EXECUTIVE SUMMARY

WWF's mission is to conserve nature and ecological processes. The *Living Planet Report* seeks to present a quantitative picture of the state of the world's natural environment and the human pressure upon it. Specifically, it presents WWF's Living Planet Index (LPI), a measure of the change in the health of the world's natural ecosystems since 1970, focusing on the Earth's forest, freshwater, and marine biomes as these contain most of the world's biodiversity.

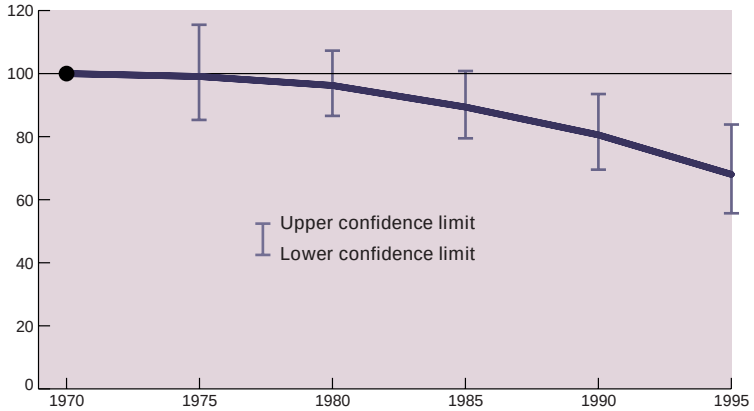
The report also analyses global consumption patterns to calculate Consumption Pressure – a measure of the burden placed on the natural environment by humanity. People put pressure on forest, freshwater, and marine ecosystems through the production and consumption of resources such as grain, fish, wood, and freshwater, and the emission of pollutants such as carbon dioxide (CO_2).

The LPI has declined by about 30 per cent relative to its reference point in 1970, which can be interpreted as meaning that the world has lost nearly a third of its natural wealth in that time. Globally, Consumption Pressure is growing rapidly – at about 5 per cent per year – and is likely to exceed sustainable levels, at least for fish consumption, meat consumption, and CO_2 emissions, if indeed they have not been exceeded already. Consumption Pressure is very unevenly distributed: on average, a consumer in the industrialized world exerts two-and-a-half times as much pressure on the natural environment as his or her counterpart in the developing world.

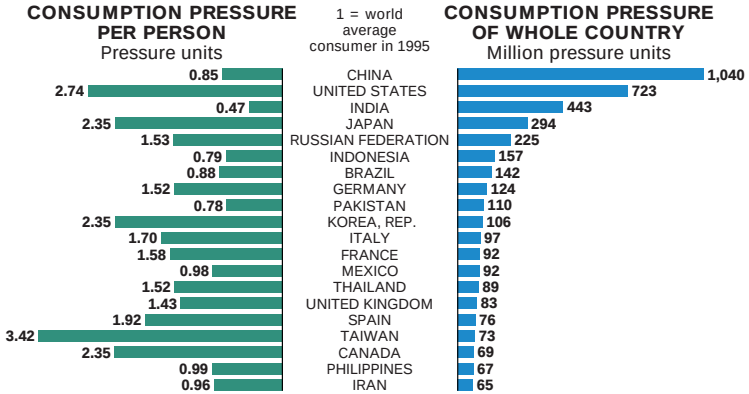
WWF is particularly worried about the significant loss of biodiversity implied by the decline in the LPI and the increasing environmental degradation implied by the growth in Consumption Pressure, and believes that it is important to try to reverse these negative trends. Recommendations on how governments, businesses, and consumers can respond to these trends, included in the sections on consumption in this report, are based on WWF policies and aim to slow down and eventually halt the degradation of the world's natural environments.

The *Living Planet Report* has drawn on recent, consistent, and updateable datasets. WWF and its collaborators, the World Conservation Monitoring Centre and the New Economics Foundation, are committed to tracking environmental trends, and to improving the report's indices.

WWF LIVING PLANET INDEX
A measure of the health of the world's natural ecosystems, 1970–1995



CONSUMPTION PRESSURE
A measure of the burden placed on the environment by people, 1995



THE LIVING PLANET INDEX

THE Living Planet Index (LPI) is a measure of the health of global ecosystems and biodiversity, based on data showing the average change over time in the state of forest, freshwater, and marine ecosystems. It is an attempt to quantify the extent and severity of biodiversity loss.

Change in the area of natural forest cover, calculated as total forest cover less plantations, is used as a measure of the state of forest ecosystems. The state of freshwater and marine ecosystems is indicated by changes in populations of selected freshwater and marine vertebrate species.

