

Sustainable use of our Quarry Resources

Sustainability is a word that is seen and used more and more in recent times. It is used by international bodies as a necessity for the world's future, it is quoted by governments as a basis for their policies, it is used by environmental groups as a demand, it is quoted by scientists as a basis for their forecasts, and is now even seen on TV in ads promoting timber products.

It is commonly acknowledged by business as one of the essential elements of corporate governance, and can now be seen in the vision statements of public companies, in the due diligence requirements of boards of directors, and even in the corporate positioning and branding of companies.

This is not surprising as arguably sustainability is one of the key requirements for the continuity of life on earth and the world's growing use of resources is pushing up against understood limits in some areas.

In the extractive industry in Australia all the major companies refer to sustainability on their websites, giving examples related to the environment, rehabilitation, water use, energy, waste, greenhouse gas emissions and community engagement. Obviously they are taking the subject seriously and many have annual sustainability reports.

With all this attention to sustainability by our major quarry companies, does the community perceive our industry as sustainable?

The anecdotal evidence is that it does not. There are innumerable examples of applications for new or expanded quarry operations meeting with significant community resistance, most often over pollution or land use issues that we often describe as "not in my backyard" (NIMBY) issues, and from this almost universal opposition, the inference could be drawn that the community usually does not see us as good neighbours, or even tolerable neighbours, who's value to the community helps offset any inconvenience, such as might be thought of for a hospital or a wind farm, where the community good or green credentials of sustainable energy generation are valued by the community.

So is there a case for a sustainable quarry industry as part of our community image and does it matter?

Firstly what is sustainability related to resources?

There is no universally accepted definition, one of the simplest being "A sustainable resource is a resource that is used up at the same speed that it is renewed" ⁽¹⁾

This definition is commonly heard in relation to renewable natural resources where the rate of exploitation is restricted to the rate of natural regeneration. It can be applied to a sustainable catch rate of a fish species that needs to be restricted to the natural growth rate, and to other renewable natural resources such as forests harvested for timber, and water extraction from an aquifer.

However it is not often that the term sustainable is associated with natural resources that are effectively non-renewable. World oil reserves are usually considered as finite, because although new oil is produced by the earth's geological processes the time scale is infinitely greater than the human time scale.

The same is usually said of other natural resources such as minerals and construction materials quarried from the earth. Their renewal is on a geological time scale of no practical use to humans, despite some minor renewal, or repositioning, such as sand replenishment in rivers and coastlines.

One of the most frequently quoted definitions is that of the United Nations' Brundtland Commission report ⁽²⁾ which defines sustainability as "development that meets the needs of the present without compromising the ability of future generations to meet their own needs".

This definition goes beyond renewable, and implicitly considers additional elements such as total resources, usage rates and future usage patterns. This is more applicable to quarry resources

On a global scale the earth will never exhaust its construction materials of rock and sand. World consumption of aggregates is around 18 billion tonnes per annum, and Australia's around 140 million tonnes, but rock forming minerals, constitute over 90% of the earth's crust, so it is impossible to globally exhaust this material or even significantly diminish it.

Therefore applied against the Brundtland definition of not "., compromising the ability of future generations to meet their own needs", quarry resources could reasonably be classified as sustainable.

Of course it's not that simple as the quarry resources aren't always located where we need them.

The location of demand for construction aggregates depends on population density while geology controls the location and quality of the aggregate resources.

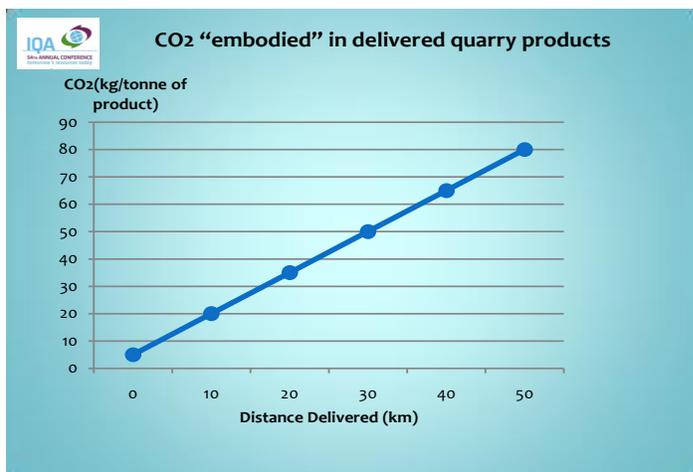
Population concentrations such as cities create demand for buildings and roads and all other aspects of urban infrastructure. As concrete is the world's most used man made material (around 1 cubic metre for every person on earth, and much more in developed countries such as Australia), then demand for aggregates for concrete and other construction materials is concentrated in population centres.

