

# The value of ecosystems as providers of goods and services for the survival and well-being of humans including medicines, gene pools and resilience to hazards

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## Ecosystem Services

This concept was developed by Costanza *et al* in a 1997 paper in **Nature**: “*The value of the world’s ecosystem services and natural capital*”. It describes the processes by which the environment produces resources utilised by humans such as clean air, water, food and materials<sup>1</sup>.

The Millennium Ecosystem Assessment (MA) provided the most comprehensive assessment of the state of the global environment to date. The MA was called for by the United Nations Secretary-General Kofi Annan in 2000. Initiated in 2001, the objective of the MA was to assess the consequences of ecosystem change for human well-being and the scientific basis for action needed to enhance the conservation and sustainable use of those systems and their contribution to human well-being. The MA has involved the work of more than 1,360 experts worldwide.<sup>2</sup> It classified ecosystem services as follows:

**Supporting services:** The services that are necessary for the production of all other ecosystem services including soil formation, photosynthesis, primary production, nutrient cycling and water cycling.

**Provisioning services:** The products obtained from ecosystems, including food, fibre, fuel, genetic resources, biochemicals, natural medicines, pharmaceuticals, ornamental resources and fresh water.

**Regulating services:** The benefits obtained from the regulation of ecosystem processes, including air quality regulation, climate regulation, water regulation, erosion regulation, water purification, disease regulation, pest regulation, pollination, natural hazard regulation.

**Cultural services:** The non-material benefits people obtain from ecosystems through spiritual enrichment, cognitive development, reflection, recreation and aesthetic experiences – thereby taking account of landscape values.

## Why are ecosystems important?

**Medicines:** Tropical rainforests are the source of between 10 and 15 percent of the natural medicines prescribed today. Chemicals found in rainforest plants have been used for treating cancer, Hodgkin’s disease, hypertension, and rheumatoid arthritis, and as an aid for surgery, and for the production of sex hormones. Drugs from the rainforest include quinine (from the cinchona tree, used for treating malaria), Tubocurarine and curare (muscle relaxants used in surgery, derived from poison frogs), reserpine (from a Southeast Asia plant, use to alleviate hypertension and Salagem (used to reduce the side effects of radiation treatment on cancer patients). Tea made from a kind of yam found in Mexico was used for birth control by rainforest women for hundreds of years. In the 1960s, drug companies discovered its potential and isolated and reproduced the active ingredient, diosgenin, giving birth to ‘the pill’.<sup>3</sup>

**Gene pools:** Rainforests produce a large variety of resins, tannins, steroids, waxes, bamboo, flavourings and dyes stuffs used to make consumer goods such as lubricants, glue, golf balls, nail varnish, deodorant, tooth paste, shampoos, mascara and lipstick. Among the foods that originated in the rainforests and are still produced there are pineapples, bananas, citrus fruits, yams, cocoa, sago, cassava, heart-of-palm, avocado, papayas, mangos Brazil nuts, winged beans and several edible oils. Spices that come from rainforest plants are vanilla, nutmeg, cinnamon and black pepper.<sup>4</sup>

There are an estimated 75k edible plants in nature, only 150 are in commercial production and 20 (mostly domesticated cereals) stand between society and starvation. This makes humans extremely susceptible to the impacts of diseases, pests and climate change.<sup>5</sup> Genetic diversity from natural ecosystems (especially tropical rainforests) can help fortify against this vulnerability.

**Resilience to hazards:** Forests (especially, but all vegetation) help to protect slopes (even gentle ones) from soil erosion. Their roots bind the soil together and, through intercepting precipitation, reduce the speed by which water enters river networks. There are many examples of floods and landslides that have been attributed to forest clearance. Higher rates of infiltration also help to increase soil and groundwater storage which increases resilience to droughts. Coral reefs provide substantial protection against natural hazards by reducing wave energy by an average of 97%. Reef crests alone dissipate most of this energy (86%). There are 100 million or more people who may receive risk reduction benefits from reefs or have to bear hazard mitigation and adaptation costs if reefs are degraded.<sup>6</sup>

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<sup>1</sup> <http://www.ecosystems-services.org.uk/ecoserv.htm> (04/07/17)

<sup>2</sup> <http://www.millenniumassessment.org/en/About.html> (04/07/17)

<sup>3</sup> <http://factsanddetails.com/world/cat52/sub329/item1304.html> (04/07/17)

<sup>4</sup> *Ibid* (04/07/17)

<sup>5</sup> [http://www.rainforestinfo.org.au/good\\_wood/the\\_imp.htm](http://www.rainforestinfo.org.au/good_wood/the_imp.htm) (04/07/17)

<sup>6</sup> <https://www.nature.com/articles/ncomms4794> (04/07/17)