CHAPTER 8

SUSTAINABILITY AND RELEVANCE OF CARBON EMISSIONS

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Concepts of Sustainability

The accepted definition of Sustainable Development is 'Development which meets the needs of the present without compromising the ability of future generations to need meet their own needs'.
The simultaneous pursuit of economic prosperity, environmental neutrality and social equity is the much recognised the triple bottom line for businesses, governments and society in general.

Firstly, Environmental Sustainability is the process of making sure current processes of interaction with the environment keep the environmental impact as low as naturally possible based on an idea that in the longer term the impact is zero, or such that nature's resources are used at a rate at which they can be replenished naturally.

Second, is Economic Sustainability, which cannot at this stage be measured with a single index which tells us the extent of progress, but this might be by way of the economic value added in the form of salaries, wages and services spent.

Thirdly, Social Policies which increase human welfare and eventually eradicate poverty are also in line with sustainability objectives.

The measurement and monitoring of these aspects is problematic, never-the-less it is accepted that well defined and harmonised indicators are the only way to make sustainability realistic and meaningful. Those indicators are adjusted through testing and observation, trial and error. Commonly used terms, measures and reporting systems are: Carbon Footprint (CO2), Global Warming Potential (GWP), Ozone Depletion Potential (ODP), Material Input per unit of Service (MIPS) and Green Building Ratings Systems (Star rating), the Global Reporting Initiative, all contribute to achieving some comparability. This concept aims to be a practical guideline towards sustainable development following the principle of conservation and increase in value rather than restricting the consumption of resources.

ISO 15392; Sustainability in building construction – General principles: is based on the concept of sustainable development as it applies to buildings and other construction works, from "the cradle to the grave". Over their life cycle, construction works absorb considerable resources and contribute to the transformation of the environment. As a result, they can have considerable economic consequences, and impacts on both the environment and human health.

Green-house gases

Green-house gases are those gasses in the atmosphere of the earth which allow short-wave infra-red (heating) radiation to pass through and warm our surrounds, but do not allow the escape of long-wave infra-red radiant to occur, with a net build-up of heat in the atmosphere.

The principle green-house gas which is accumulating in our atmosphere is Carbon-dioxide. The concentration of this gas is increasing in our atmosphere as result of the burning of fossil fuels and the levels have more than doubled since the advent of the industrial age. Others which have greater impact, but which are in much lower concentrations are methane and various oxides of sulphur and nitrogen. The net result of the increased concentration of these gases is an increase in the average temperature of the Earth.

This rise in temperature is likely to cause climate change such as will kill off marginal animal and plant species, reduce global food production, cause a melting of the ice-caps and a rise in sea-levels with consequent flooding of low lying coastal areas.

If human economic activities are generating green-house gases they are harming future generations and these activities are more and more being considered to be unacceptable by society.

GHG Reporting has been voluntarily adopted by many organisations in South Africa as part of the international Carbon Disclosure Project (CDP). This is an independent non-profit organization holding the largest database of corporate climate change information in the world. Wal-Mart recently asked many of its suppliers to begin reporting to the CDP as part of the company's sustainability index.

The mandatory reporting of GHG is not expected in the RSA until such time as Carbon Taxation is implemented. This will require third-party verification of reported emissions as this is a prominent feature in the draft legislation currently circulating and can be expected to be included in any law that is passed.

The advantage of having an industry-wide GHG inventory or carbon-footprint within a Life Cycle Assessment will enable the CBA to make confident, credible claims about the Industry GHG footprint, and it will confirm the voracity of current industry claims for clay brick masonry to be a relatively clean industry and technology. This information can then be clearly communicated to specifiers, customers, investors, and media for the reporting objectives and requirements of financial, environmental, and social institutions. This will also ensure compliance with regulatory requirements for GHG emissions reporting and reduction, along with achieving local air quality emission standards.

Carbon Footprint

Greenhouse gases can be emitted through transport, land clearance, and the production and consumption of food, fuels, manufactured goods, materials, wood, roads, the operation of buildings, the provision of services and most human activity. For simplicity of reporting, it is often expressed in terms of the amount of carbon dioxide, or its equivalent of other GHGs emitted.