Figure 1 shows that the LPI fell by over 30 per cent between 1970 and 1995 and that the average rate of decline between 1990 and 1995 was about 3 per cent per year. This can be interpreted as meaning that 30 per cent of the Earth's natural wealth was lost during this period.

The forest index went down by about 10 per cent from 1970 to 1995. But forest area is not necessarily proportional to forest biodiversity, and the relatively slow decline of the index masks a loss of ecological quality, particularly in temperate forests.

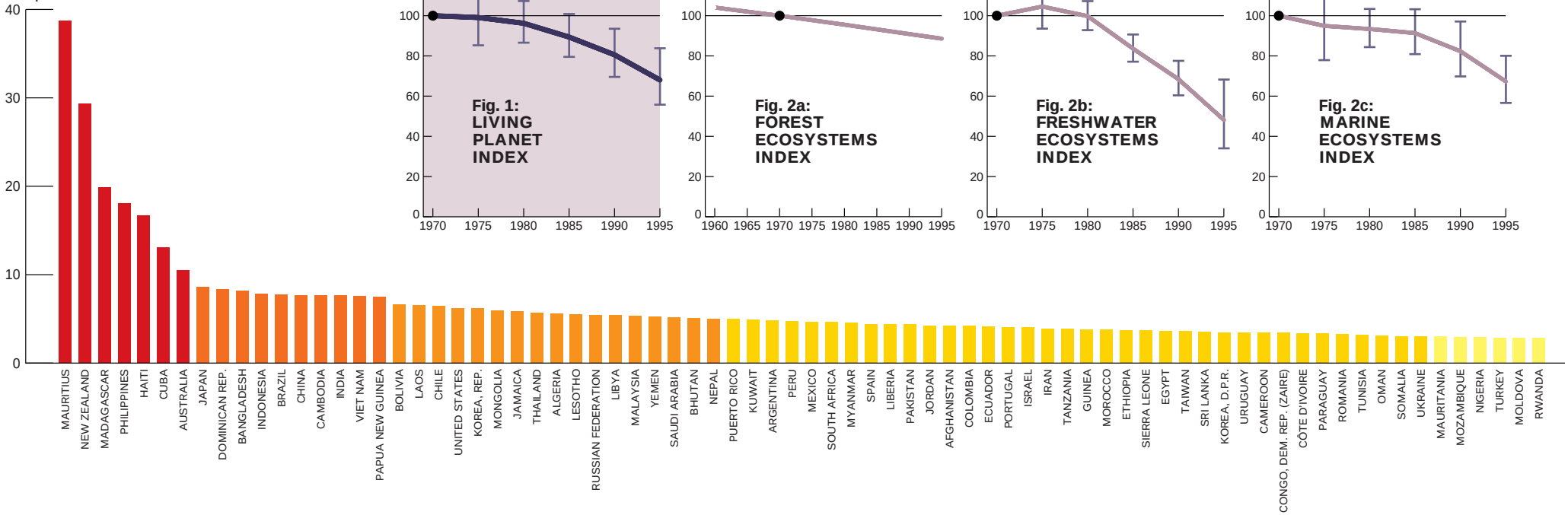
The freshwater ecosystems index dropped by 50 per cent over the same 25-year period. Between 1990 and 1995 the average rate of decline was almost 6 per cent per year.

The marine ecosystems index fell by about 30 per cent, with an average rate of decrease between 1990 and 1995 of nearly 4 per cent per year.

