yourhome.gov.au/sites/prod.yourhome.gov.au/files/images/M-Embodied-EEC-SIRO-02_fmt.png

Fast Fact:

Embodied energy and water

Embodied Energy: the energy consumed by all of the processes associated with the production of a building, from the mining and processing of natural resources to manufacturing, transport and product delivery.

Source: www.yourhome.gov.au/materials/embodied-energy)

Embodied Water: This is the amount of water used during the growing, processing and transportation of the goods we use or consume, or the services we use.

Source: http://www.savewater.com.au/research-and-resources/why-save-water/embodied-water)

Common procurement practices for building materials and products include criteria such as cost, availability, functionality, aesthetics, and client and project team preferences. With the implementation of green procurement practices, materials are chosen using additional criteria with regard to their effect on the local and global environment and socio-economic issues. A green material has few additives (such as stone or wood rather than plastic); does not offgas or release toxic fumes (such as formaldehydes in many composite wood products), is made locally (sometimes even produced or sourced on site), and may offer an opportunity to involve local community members, create employment, and develop and transfer valuable skills. When thinking about green materials, it is also necessary to consider the lifecycle of a product especially with regard to disposal or disassembly. Green materials can either be reused, repurposed or recycled easily.

11.1 What changes do we need?

In Steve Tshwete, to aid the transition to low emission development, the aim of these guidelines is to promote green procurement practices that encourage and specify the use of locally sourced building materials that have a low embodied energy and water. This aims to reduce the negative effect that buildings have on the natural environment, while encouraging local job creation and economic development within the municipality.

11.2 How do we design our buildings?

11.2.1 Design for dematerialisation

Dematerialisation refers to designing a building in such a way as to reduce the net amount of material used without compromising its strength and functionality. This can focus on the reduction of material used in the structure of the building, where less concrete and steel is used, and in the use of less material for piping, ductwork and internal finishes. This can also be achieved where cladding is multifunctional, such as a green roof that acts as insulation, stormwater management system and roof cover material.

11.2.2 Specify the use of recycled content

Recycled material is a valuable resource as it offers renewable access to non-renewable resources. This reduces the overall environmental impact of construction materials as lower quantities of new materials need to be extracted. This, in turn, lowers the energy and water used and carbon emissions of building materials, and reduces the amount of waste going to landfill unnecessarily. Common building materials which are recycled and reused include concrete, steel and timber.

- **Concrete:** New concrete mixes can use recycled and crushed concrete as aggregate in place of stone. It is important to consider the use of recycled aggregate when an existing building on site is going to be demolished.
- **Steel:** Structural steel components and steel rebar used in reinforced concrete can contain high proportions of post-consumer recycled steel without undermining the strength of the material for construction purposes. Therefore look to increase the percentage of recycled steel used in steel products, such as reinforcing bar, structural beams, window and door frames, etc. through specifying steel with a minimum post-consumer recycled content of 60%.
- **Timber:** When choosing timber products, either use recycled wood, reused wood or wood which is from sustainably managed sources and certified by the Forest Stewardship Council (FSC) or Programme for the Endorsement of Forest Certification (PEFC). This helps to protect natural forests and promote sustainable wood harvesting practices for this renewable resource.

11.2.3 Specify the local sourcing of materials and products

Sourcing materials locally is beneficial to the environment as it reduces greenhouse gas emissions associated with transport and is beneficial to the economy as it creates local jobs as demand drives growth in the materials sector. A further benefit can be the creation of a unique aesthetic identity specific to the local culture and context. Building materials are considered to be sourced locally if they are extracted, harvested, recovered and manufactured within 400km of the construction site. To ensure even greater environmental benefits, the materials should be sourced within 50km of the site.

11.2.4 Consider alternative building materials

Alternative building materials, those other than concrete, timber and steel which are most commonly used, are increasingly being considered in building construction for their improved environmental benefits over conventional materials. These can include reduced volume of material, lower embodied energy and water and lower greenhouse gas emissions with improved thermal performance. This is most common in residential buildings which have fewer structural constraints, such as large widths to span and fewer floors to support. Alternative building materials can include straw bales, sandbags, mud bricks, reused shipping containers, and reinforced expanded polystyrene. Alternative building delivery methods such as prefabrication are often adopted along with the use of alternative building materials. When using alternative building materials and delivery ensure that they are approved by Agrement South Africa to credit their quality and strength for the safety of occupants.

