

# Resource depletion

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**Resource depletion** is the consumption of a resource faster than it can be replenished. Natural resources are commonly divided between renewable resources and non-renewable resources (see also mineral resource classification). Use of either of these forms of resources beyond their rate of replacement is considered to be resource depletion<sup>[1]</sup>.

Resource depletion is most commonly used in reference to farming, fishing, mining, water usage, and consumption of fossil fuels.<sup>[2]</sup>

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## Causes

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- Aquifer depletion
- Mining for fossil fuels and minerals
- Overconsumption, excessive or unnecessary use of resources
- Overpopulation
- Pollution or contamination of resources
- Slash-and-burn agricultural practices, currently occurring in many developing countries
- Soil erosion
- Technological and industrial development
- Deforestation
  - Increases the greenhouse gases
- Ozone depletion

## Minerals depletion

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Minerals are needed to provide food, clothing, and housing. A United States Geological Survey (USGS) study found a significant long-term trend over the 20th century for non-renewable resources such as minerals to supply a greater proportion of the raw material inputs to the non-fuel, non-food sector of the economy; an example is the greater consumption of crushed stone, sand, and gravel used in construction.<sup>[3]</sup>

Large-scale exploitation of minerals began in the Industrial Revolution around 1760 in England and has grown rapidly ever since. Technological improvements have allowed humans to dig deeper and access lower grades and different types of ore over that time.<sup>[4][5][6]</sup> Virtually all basic industrial metals (copper, iron, bauxite, etc.), as well as rare earth minerals, face production output limitations from time to time,<sup>[7]</sup> because supply involves large up-front investments and is therefore slow to respond to rapid increases in demand.<sup>[5]</sup>

Minerals projected by some to enter production decline during the next 20 years:

- Gas (2023)<sup>[8]</sup>
- Copper (2024).<sup>[9]</sup> Data from the United States Geological Survey (USGS) suggest that it is very unlikely that copper production will peak before 2040.<sup>[6]</sup>
- Zinc.<sup>[10]</sup> Developments in hydrometallurgy have transformed non-sulphide zinc deposits (largely ignored until now) into large low cost reserves.<sup>[11][12]</sup>

Minerals projected by some to enter production decline during the present century:

- Aluminium (2057)<sup>[9]</sup>
- Coal (2060)<sup>[9]</sup>
- Iron (2068)<sup>[9]</sup>

Such projections may change, as new discoveries are made<sup>[9]</sup> and typically misinterpret available data on Mineral Resources and Mineral Reserves.<sup>[5][6]</sup>

## Oil

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Peak oil is the period when the maximum rate of global petroleum extraction is reached, after which, according to peak oil theory, the rate of production will undergo a long-term decline. The 2005 Hirsch report concluded that the decreased supply combined with increasing demand will significantly increase the worldwide prices of petroleum derived products, and that most significant will be the availability and price of liquid fuel for transportation.

The Hirsch report, funded by United States Department of Energy, concluded that that “The peaking of world oil production presents the U. S. and the world with an unprecedented risk management problem. As peaking is approached, liquid fuel prices and price volatility will increase dramatically, and, without timely mitigation, the economic, social, and political costs will be unprecedented. Viable mitigation options exist on both the supply and demand sides, but to have substantial impact, they must be initiated more than a decade in advance of peaking.”<sup>[13]</sup>

## Deforestation

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Deforestation is the clearing of forests by cutting or burning of trees and plants in a forested area. As a result of deforestation, presently about one half of the forests that once covered Earth have been destroyed.<sup>[14]</sup> It occurs for many different reasons, and it has several negative implications on the atmosphere and the quality of the land in and surrounding the forest.

### Causes

One of the main causes of deforestation is clearing forests for agricultural reasons. As the population of developing areas, especially near rainforests, increases, the need for land for farming becomes more and more important.<sup>[15]</sup> For most people, a forest has no value when its resources are not being used, so the incentives to deforest these areas outweigh the incentives to preserve the forests. For this reason, the economic value of the forests is very important for the developing countries.<sup>[16]</sup>

### Environmental impact

Because deforestation is so extensive, it has made several significant impacts on the environment, including carbon dioxide in the atmosphere, changing the water cycle, an increase in soil erosion, and a decrease in biodiversity. Deforestation is often cited as a cause of global warming. Because trees and plants remove carbon dioxide and emit oxygen into the atmosphere, the reduction of forests contribute to about 12% of anthropogenic carbon dioxide emissions.<sup>[17]</sup> One of the most pressing issues that deforestation creates is soil erosion. The removal of trees causes higher rates of erosion, increasing risks of landslides, which is a direct threat to many people living close to deforested areas. As forests get destroyed, so does the habitat for millions of animals. It is estimated that 80% of the world's known biodiversity lives in the rainforests, and the destruction of these rainforests is accelerating extinction at an alarming rate.<sup>[18]</sup>