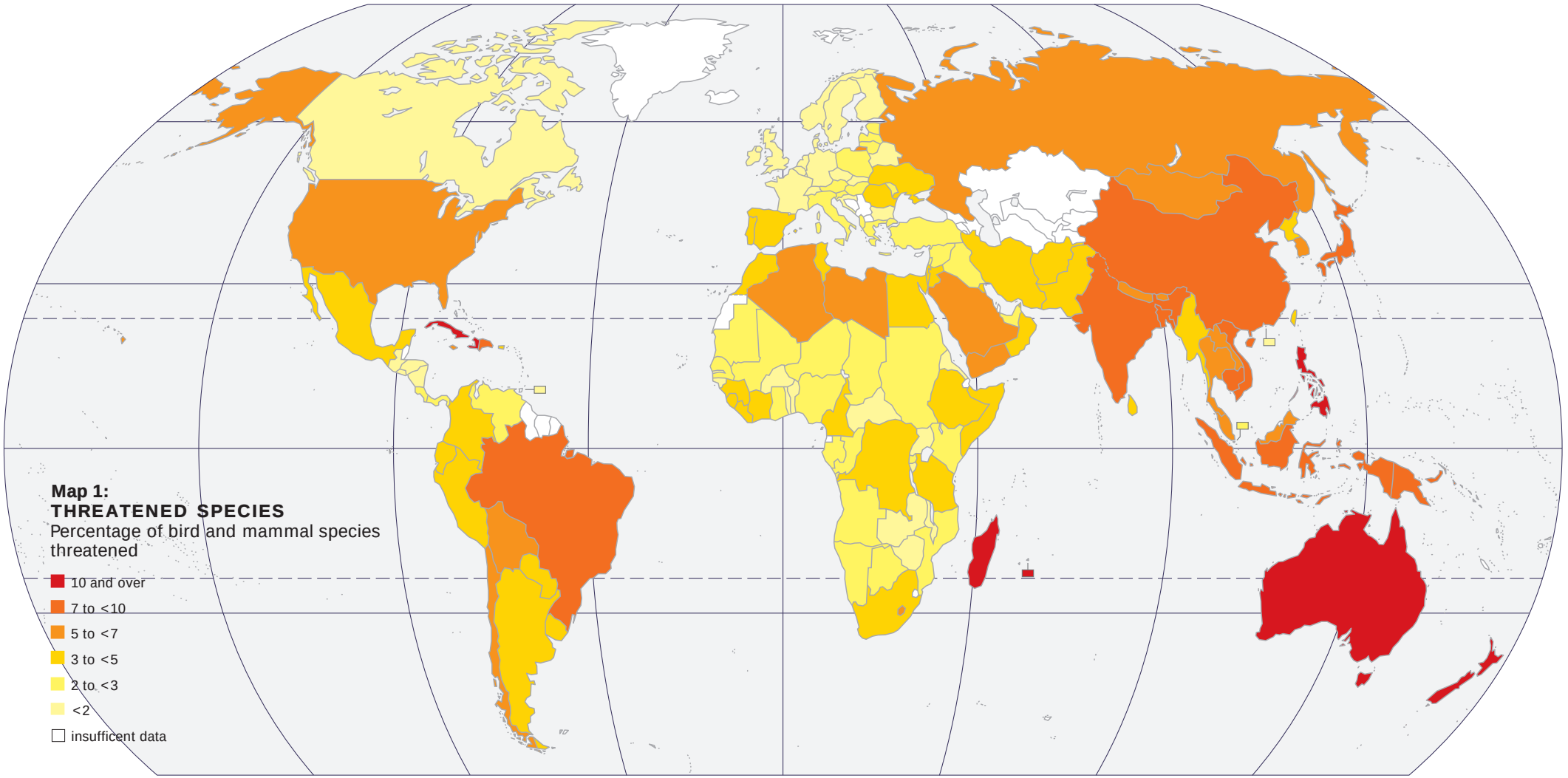
The freshwater and marine indices can be thought of as measuring the change in the population of a typical marine or freshwater species, starting with 100 individuals in 1970. The samples of species used in both indices include all those for which time-series population data could be found – 70 freshwater and 87 marine species. Fish and amphibian species are under-represented compared with birds, mammals, and reptiles, as are tropical species compared with temperate ones. (Further detail of the construction of the indices is discussed on pages 6-11.)

To supplement the LPI's perspective on the state of natural ecosystems at a global level, Map 1 and Figure 3 show a measure of the current state of biodiversity at a national level, based on the percentage of each country's bird and mammal species that are classified as vulnerable, endangered or critically endangered in the *1996 IUCN Red List of Threatened Animals.*

Fig. 3:
THREATENED SPECIES
Percentage of bird and mammal species threatened



WWF LIVING PLANET INDEX
A measure of the health of the world's natural ecosystems, 1970–1995



KENYA
NAMIBIA
ANGOLA
LATVIA
GREECE
LITHUANIA
CHAD
POLAND
GHANA
HUNGARY
SINGAPORE
MALI
LEBANON
IRAQ
NIGER
GABON
VENEZUELA
SYRIA
COSTA RICA
BOTSWANA
SLOVENIA
UNITED ARAB EMIRATES
CONGO
ESTONIA
ITALY
PANAMA
SENEGAL
AUSTRIA
ALBANIA
SUDAN
FINLAND
FRANCE
GERMANY
UGANDA
BULGARIA
MALAWI
BELARUS
ZAMBIA
BURUNDI
CROATIA
ZIMBABWE
NORWAY
CANADA
SWEDEN
CZECH REP.
SLOVAKIA
GUINEA-BISSAU
BENIN
TOGO
HONDURAS
BELGIUM/LUXEMBOURG
BURKINA FASO
NETHERLANDS
CENTRAL AFRICAN REP.
NICARAGUA
GUATEMALA
SWITZERLAND
ERITREA
DENMARK
TRINIDAD AND TOBAGO
GAMBIA, THE
UNITED KINGDOM
IRELAND
EL SALVADOR
HONG KONG
ARMENIA
AZERBAIJAN
BOSNIA AND HERZEGOVINA
GEORGIA
KAZAKHSTAN
KYRGYZSTAN
MACEDONIA
TAJIKISTAN
TURKMENISTAN
UZBEKISTAN
YUGOSLAVIA