As this very same population requires land to live, work and be transported, there inevitably arises land use conflicts, pushing quarries further away from the demand, (although in an absolute sense extractive quarries occupy a miniscule fraction of the whole land area, equal to around 0.005% in Germany for example ⁽³⁾). These land use conflicts which sterilise quarry resources are becoming increasingly common as more land is preserved for nature preservation, ground water protection, animal habitat and plant biodiversity and is driven by politicians who react to the community's demands, often without taking a balanced view of long term resource needs. In Europe, known gravel reserves have been reduced due to land preservation by more than 80% ⁽⁴⁾ and in Queensland a CC&AA commissioned study found known hard rock resources had been reduced due to government land use restrictions by 75%⁽³⁾

Thus there will probably be localised shortages of rock and sand resources around most major cities.

As transport and roads are readily available around population centres this is not a practical limitation on supply, but as quarried construction materials are a high volume, low unit value material, the cost of increased transport distance becomes a significant and sometimes dominant factor.

This increased transport distance also has a serious environmental penalty. Extracting rock and sand in Australia produces very little carbon dioxide (around 3 to 6 kg of CO₂ per tonne of product ^(5,6)) hence our products are "green" from the embodied greenhouse gas perspective. However when it is transported, the carbon dioxide emitted by trucking, (1.5kg of CO₂ per tonne of product^(5,6)) increases the embodied emissions of the delivered product significantly, such that at 10km the embedded carbon dioxide per tonne is four times that at the quarry gate, and at 100km it is more than 30 times .



To mitigate this distance issue, the EU and other countries have adopted the "proximity principle" ⁽⁷⁾ which while initially applied to waste, equally applies to raw material sourcing, expressed as "raw materials should be sourced as close as possible to the location of their use". This is a reflection of the major impact of the transport cost and environmental effect.

In addition to optimum sourcing of virgin quarried materials, there are well established means to reduce overall demand by efficient use and recycling, thereby ensuring the minimum demand for establishing new quarries.

Firstly “efficient use” means simply to exploit a virgin resource to produce the maximum quantity of usable product for a given quarry location. This can include extraction design, processing equipment, product mix and economies of scale presented by a large quarry, and is a direction most quarries are now headed because of the business need for reduced costs, but many of these efficiencies are being increasingly hampered by environmental issues of buffer zones, setbacks, vegetation offsets and sight lines, and these constraints are having the inadvertent and contrary effect of reducing extraction efficiency and hence sustainability.

Equally “efficient use” can be assisted by users such as specifying authorities tailoring or “relaxing” product standards, so that the highest quality and scarcer resource is reserved for the uses of highest need, and uses that do not need the highest quality product can be met by lower quality resources. It is fairly obvious that rock used as sub-base in a country road does not need to be of the same quality as rock used for aggregates in very high strength concrete, but some Australian authorities appear reluctant to recognize such realities.

Secondly recycling can and is playing an increasing role in substituting for virgin resources, and is even more valuable because often it has a proximity advantage to the place of demand. A recycling centre in an exhausted quarry or on waste land near a city is well located to both receive C&D materials for processing and supply them.

In fact because of the nature of the aggregate product, it could be said that it is not “consumed” in manufacture, such as say for oil, merely transformed (ie: solid rock to solid concrete), and that recycling “transforms” it back to its near original form (solid concrete to crushed aggregate). A built environment can be seen as an “urban deposit” of concrete ready for extraction through recycling.

