

Head in the sand

28 February 2020

Without sand there would be no concrete, no asphalt and no glass. But with rapid urbanisation and population growth, are we in danger of running out of this crucial resource, asks Pascal Peduzzi?

It would be impossible to build the schools, hospitals, roads, solar panels and other infrastructure necessary to achieve the [UN Sustainable Development Goals \(SDGs\)](#) without a supply of sand and gravel. But global consumption of sand and gravel is estimated at 40?50bn tonnes a year. Without regulation, extraction of such large volumes of aggregates has a major impact on our environment. Land is lost through river or coastal erosion, the water table is lowered and sediment supply decreased. Despite this, policy-makers have not put it on their agenda and the public is largely unaware of the issue.

Aggregates account for the largest volume of solid material extracted globally, about 18kg per day per person on the planet. This raises 3 major concerns: 1st, we cannot extract such a volume without an enormous impact on the environment; 2nd, given our dependence on these resources, how do most governments and decision-makers not have a greater awareness of the issue? Aggregates are assumed to be so common that no one worries, despite our reliance on them. Then, 3rd, with population growth, urbanisation and the necessary improvements in infrastructure to achieve the SDGs, the demand for aggregates will increase.

Governments need improved policies for dealing with the extraction and use of aggregates. We need to have global monitoring in place and to improve the way we consider this material.

For instance, Dubai is among the world?s most spectacular architectural developments, but it has put significant pressure on marine aggregates. The city is home to the Burj Khalifa tower, the tallest building in the world at 828m; the Palm Jumeirah and Palm Jebel Ali, artificial sets of sand islands; and the World Islands project, 300 islands representing a map of the globe. These 3 projects required more than 750m tonnes of sand in total. While such development is impressive, 31% of office space in the centre of Dubai was vacant in 2013. The projects thus represent real-estate speculation: selling luxury villas on the sand for millions of dollars, or selling the sand islands for tens of millions of dollars each.

So how can we reduce the impact of our sand consumption? The simplest answer is to consume less. This is easier said than done, but the following could be considered.

- **Avoid speculative construction:** some prestigious buildings or tourist attractions are built but remain empty, such as Burj Khalifa tower; or the Kangbashi district in China, a district of Ordos city that was designed to host 1m inhabitants.
- **Re-use existing infrastructure:** services can be retrofitted or adapted to a new use.
- **Reduce demand for sand:** don?t overdesign buildings. Build for the long term, substitute different materials and recycle concrete from demolition; the latter option has great potential, as it also reduces the need for landfill. Introducing a landfill tax will subsidise concrete recycling, and help the transition.
- **Retrieve material from waste:** incinerator bottom ash, or slag, can be substituted

for sand, for instance.

Sand extraction has different impacts depending where it comes from and how it is extracted. Generally there are 2 types of site ? dynamic and static.

Rivers, beaches or the marine environment, for instance, are dynamic, and sand is part of the ecosystem providing shelter and habitat. Removing sand from rivers can therefore have a serious environmental impact, including changes in turbidity and loss of biodiversity. It also affects river flow, potentially leading to riverbank erosion, and changes in flood and drought frequency or intensity.

Extraction of marine sand is also increasing significantly, which destroys the benthic areas ? at the bottom of the sea ? where micro-organisms live, feeding small fish that in turn feed bigger ones. This has an impact on biodiversity and fisheries. Operating in dynamic areas such as this should only be done after extensive environmental impact assessment.

Marine sand extraction has an impact on seabed flora and fauna, while dredging and extraction of aggregates from the sea bottom destroys organisms, habitats and ecosystems as well as affecting biodiversity, usually leading to a net decline in faunal biomass and abundance or a shift in species composition. Long-term recovery can occur only where original sediment composition is restored. Sand extraction also has an impact on fisheries.

The worst case is where sand is taken from beaches as it can destroy this ecosystem. Beaches protect land against storm surges, as well as against sea water infiltration into aquifers. They are specific ecosystems, and mining them affects biodiversity and plans for recreation.

The safest source remains sand taken from quarries or produced by crunching rocks from mountains, as these are static environments where aggregates are a deposit or part of the rock. It is easier to reduce the impact of extraction in such conditions, and a government concession or licence is required. An environmental impact assessment should be carried out before extraction and funds reserved to restore the site afterwards.

Although we are not yet running out of sand, it is becoming rare in some locations ? so we need to be smarter when we use it.

Pascal Peduzzi is director of the GRID-Geneva at the [UN Environment Programme](#)

RICS? view

RICS welcomes the UN spotlight on natural resources, in particular sand used as an aggregate, under Sustainable Development Goal 12 to ensure sustainable consumption and production patterns. Raw materials are essential to society, but demand is increasing as global population grows. This is not a concern unique to sand but one that affects all natural resources, including water, timber and fisheries.

Governance, standards and management are key, but in developing nations these are not necessarily in place or they are enforced ineffectively, making this a global issue that plays out at a local scale. This creates challenges, because while extraction in countries such as the UK may be a well-established and effective practice, it is complex to transfer this to other countries. However, learning and effective standards should be accelerated through better transfer of knowledge and experiences. With the spotlight on sand and other construction materials, we must take care that the social, environmental and economic issues associated with the supply of one resource are not simply transferred to another.

This global issue is an opportunity for RICS, which represents the only profession operating throughout the property life cycle, including mineral resource management and material specification for construction projects. RICS professionals and standards can help make urbanisation well planned and resource-efficient, with the environmental performance of supply strategies compared on a consistent basis to make the cities and infrastructure of the future more sustainable and more resilient.

David Sandbrook FRICS represents land strategy on the [RICS Governing Council](#) , and sits on the Land & Resources Steering Group

Further information

- Related competencies include: [Minerals management](#) , [Sustainability](#)
- [2019 Sand and Sustainability: Finding new solutions for environmental governance of global sand resources](#)
- [The Mineral Products Association?s Sand Supply ? a UK Perspective on a Global Issue](#)
- This feature is taken from the [RICS Land journal](#) (January/February 2020).
- Related categories: [Ecological considerations](#) ; [Environmental impact assessment](#) ; [Minerals and waste management](#) ; [Planning policy](#)