CONSUMPTION PRESSURE

CONSUMPTION Pressure is a measure of national and individual pressures on natural ecosystems, based on resource consumption and pollution data from 152 countries in 1995. It is an attempt to quantify the burden placed on the global environment by the inhabitants of these countries.

There are six components to Consumption Pressure: grain, marine fish, and wood consumption; freshwater withdrawals; carbon dioxide emissions, as a proxy for fossil fuel consumption; and cement consumption, as a proxy for land consumption. Importantly, consistent, recent, and updateable information is available for each of these components for most countries. The production and consumption of these resources are closely related to the degradation of the planet's natural ecosystems.

For each of the six components, a country's total consumption – calculated as its production of the resource in question plus imports minus exports – is divided by its population to provide the average consumption per person for that country. The results of these calculations are shown on pages 12-23. Figures 4 and 5 show total and per person Consumption Pressure, based on all six components combined, for selected countries and regions. Figure 6 shows Consumption Pressure per person for all 152 countries and Map 2 shows the geographical distribution of Consumption Pressure globally – the distribution of Consumption Pressure within countries is based only on the distribution of its population.

Each of the six components has been given equal weighting in calculating Consumption Pressure. It would, of course, be possible to obtain different results by applying different weightings to different components, but the method used here is the simplest. More details on the calculations are given on page 24.

Fig. 4:
CONSUMPTION PRESSURE
A measure of the burden placed on the environment by people, 1995

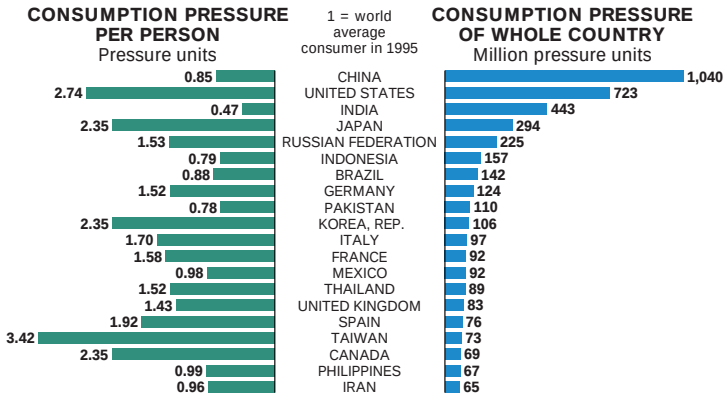


Fig. 5:
CONSUMPTION PRESSURE BY REGION
Pressure units per person per year, 1995
(1 = world average consumer in 1995)