A carbon footprint is defined as a measure of the total amount of carbon dioxide (CO2) and equivalents of other gas emissions, of a defined population, system or activity, considering all

relevant sources, sinks and storage within the boundaries of that population or that area of interest. The concept name of the carbon footprint is derived from the ecological footprint concept. There is a fair closeness of comparison between the Carbon Footprint per square meter calculated in the Energetics report for Think Brick of Australia and the results obtained by WSP in their research on the 130m^2 house, upon cursory examination. An estimation of masonry Carbon Footprint for the RSA will be valuable data for comparative analysis against other forms of construction.

Life Cycle Assessment

The LCA should report on expected environmental impacts, in particular energy use and resultant greenhouse gas emissions, water usage, product recyclability and local air quality associated with the manufacture of bricks and the production and operation of masonry houses and other structures, over the expected life-span. The economic and social contribution of bricks and masonry to the RSA economy and social fabric will also be reported on in the LCA, all in accordance with the principles and guiding provisions of ISO14040/14044.

This is in order that the sustainability of the Industry may be fairly compared fairly with that of houses and other buildings constructed from other building materials.

As part of a LCA the GHG emission assessment the product systems of bricks, brick walls and house/building designs, and ultimately the recycling and re-use of the original brick material, have to be standardised and attributed, in useful and acceptable inventory units - the Life Cycle Inventory- or LCI.

A set of well-defined and harmonized indicators are used as input to the Life Cycle Impact Assessment (LCIA). This is a classification and characterization of the LCI results. In this step, the input and output results from the LCI phase are sorted and assigned to environmental impact categories such as Global warming potential, Ozone depletion, Human toxicity, Eco-toxicity, Photochemical reaction, Acidification, Eutrophication, Resource depletion and Land use.

Factors which will need to be reported on (in greater detail than the Australian Energetics LCA Report) are the social and economic aspects. The employment creation within the brick-laying and associated trades in the RSA is a factor of National interest, and is a pillar on which the clay brick manufacturing and masonry walling industry stands.

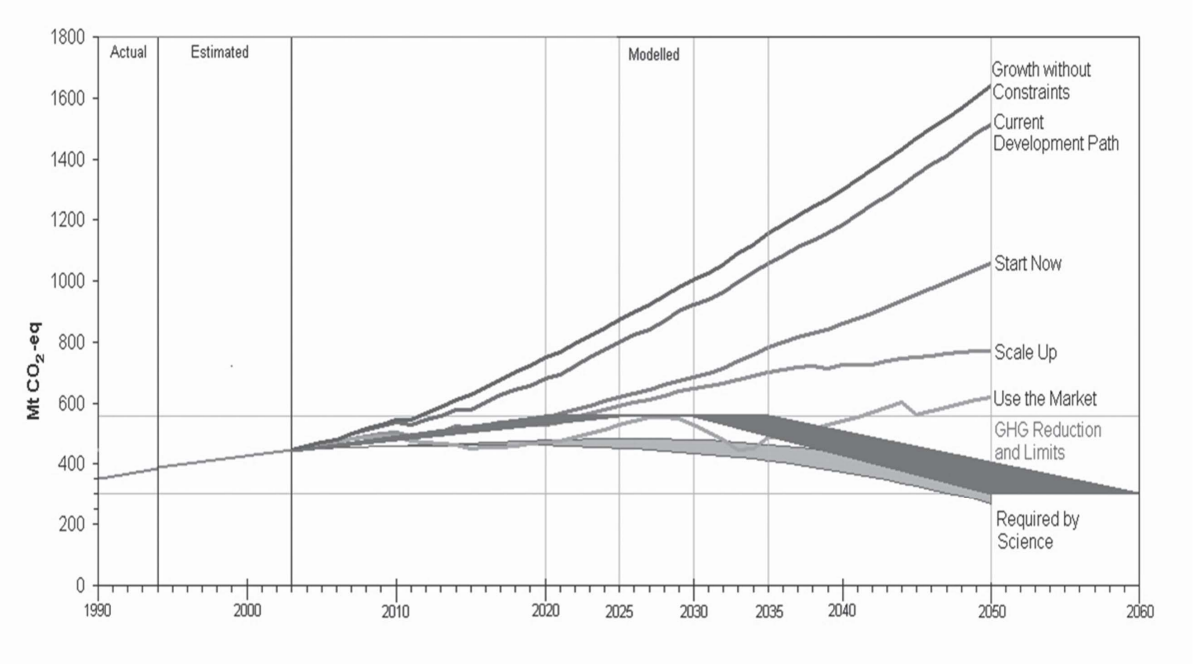
It is expected that a detailed analysis of the various extraction, production, distribution and construction aspects, as well as the dematerialisation impacts on energy, and the greenhouse gas performance of masonry in a house/non-residential structure over its life cycle, needs to be performed. The energy inputs and mix will need to be closely analysed, as will the atmospheric pollution record of RSA brick manufacturers, water impacts in all phases, and recycling realities in the RSA. The new paradigm is possibly Cradle to Cradle in place of Cradle to Gate.

