



FACTSHEET

Local climate regulation

In a nutshell

Trees and green spaces moderate the temperature (e.g. in cities) while forests influence rainfall and water availability both locally and regionally. Trees and other plants also play an important role in regulating air quality by removing pollutants from the atmosphere.

1. Role for human well-being

Ecosystems such as forests and wetlands [regulate the microclimate](#) at the local level. People often benefit directly, e.g. in terms of the production of food and raw materials, water supply and good health. The use of [agroforestry systems](#) for the production of crops or coffee provide shade, regulate temperatures and reduce the impacts of strong rain events. In tropical regions especially forests are important for [regulating rainfall and temperature](#) on a regional scale. Here, up to thirty percent of the rain that falls is water that rainforests have recycled into the atmosphere. In cities, trees and green spaces are crucial to avoiding the so-called 'urban heat island' effect which occurs in cities worldwide. In a hot climate, trees provide much appreciated shade. To find out about further benefits of green spaces related to local climate regulation and beyond, see [Project EverGreen](#). In the [USA the annual pollution removal](#) by trees in urban parks and related benefits are estimated at about 75,000 tons (\$500 million) or 80 pounds per acre of tree cover (\$300 per acre of tree cover). Ecosystems in general can also be a sink for tropospheric ozone, ammonia, NO_x, SO₂, particulates and CH₄.

2. Typical threats

Land cover changes can affect local and regional climates in many ways. If forests in tropical areas are cleared, the rainfall regime can shift and the temperature rise. [Threats to rainforests](#) stem mostly from economic development including agricultural expansion or infrastructure projects such as dams. In and around cities increasing urbanisation is the most pressing issue. Trees that provide shade or green spaces that serve as corridors for fresh air are lost through a lack of awareness of their necessity or through the need for housing (e.g. green spaces compete with infrastructure building areas or dwellings). As global temperatures are expected to rise in the medium term, both the threats to this ecosystem service and its importance for human well-being will increase.

3. Example indicators

- The [air quality index](#) indicates how clean or polluted the air is (g/m³/day). This indicator can be directly linked to human well-being through the associated health effects which might arise.
- The indicator [forest fragmentation](#) can be used to indicate specific changes in forest configuration that can be associated with changes to the local climate.
- The canopy of a forest can be measured using the [leaf area index](#).
- The effects on temperature of green spaces and trees in cities can be measured by thermal mapping to detect overheated or cool areas. By calculating the effects on health or cooling costs, this information can be converted into socio-economic terms.
- Differentials in the number of people with respiratory disease can also indicate the socio-economic importance of this service.





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- The capacity of ecosystems to extract aerosols & chemicals from the atmosphere can be measured using various indicators including the following:
 - The fine dust captured by vegetation (kg/ha) and/or NO_x fixation (kg/ha).
 - The change in atmospheric fine dust concentration (PPM, g/m³)

4. Example methods

Methods **for assessing the value** of this service:

- [Contingent valuation](#)
- [Cost based methods](#) such as : Avoided damage costs, replacement and restoration costs

Methods for **assessing the condition** of this service:

- The descriptions of [essential climate variables](#) by the [Global Terrestrial Observing System](#) provide a good overview of how to measure the [leaf area index](#) or current [land cover](#).
- [InVEST \(Integrated Valuation of Environmental Services and Tradeoffs\) in general](#)
- [ARIES](#)
- [MARXAN](#)
- In urban areas tools such as [CITYgreen](#) or [i-tree Eco](#) are useful to measure e.g. summer energy savings or air quality. See, for example, the [case study from Barcelona](#).

5. Managing this service

Typical instruments for managing this service include:

Land planning and zoning

- Assigning watershed status, protecting forest areas in sensitive areas, and other land planning measures can be used to maintain or improve micro-climatic conditions. For example, [thermal maps can be used for city planning](#).

Restoration and preservation of trees and green spaces in urban areas

- A [research note](#) by the UK forestry commission provides guidance on how to manage urban trees and green infrastructure for air temperature regulation.

Agroforestry systems

- The world agroforestry centre provides a host of guidance and case studies related to the benefits provided by [ecosystem-based adaptation](#) such as local climate regulation.

On behalf of:



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