## Controlling deforestation

The United Nations and the World Bank created programs such as Reducing Emissions from Deforestation and Forest Degradation (REDD), which works especially with developing countries to use subsidies or other incentives to encourage citizens to use the forest in a more sustainable way.<sup>[19]</sup> In addition to making sure that emissions from deforestation are kept to a minimum, an effort to educate people on sustainability and helping them to focus on the long-term risks is key to the success of these programs.<sup>[20]</sup> The New York Declaration on Forests and its associated actions promotes reforestation, which is being encouraged in many countries in an attempt to repair the damage that deforestation has done.<sup>[21]</sup>

## Wetlands

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Wetlands are ecosystems that are often saturated by enough surface or groundwater to sustain vegetation that is usually adapted to saturated soil conditions, such as cattails, bulrushes, red maples, wild rice, blackberries, cranberries, and peat moss. Because some varieties of wetlands are rich in minerals and nutrients and provide many of the advantages of both land and water environments they contain diverse species and provide a distinct basis for the food chain.

Traditionally, wetlands were assumed to be useless so it was not a large concern when they were being dug up for settlements, agricultural use, etc. It is now believed that the wetland habitats contribute to environmental health and biodiversity.

In the USA, less than half of the wetlands that still existed in the 1600s have vanished.<sup>[22]</sup>

Wetlands provide environmental services for:

1. Food and habitat
2. Improving water quality
3. Commercial fishing
4. Floodwater reduction
5. Shoreline stabilization
6. Recreation

Some loss of wetlands resulted from natural causes such as erosion, sedimentation (the buildup of soil by the settling of fine particles over a long period of time), subsidence (the sinking of land because of diminishing underground water supplies), and a rise in the sea level.

Nonnatural causes of wetland degradation and loss include.<sup>[22]</sup>

- Hydrologic alteration
  - drainage
  - dredging
  - stream channelization
  - ditching
  - levees
  - deposition of fill material
  - stream diversion
  - groundwater drainage

- impoundment
- Urbanization and urban development
- Marinas/boats
- Industrialization and industrial development
- Agriculture
- Silviculture/Timber harvest
- Mining
- Atmospheric deposition

## Water

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Water is an essential resource needed to survive everyday life. In fact, we would only be able to last around a week without consuming any water.<sup>[23]</sup> Even historically, water has had a profound influence on a nation and people's prosperity and success around the world.<sup>[24]</sup>

As of right now, groundwater is considered to be a non-renewable resources and it actually serves as ninety-eight percent of all the earth's available fresh water.<sup>[25][26]</sup> Groundwater is known to be used to supply things such as wells and aquifers for private, agricultural, and public use.<sup>[25]</sup> Of all the groundwater covering the entire world, six percent of it is replenished every fifty, or so, years.<sup>[25]</sup> However, of all the 22.6 million cubic kilometers of groundwater available, only .35 million of it is renewable.<sup>[25]</sup>

## Political effects

The use and depletion of water sources has created turmoil in these nations that have little access to water reserves. A good example of this turmoil can be seen in both the nations of Egypt and Israel.<sup>[27]</sup> Each nation lives downstream of very important rivers; therefore, it is crucial for both Egypt and Israel that these rivers are not tampered with or that they do not dry up.<sup>[27]</sup> In fact, both nations have threatened to go to war with the nations residing upstream if they were to dam the rivers and/or cut off their supply of fresh water resources to them!<sup>[27]</sup>

Migration is another factor of water depletion that is affecting not only the nation which is suffering from the loss of water resources but also nations farther outside their borders as well. People tend to migrate to nations with better environmental regions than their own.<sup>[27]</sup> This mass movement of people has been causing violence and chaos throughout the world.<sup>[27]</sup> It has also been met with resistance because places like the United States and Europe do not want migrants coming to their lands and nations.<sup>[27]</sup>

## See also

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|------------------------------|-------------------------------|
| ▪ <u>Holocene extinction</u> | ▪ <u>Peak gold</u>            |
| ▪ <u>Jevons's paradox</u>    | ▪ <u>Peak minerals</u>        |
| ▪ <u>Overexploitation</u>    | ▪ <u>Peak phosphorus</u>      |
| ▪ <u>Overfishing</u>         | ▪ <u>Peak uranium</u>         |
| ▪ <u>Peak coal</u>           | ▪ <u>Peak water</u>           |
| ▪ <u>Peak copper</u>         | ▪ <u>Peak wheat</u>           |
| ▪ <u>Peak gas</u>            | ▪ <u>Planetary boundaries</u> |

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## Further reading

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[T]he ongoing effects of the ruinous 2003 war in Iraq and the 2007–8 financial meltdown are... two indicators that the promise of endless growth can no longer help organize people's aspirations... We are entering the second 'lost decade' of what Larry Summers calls 'secular stagnation,' and soon we'll be in the third decade of a war that Senator Lindsey Graham... says will never end. [T]here is a realization that the world is fragile and that we are trapped in an economic system that is well past sustainable or justifiable.... In a nation like the United States, founded on a mythical belief in a kind of species immunity—less an American exceptionalism than exemptionism, an insistence that the nation was exempt from nature, society history, even death—the realization that it can't go on forever is traumatic." (p. 21.)

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