



## Scientific Facts on

# The mining of sand, a non-renewable resource

**Source document:**  
UNEP (2014)

**Summary & Details:**  
GreenFacts

**Context** - Sand and gravel are used extensively in construction for the preparation of concrete as well as for other applications such as glass, electronics or aeronautics.

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These are mined in coastal areas, where it can cause problems. What could be done to ensure that this resource will stay available ?

This is a faithful summary of the leading report produced in 2014 by the United Nations Environment Programme (UNEP):  
*"Sand, rarer than one thinks - Why is this issue important?"*

The full Digest is available at: <https://www.greenfacts.org/en/sand-extraction/>

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- Each question is answered in Level 1 with a short summary.
- These answers are developed in more detail in Level 2.
- Level 3 consists of the Source document, the internationally recognised scientific consensus report which is faithfully summarised in Level 2 and further in Level 1.

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## 1. Introduction

Sand and gravel are used extensively in construction for the preparation of concrete for buildings and roads, as well as for other applications such as glass, electronics or aeronautics. Added to this are all the aggregates used in land reclamation, shoreline developments and road embankments, plus sand used in industry.

This sand and gravel are mined world-wide and account for the largest volume of solid material extracted globally and the highest volume of raw material used on earth after water (about 70-80% of the 50 billion tons material mined/year). Formed by erosive processes over thousands of years, they are now being extracted at a rate far greater than their renewal. The amount being mined is increasing exponentially, mainly as a result of rapid economic growth in Asia and the resulting boom in construction. A conservative estimate of 40 billion tonnes /yr for the world consumption of aggregates is twice the yearly amount of sediment carried by all of the rivers of the world .

Despite our increasing dependence on the colossal quantities of sand and gravel being used and the significant impact that their extraction has on the environment, the absence of global data on aggregates mining makes environmental assessment very difficult and this issue has been mostly ignored by policy makers and remains largely unknown by the general public.

## 2. Why is marine sand used?

The inland resources of sand from rivers and lakes are not sufficient to meet the ever increasing demand and the existence of river ecosystems is threatened in a number of locations. In addition, the sand that is found in most deserts is paradoxically unsuitable for concrete and land reclaiming, as the wind erosion process forms round grains that do not bind well.

On the other hand, for use in concrete, marine aggregate needs to be thoroughly washed to remove salt. If the sodium is not removed from marine aggregate, a structure built with it might collapse after few decades due to corrosion of its metal structures. For concrete, in-stream gravel requires less processing and produces high-quality material.

## 3. What are the main issues with sand mining?

Negative effects on the environment are unequivocal and are occurring around the world. The volume being extracted is having a major impact on rivers, deltas and coastal and marine ecosystems results in loss of land through river or coastal erosion, lowering of the water table and decreases in the amount of sediment supply.

Extraction has an impact on biodiversity, water turbidity, water table levels and landscape and on climate through carbon dioxide emissions from transportation. There are also socio-economic, cultural and even political consequences. Mining of aggregates in rivers can change the riverbed, increase flood frequency and intensity. The problem is now so serious that the existence of river ecosystems is threatened in a number of locations and damage is more severe in small river catchments. The same applies to threats to benthic ecosystems from marine extraction . In some extreme cases, the mining of marine aggregates has changed international boundaries, such as through the disappearance of sand islands in Indonesia.

## 4. What can be done to reduce the problems?

Several options are possible, in combination :

- **Reducing the consumption of sand** : this can be done for instance by optimizing existing infrastructure, by recycling concrete rubble, or the use of alternative construction materials like wood.
- **Setting taxes on sand and gravel extraction to create incentive** for economically viable **alternatives**.
- **Reducing the negative impact of extraction** : this can be done by modulating the rate of extraction to the rate of renewal of the resource, and by determining the acceptable limit of extraction.

Absence of global data on aggregates mining makes environmental assessment very difficult and has contributed to the lack of awareness about this issue. As a consequence, a large discrepancy exists between the magnitude of the problem and public awareness of it.

There is a need for regulating sand extraction in both national and international waters and it should be authorized only after sound scientific assessment shows there would be limited impact on the environment. Greater consideration of substitute and sustainable use of the resource could drastically reduce negative impact on the environment.