It may be necessary to place the CBA LCA in the context of other materials and systems, and in the absence of similar LCA from other sectors the scope of the project may need to be expanded to a comparative against other building materials and systems. It will be important to bring Government into the decision making process such that the LCA methodology followed by the CBA will be accepted for use by other industries in time.

National Emission reduction programmes

All nations which are signatories to the Kyoto Protocol have developed their national plan to try to steer their economies on a path of reducing GHG emissions similar to that above for South Africa.

The below graph is developed as part of Long Term Mitigation Study for the RSA Department of Environment, and is backed up by a number of sub-strategies which pertain to the major non-renewable carbon usage such as the Mining and Manufacturing industries, liquid fuel industries and others. The graph shows that if no action is taken, CO2 emissions will more than double



in the next 30 years, at present rates of economic growth, and present fuel usage patterns.

The President of the Republic of South Africa has however committed the nation to a 34% reduction off the business as usual projection by 2020 and a 43% reduction by 2025. These are ambitious targets and will need to be supported by incentives and penalties to direct development to a lower emissions growth trajectory in such a short period of time.

Incentives to encourage Industries to adopt lower electrical energy usage, and penalties by way of Carbon Taxes are available or under development to effect the above reductions in GHG. It is expected that the movement toward lower environmental impact and lower energy usage will also be forced on consumers by the inexorable rise in primary energy costs as result of inherent shortages or supply constraints, as result of the slow rates of discovery of oil and gas resources, and inadequate investment in electrical generating and refining capacity worldwide.

Green buildings rating systems

The Green Building Rating Systems are standards which provide practical guidelines for improving the environmental quality of buildings relative to current typical building practices.

The first of the International Green Building Rating Systems was the United Kingdom's (UK) Building Research Establishment Environmental Assessment Method (BREEAM), established in 1990. A number of other building environment assessment and rating systems have followed in other countries, and the object has been to put the concept of Sustainable Construction into effect. These countries are HK BEAM (Hong Kong, 1995), ECO-Profile (Norway, 1996) LEED (USA, 1997), CASBEE (Japan, 2001), Green Star (Australia, 2002) and Green Star (South Africa, 2007).

The expected performance of candidate buildings is linked to credits, against which the environmental performance of buildings can be assessed. By totalling the credits an overall score and Star Rating for the assessed building is the result. In the RSA a minimum Four Star Rating is awarded, and recently a Six Star Building has been confirmed. A Green Star SA rating tools consist of eight environmental impact categories and an innovation category. Within each category, there are credits which represent individual design initiatives. Finally, within each credit, points are awarded based on the relative environmental impact of the credit (bigger impact credits have more points available). Though many of the credits are similar across tools and have common code references, tools also have sector specific credits that address initiatives only relevant in those building types.

The Green Star SA rating tools are developed to be equitable across building sectors. In other words, a 5 Star Green Star SA – Retail Centre project will exhibit a degree of industry leadership comparable to that of any other 5 Star Green Star SA project under another tool. For more detail on the specific Green Star tools refer to CBA Technical Note 9.

Building rating systems need a scientific basis that links sustainability principles with solutions appropriate for the building sector. Trends in the environmental labelling of buildings, which are discussed in the next sub-chapter suggest that the sector will move towards this new route to Sustainable Construction. The Sustainable Building Alliance (SB Alliance) is an international coalition of standard setting organizations and construction industry sector stakeholders who aim to accelerate the international adoption of Sustainable Building (SB) practices through the promotion of shared methods of building performance assessment and rating. SB Alliance members include nine buildings assessment and rating tool developers, of which the most well-known are the US Green Building Council (LEED), the British Research Establishment (BREEAM).

