

The scale of our presence

HUMANS are perhaps the most successful species in the history of life on Earth. From a few thousand individuals some 200 000 years ago, we passed 1 billion around 1800 and 6 billion in 1999. Our levels of consumption and the scope of our technologies have grown in parallel with, and in some ways outpaced, our numbers.

But our success is showing signs of overreaching itself, of threatening the key resources on which we depend. Today our impact on the planet has reached a truly massive scale. In many fields our ecological “footprint” outweighs the impact of all other living species combined.

We have transformed approximately half the land on Earth for our own uses – around 11 percent each for farming and forestry, and 26 percent for pasture, with at least another 2 to 3 percent for housing, industry, services and transport¹. The area used for growing crops has increased by almost six times since 1700, mainly at the expense of forest and woodland².

Of the easily accessible freshwater we already use more than half. We have regulated the flow of around two thirds of all rivers on Earth, creating artificial lakes and altering the ecology of existing lakes and estuaries³.

The oceans make up seven tenths of the planet’s surface, and we use only an estimated 8 percent of their total primary productivity. Yet we have fished up to the limits or beyond of two thirds of marine fisheries and altered the ecology of a vast range of marine species. During this century we have destroyed perhaps half of all coastal mangrove forests and irrevocably degraded 10 percent of coral reefs.

Through fossil-fuel burning and fertilizer application we have altered the natural cycles of carbon and nitrogen. The amount of nitrogen entering the cycle has more than doubled over the last century, and we now contribute 50 percent more to the nitrogen cycle than all natural sources combined. The excess is leading to the impoverishment of forest soils and forest death, and at sea to the development of toxic algal blooms and expanding “dead” zones devoid of oxygen⁴.

By burning fossil fuels in which carbon was locked up hundreds of millions of years ago, we have increased the carbon dioxide content of the atmosphere by 30 percent over pre-industrial levels. We have boosted methane content by 145 percent over natural levels⁵.

Through mining and processing we are releasing toxic metals into the biosphere that would otherwise have remained safely locked in stone. We are producing new synthetic chemicals, many of which may have as yet undetermined effects on other organisms.

We have thinned the ozone layer that protects life on Earth from harmful ultra-violet radiation. Most scientists agree that human activities are contributing to global warming, raising global temperatures and sea levels.

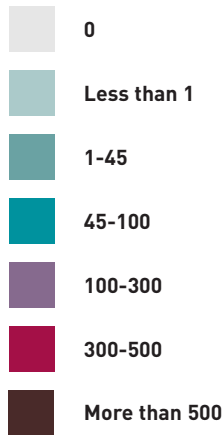
These processes affect the habitats and environmental pressures under which all species exist. As a result, we have had an incalculable effect on the Earth’s biodiversity. The 484 animal and 654 plant species recorded as extinct since 1600 are only the tip of a massive iceberg⁶.

We have become a major force of evolution, not just for the “new” species we breed and genetically engineer, but for the thousands of species whose habitats we modify, consigning many to

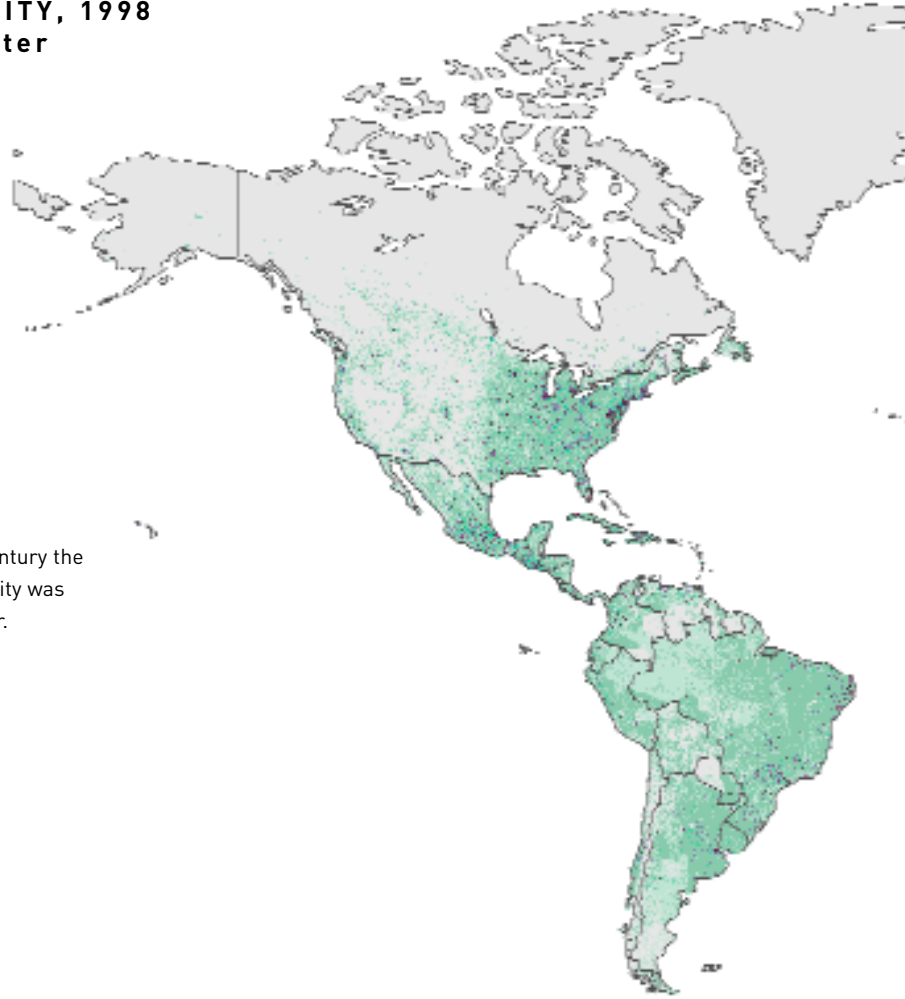
The scale of human activities

The scale of human activities can be represented partly by observing population density, both over the globe and over time.