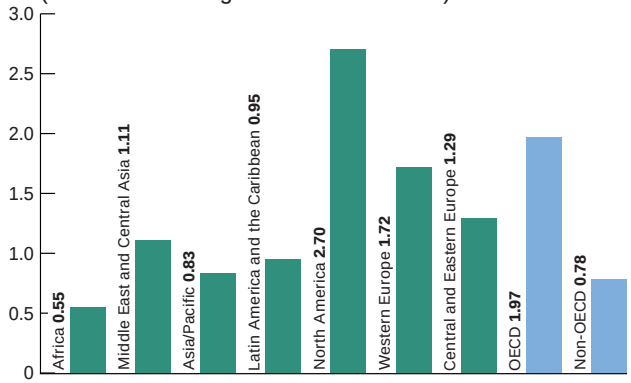
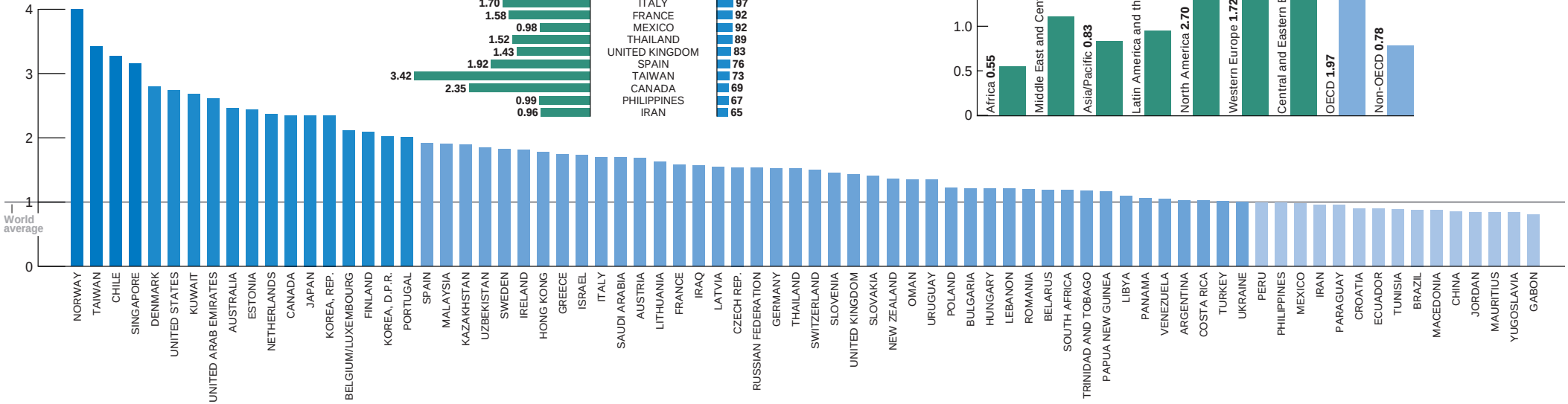
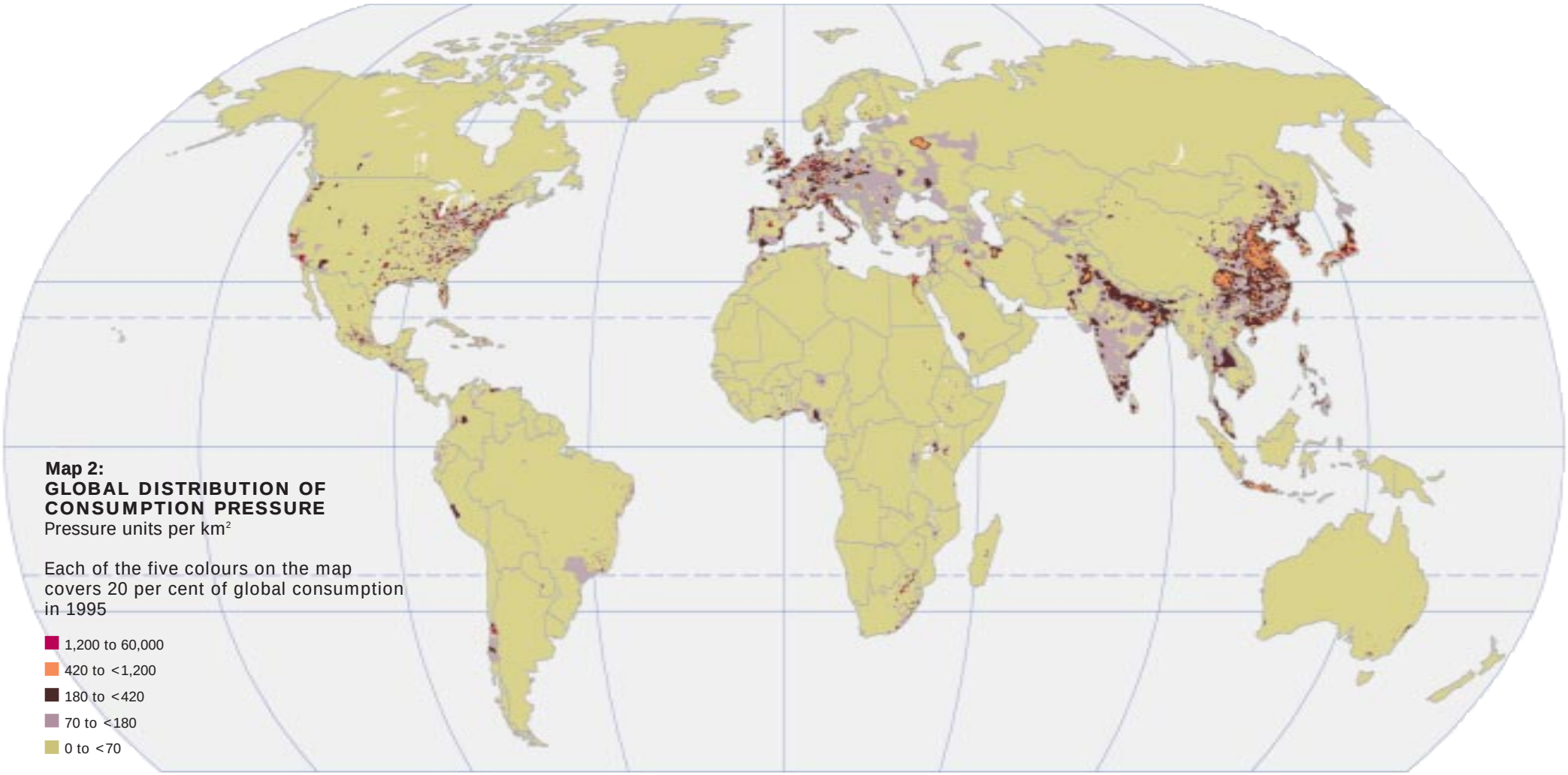