Fast Fact:

Agrement South Africa

Agrement South Africa is a government body that assesses and certifies innovative non-standardised construction products, systems, materials, components and processes, which are not fully covered by a South African Bureau of Standards regulation or code of practice. This is to support and promote the process of integrated socio-economic development in South Africa as it relates to the construction industry by facilitating the introduction, application and utilisation of satisfactory innovation and technology development, in a manner which will add value to the process.

Source: http://www.agrement.co.za/

11.3 How do we construct our buildings?

11.3.1 Sustainably sourced, reused or recycled shutterboard

When choosing timber products, such as shutterboard as formwork for concrete, either use recycled wood, reused wood or wood which is from sustainably managed sources and certified by the Forest Stewardship Council (FSC) or Programme for the Endorsement of Forest Certification (PEFC).

11.3.2 Consider the use of local skills and labour

While the building materials are chosen and specified in the design phase of a building, the construction phase offers the opportunity to use local skills and labour. These local skills can accompany the use of local building materials so that local knowledge is used and beneficial to the project. This in turn is beneficial to the local economy through job creation.

Case Study

Vele Secondary School
Limpopo

This high school for 640 learners in northern Limpopo has been designed, built and is still managed on the basis of sustainable practices. With regard to the use of materials in particular, this school's walls were constructed in part with stone found on site that otherwise would have been discarded in a landfill. Using this stone lowered the building's embodied energy and water by reducing the number of bricks and the amount of plaster needed to be brought in from far away. Using this stone also helped to create the building's unique and local identity by connecting it physically to its site and context. To construct the building using local stone, local community members were taught the skills of stone masonry thereby creating employment and providing community members with new skills. This also allowed the community to be intimately involved in the building which led to an increased sense of ownership of the building thereby ensuring a positive ongoing relationship between the community and the school.

Source: http://www.eastcoastarchitects.co.za/projects-vele.html

11.3.3 Identify opportunities for skills transfer and training

Where the skills required for the construction of a building might not yet exist in the local community, identify opportunities to develop these skills. This will enable the project to make use of local labour to benefit the local economy and allow the building to have a lasting impact.

11.4 How do we manage our buildings?

11.4.1 Implement green procurement policies

During the operation and management of a building or facility, new products and materials will need to be sourced to ensure the ongoing functioning and upkeep of the premises. To ensure that the building can continue to be green throughout its lifecycle, it is helpful to adopt and implement a green procurement policy. This policy would stipulate the conditions against which products and materials are chosen for use in the building. The green procurement policy would include the following:

Locally sourced materials and products: Sourcing materials and products locally has positive environmental and economic benefits as greenhouse gas emissions are reduced from limiting transport needs and it creates jobs locally through developing the local economy. Building materials are considered to be sourced locally if they are extracted, harvested, recovered and manufactured within 400km of the construction site. To ensure even greater environmental benefits, the materials should be sourced within 50km of the site. This is especially important when considering the retrofit or refurbishment of a building.

Low embodied energy and water products: Products that use less energy and water in the harvesting and manufacturing process have a more positive impact on the environment as resource use is reduced. Where possible, make use of products and materials that have a low embodied energy and water. This can be as simple as choosing to use sustainably sourced wood rather than plastic for tenant fit-outs.

Environmentally-friendly cleaning products: The production and use of manufactured chemicals for cleaning products can be harmful to the environment. This is through the heavy industrial processes used to produce them which require high energy input with potentially toxic emissions. Environmentally friendly cleaning products are those that do not cause harm to the health of cleaners and building occupants and those that can be easily broken down to harmless substances through ecological processes.

11.5 How do we enhance our precincts?

11.5.1 Develop a directory of local services and products

To help those in the community, precinct and town to source products from local suppliers and manufacturers or services from residents of the municipality, it is necessary to provide some form of reference guide to highlight the services and goods available locally. This could take place as part of a monthly newspaper insert or as a brochure or flyer made available to all residents. While increasing connectivity and local knowledge, this could also help to boost the local economy.