In 2009 the SB Alliance identified a core set of six quantitative indicators for building performance assessments. Outdoor environmental affects will be assessed on the basis of four criteria, namely, primary energy, water, greenhouse gas emissions and waste. The assessment criteria for outdoor environmental quality (OEQ), and thermal comfort and indoor air quality (IAQ) reflects concerns for human health and well-being. The key source of information will be Environmental Products Declarations (EPDs) of building products, as is described in the next chapter.

The additional indicators under discussion are economic performances, and visual and acoustic comfort. For South African situations the social aspects will need to be included. Unlike the first generation building rating systems which limit assessments to building design, construction and operation, the harmonised environmental assessment and rating methodology looks to take the entire building life cycle into consideration, and the CBA will need to ready itself for this development.

Compulsory environmental rating systems may succeed the current voluntary schemes, and to this end the International Green Construction Code (IgCC) is set to mainstream "green" building in the US as it stipulates enforceable minimum "green" requirements to be met by all buildings. In the South African environment the Construction Industry Development Board is developing such standards for state owned and occupied building and is endeavouring to take a similar leadership position, by settinga minimum four star requirement for such buildings.

It is well documented that between 30% and 40% of energy usage is attributable to buildings world-wide.The Green Building movement does not extend to influencing the operational energies or occupational usage energy after the construction phase, and this it is proposed, will be controlled via Building Energy Performance Certification or Labelling.

Green product labelling systems

The outdoor and indoor environmental impact of a building is the sum total of the environmental effects of the many contributing construction systems and products – structural, envelope and finishing materials. Product certification aims to avoid or reduce these potential effects at the level of individual construction products and is therefore an essential component of sustainable construction.

The outdoor environmental effects arising from building products used and pollutants released may occur at any stage from raw material extraction to disposal or reuse of the construction product. The effects occur at a global, e.g. Green-House gases (GHG), regional or local scale. Since not all

VOCs contribute to ambient air quality problems, 'No VOC" or "Low VOC "labelled products can still off- gas potentially toxic chemicals into the indoor environment. Evidence suggests that the air within buildings can be more seriously polluted than the outdoor air, and that the construction products which occupy large surface areas – floors, walls, and ceilings, are the single most important source of indoor air contaminants.

From an indoor air quality (IAQ) perspective, the key chemicals of concern are Volatile Organic Compounds (VOCs) and Semi-Volatile Organic Compound (SVOCs) used in the manufacture of furniture, upholstery, cleaning supplies and a broad range of construction products found in the indoor environment. As people spend most of their time indoors their exposure to such pollutants is possibly continuous. For more information on VOC issue and masonry construction see the CBA Technical Note 4.

Standards certifying the indoor or outdoor environmental performance of building products can be utilised to affect some control in buildings. The objective of the ISO14020 series of standards is to develop internationally accepted a best practice on environmental labelling, which is verifiable and accurate information – which is not misleading in anyway – with respect to the environmental aspects of product and services. It is intended that the demand and supply of those products and services causes less stress on the environment and that they stimulate the potential for market-driven continuous environment improvement.

The ISO 14020 standards series of Environmental Labels and Declarations comprises of:

ISO 14020 (2000): General principles; requires that the criteria be based on life cycle considerations that is, the criteria selection process shall consider in a qualitative manner the function of the product (or service) and all life cycle stages and embodied effects associated with the product in question.

ISO 14024 (1999): Type I Environmental Labelling, which is commonly known as an "Ecolabel". This conveys business –to- consumer information in the form of a symbol or seal of approval which confirms the environmental preference of a labelled product within a specific products category. An Ecolabel is awarded by an impartial third-party who operates an Eco labelling programme which sanctions the use of the label.

ISO 14021 (1999): Type II Self-declared Environmental Claim for first parties prohibits the use of vague or non-specific language such as "environmentally friendly' or "non-polluting" or "green" in a claim. Under this type of Label the assessment, verification and certification protocols are all under the control of the product manufacturer. As there are no definitive methods for measuring sustainability, the international standards specifically exclude usage of the terms "sustainability" or "sustainable" in the contents of a first –party claim. Type II labels are typically marketed on the basis of only one environmental attribute, for example, energy efficiency, with a risk that possibly adverse environmental impacts are not made known to the consumer. This label type is the most frequently dogged by concerns of "green washing ". Industry agreements can be to direct association member companies to adopt such a standard as the acceptable code.