Fig. 6:
CONSUMPTION PRESSURE BY COUNTRY
Pressure units per person per year, 1995

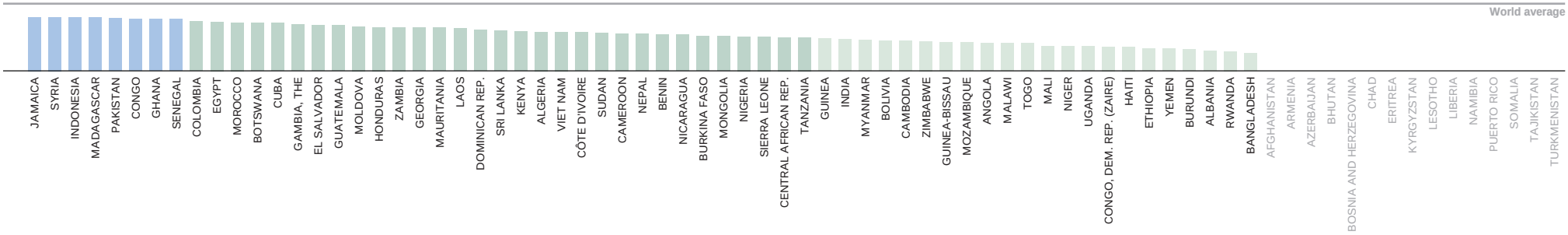




Map 2:
GLOBAL DISTRIBUTION OF CONSUMPTION PRESSURE
Pressure units per km²

Each of the five colours on the map covers 20 per cent of global consumption in 1995

- 1,200 to 60,000
- 420 to <1,200
- 180 to <420
- 70 to <180
- 0 to <70



FOREST ECOSYSTEMS

THE world's forest cover, not counting plantations, decreased by 13 per cent between 1960 and 1990, from 37 million km² to 32 million km². This is equivalent to an average annual loss of about 160,000km² – an area half the size of Norway – or 0.5 per cent per year. Figure 7 shows that most of this has occurred in tropical regions. For example, satellite images of the Brazilian Amazon show that forest cover has been lost at an average annual rate of about 19,000km² over the last 20 years: the total accumulated deforestation up to 1996 was equivalent to the loss of an area slightly larger than Spain out of an original forest area about the size of Western Europe. Although temperate and boreal forest area has remained more or less constant since the 1960s, the flat lines on the graph conceal a decline in quality, as much of it is secondary or semi-natural rather than old-growth forest.

In addition, Table 2 (page 36) shows that much current forest is fragmented into areas too small to support the full complement of species that would live in an undisturbed natural forest. Plantations, which make up large tracts of current forest area, neither support the same levels of biodiversity nor perform the same ecological functions as old-growth forest.