Recycled aggregate use is increasing rapidly in Australia for suitable uses, with around 80% or more of roadbase in the Sydney region being recycled C&D material. This serves the dual purpose of substituting for virgin materials and removing a potential waste product. However because of limitations on the practicality, properties and volumes, and sometimes unnecessary limitations by specifiers, recycling can never supply a majority of total demand. Europe with much stricter recycling laws than Australia averages 6% of total demand met by recycling, while its best performing countries (UK, Belgium, Netherlands) meet a maximum of 20% of demand with recycled materials ⁽⁴⁾

So in and around cities we may locally run short of economic virgin quarried materials, but with an understanding of the factors affecting supply and demand, this can be mitigated.

Therefore in a pure material supply sense I contend that quarried materials are a “sustainable resource”

Again of course that is not all the picture.

The other no less important component of sustainability, is the peripheral, undesirable effects of the extraction, manufacturing and transport processes. Environmental impacts such as air, noise and water pollution, water consumption, visual intrusion, ecosystem degradation, vegetation loss, increased road and rail traffic, greenhouse gas emissions and waste production are some of these.

The industry seeks to minimise all these impacts, in fact it is part of the requirement of all our approvals, and in general I suggest it is more and more aware of this need, and is rapidly improving its performance.

In some areas it is in fact generating a positive out of the necessities in such areas as reuse of depleted quarries to provide the community with cost effective and much needed land for development, waste disposal facilities or open space recreational areas. Rehabilitation of sites is becoming more sophisticated with large sites affording opportunities for large scale land reforming, creating new public use areas, of great benefit to the community, which would otherwise never have been available. The part completed and ongoing Penrith Lakes area in Sydney, with its Olympic rowing course, white water rafting facility and large recreational park and water areas, is a facility of much value in western Sydney, that other than for the extraction industry could most likely not have been afforded by the community.

Finally I would like to deal with the public perception of our industry and sustainability. It has become apparent to all of us that our industry requires a “social licence” from the community to operate. Apart from all the approval processes and legal requirements, if the community does not want or appreciate the industry, we will find it increasingly difficult to operate over time, eventually making the products so costly that other more expensive and less suitable substitutes may emerge.

This social licence depends on how the community perceives us, and sustainability has become a key part of public expectation.

We have been perceived by some in the community as an industry that exploits the natural environment for short term gain with little consideration of the future. But often there is little appreciation of the benefits arising from the use of our products, the roads, the offices, hospitals, the drainage systems, the airports and the homes.

I would therefore like to introduce a recent Australian definition of sustainability that I think captures this. It is from Dr Martin Parkinson, Secretary to the Treasury of the Australian Government and he says sustainability requires;

“...that each generation bequeath a stock of capital –the productive base for well being –that is at least as large as the stock it inherited” ⁽⁸⁾,

and that;

“For example, reducing our natural resource base and using the proceeds to build human capital or infrastructure may offer prospects of higher future well-being”

This introduces the important concept of the beneficial use of our virgin resources to create valued products, as part of sustainability. As our industry supplies quarried materials which are manufactured into buildings and roads, we are adding to the infrastructure which improves the well being of the community, which offsets or more than offsets the reduction in the natural resources, and hence maintains or increases sustainability.

As argued in this paper we are an industry which provides essential materials for the economic growth and well being of society, and which does so sustainably. I suggest our industry must be unashamed of its role and be much more forthright in getting this message of a sustainable and valuable industry into the community consciousness, if we are to have a long term and prosperous future.

References

1. Wiki.answers website 22/9/2011
2. United Nations Brundtland Commission report “Our Common Future” 1987
3. A is for Aggregate, Bill Langer, Quarry, Sept 2010
4. Jim O’Brien, President of the European Aggregates Association, presentation in Sydney, July 2011
5. Cement Concrete & Aggregate Australia, private correspondence, 13/9/2011
6. Rocla Quarry Products in-house company data, July 2011
7. EU Treaty-Sustainable Development, Article 174(2), Guiding Environmental Principles
8. Sustainable Wellbeing-An Economic Future for Australia, Dr Martin Parkinson, PSM, Secretary to the Treasury, Australian Government, 23 August 2011