ISO 14025 (2006): Type III Environmental Declarations have the following built-in features:

These are designed to foster transparency, impartiality and credibility in the market place, via:

- Independent, third party verification and certification of product claims.
- A whole life cycle assessment based on multiple criteria so that all environmental consequences of a product are identified and addressed in a holistic manner.
- Thorough consultation; and participation of stake holders (producers, consumers, authorities, etcetera) in the standard development process.

Many manufacturers are now resorting to second or third party certification to boost the public image of Type II labelled products. An EPD standard for building products, which is currently under development, is likely to become a US National Standard, subordinating existing Types I and II labels in the USA. The development of a harmonised, European EPD standard for construction products is set to be published in 2012.

In the RSA the White Paper on environment management policy for South Africa (1998)makes specific reference to eco labelling as a means for industry to take greater responsibility for environmental protection, and for the consumer public to gain access to environmental information. This infers a minimum preferred national standard for environmental labelling as per ISO Type I Ecolabel. The White Paper is based on multiple life cycle criteria; and requires public consultation and third- party certification. This policy position has been transcribed into the key items of consumer and environmental legislation. For example, the Air Quality Act of 2004 requires the use of environmental labelling to achieve emissions reductions target; and the minimum requirements set out by the Consumer Protection Act of 2008 include labelling of products which may result in hazardous waste.

A view advanced is that the status of environmental labelling in the SA construction industry supply sector is that the basis for environmental performance assessment and labelling will be Eco Product, a tool founded on the principles and procedures of the Type I Environmental labelling standard ISO 14024: 1999. Eco Standards completed a pilot project in 2011 and intends to launch its construction product programme, which will rely on voluntary participation by construction product manufacturers, in January 2012.

The goal of the South African National Ecolabelling Scheme (SANES), a government funded initiative established in 2007, is to create an enabling environment for South Africa to achieve an important environmental policy milestone – that of using industry self- regulation to complement environmental regulation. SANES provides third-party certification of environmental claims in accordance with principles and procedures of the Type I environmental labelling standards, ISO 14024; 1999. Participation in SANES is voluntary. The stated objectives of SANES are to:

- Unite the growing number of environmental claims "under one umbrella",
- Provide environmental assessment, certification and labelling services for all South African industry sector products;
- Encourage new actions which will enhance biodiversity, minimise waste and pollution and conserve (water and energy)

SANES has developed and piloted Ecolabels for domestic cleaning products and tourism sector. There is currently a process underway to develop SANES Ecolabels for construction products.

SANES is administered by Indalo Yethu, a legacy project of the Third Earth Summit which was held in Johannesburg in 2002. Indalo Yethu was created by the Department of Environmental Affairs (DEA) in 2003.

Environmental Product Declarations

In the European Community key information will routinely be made available by suppliers on an Environmental Performance Declaration (EPD). All aspects and impacts are captured where they occur in the building life cycle stages and sub-stages. For example, waste from the brick production process is allocated to "production", waste generated during transport of the bricks to "transport", brick-waste generated in the bricklaying is allocated to "construction", etc. We can expect that this information will be required to be provided by suppliers in terms of supply contracts and purchase agreements. This will be provided in terms of an Environmental Performance Declaration (EPD).

In the chain of supply of information to the building industry the environmental, social and economic information is based on the input and output of resources, energy and emissions. By Industry Agreement this data may be standardised in terms of assumptions around quarry conditions, brick manufacturing methods, firing fuel sources, distances from point of supply, type of masonry construction etc. This is effectively a further development in Material Safety and Specification Sheets.

Conclusions; The impact of the above issues on the Clay Brick Industry

Materials manufacturing industry initiatives are resulting in a growing "green "marketing effort. Nine out of twenty-one major construction material groups surveyed feature an environmentally sound or "green "brand. There is however a strong trend toward ISO Type II Self – declared claims and therefore a high risk of loss of consumer confidence due to fears of green washing.

Five out of the nine major materials groups identified in the survey (Table 6) – floor covering; decorative paints; doors; windows and frames; particleboard and medium density fibreboard (MDF); and insulation are suspected to have environmental issues which are driving their marketing message. In the absence of a sound basis for the claims the credibility of companies in the long term is a risk, unless they move towards a Type I or Type III approach.

The relevance of the GHG issue and the Industry carbon foot-print must be a concern to some of the CBA publics, and if the Industry players continue to show progress towards cleaner production and innovation, and continue to promote means of making buildings more efficient these publics will be supportive of the CBA and their members initiatives.

NOTES