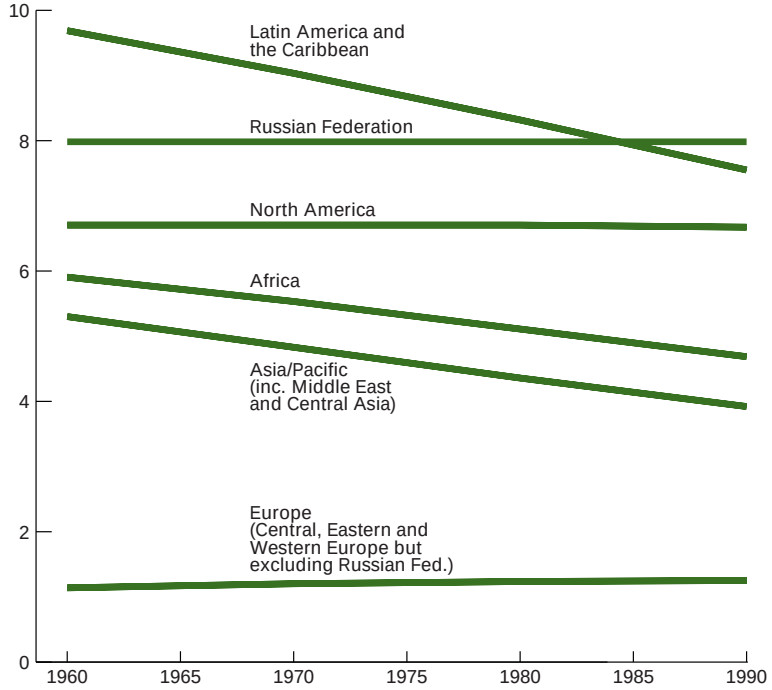
Original forest cover

Half of the world's original forest has gone. Original forest cover is an estimate of the likely area of forest under current climatic conditions without human interference. This would be close to the maximal area of forest some time after the last ice age, around 6,000-8,000 years ago. Since then forests have been cleared to make room for agriculture and other human activities.

It is apparent from Figure 9 and Map 3 that, historically, temperate forests have fared at least as badly as tropical forests which are currently disappearing fastest. The percentages of four forest types lost are: over 60 per cent of temperate broadleaf and mixed forest; around 30 per cent of needleleaf forest; about 45 per cent of tropical moist forest; and approximately 70 per cent of tropical dry forest.

The greatest reduction has been in Asia, where about 70 per cent of the original forest cover has gone. Today, largely intact tracts of undisturbed forest remain only in the Russian Federation, Canada, and the Amazon and Congo basins.