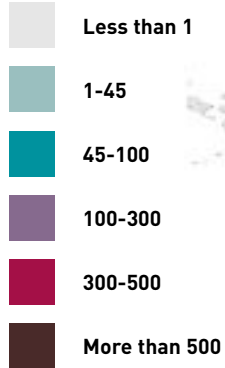
POPULATION DENSITY, 1998
Per square kilometer



Note: At the end of the 20th century the world average population density was 45 people per square kilometer.



Population density per square kilometer



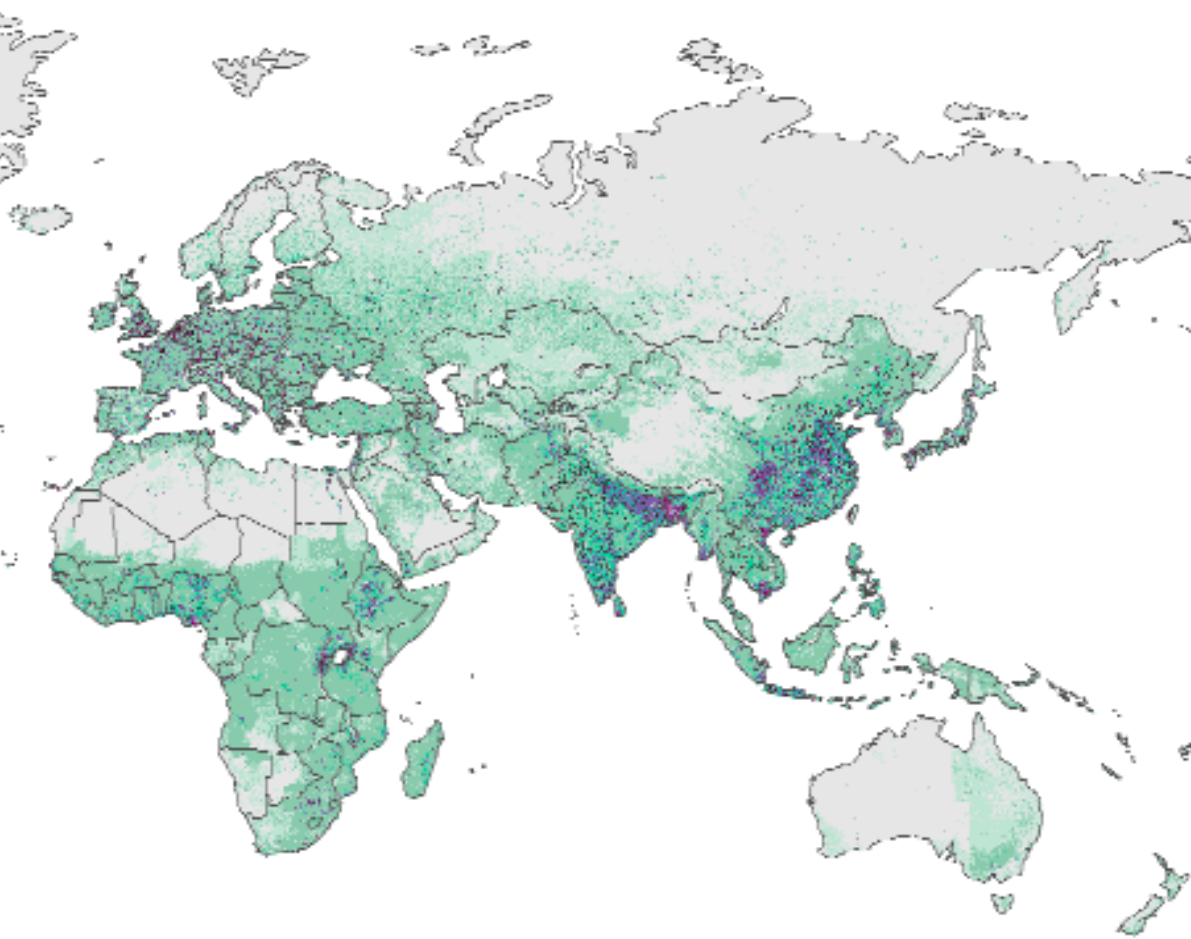
EXPANSION OF THE HUMAN POPULATION
1700



1800



Source: RIVM.



Source: ORNL.

1900



extinction; compelling others to evolve and adapt to our pressures. We have become a force of nature comparable to volcanoes or to cyclical variations in the Earth's orbit.

The scale of our activities depends on our population numbers, our consumption and the resource or pollution impact of our technologies – and all three of these factors are still on the increase. The maps on the previous pages illustrate the increasing spread and density of the human population over the last three centuries.

As we enter the third millennium, the destiny of the planet is in our hands as never before, yet they are inexperienced hands. We are modifying ecosystems and global systems faster than we can understand the changes and prepare responses to them. All the factors in this vast equation affect each other constantly. In a globalized world the elements of human activity interact with each other and with local and planetary environments.

In this unprecedented situation, the need to be fully aware of what we are doing has never been greater. We need to understand the way in which population, consumption and technology create their impact, to review that impact across the most critical fields, and to find ways of using our understanding of the links to inform policy.