Fig. 7:
NATURAL FOREST COVER
Million square kilometres, 1960–1990



ORIGINAL AND CURRENT FOREST COVER:
Fig. 8: BY REGION
Million square kilometres

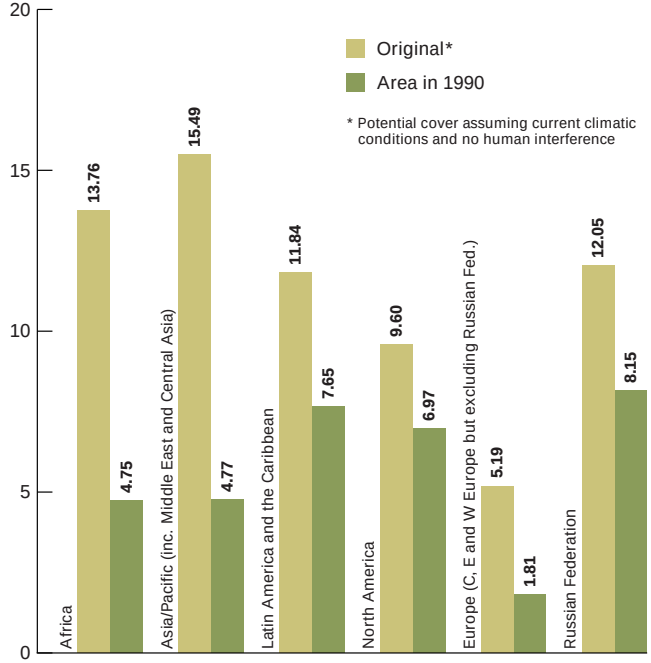
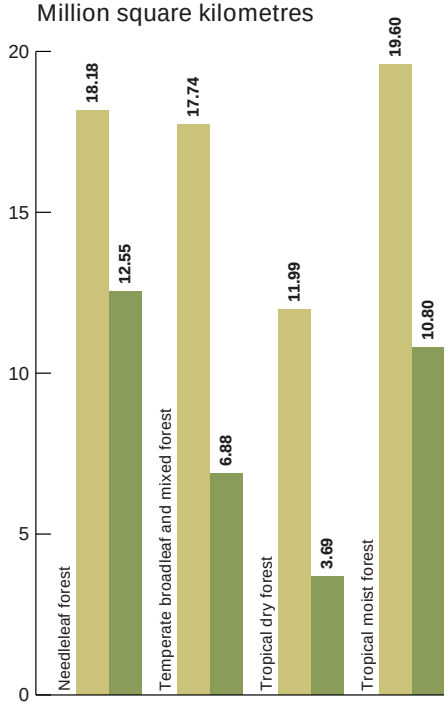
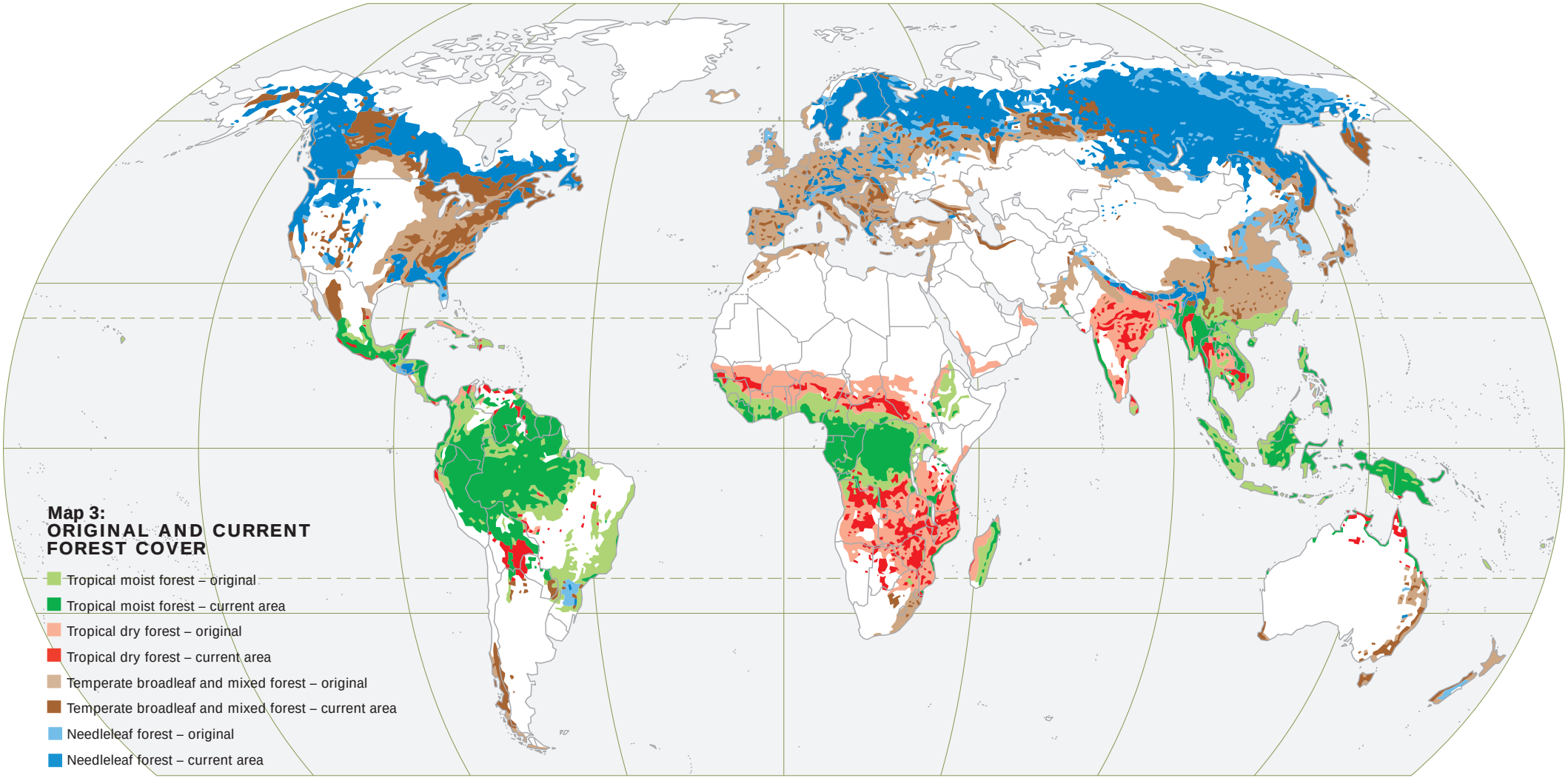


Fig. 9: BY TYPE
Million square kilometres




Map 3:
ORIGINAL AND CURRENT
FOREST COVER
Tropical moist forest – original
Tropical moist forest – current area
Tropical dry forest – original
Tropical dry forest – current area
Temperate broadleaf and mixed forest – original
Temperate broadleaf and mixed forest – current area
Needleleaf forest – original
Needleleaf forest – current area

FRESHWATER ECOSYSTEMS

UNLIKE changes in forest ecosystems, it is difficult to indicate biological trends in freshwater ecosystems such as lakes, rivers, and wetlands by measuring changes in area. Instead Figure 10 shows changes in populations of selected freshwater species as a measure of the health of these ecosystems.

Data on trends in the populations of 227 freshwater fish, reptile, bird, and mammal species were analysed to estimate the percentage that were either declining, stable, or increasing during the 1970s, the 1980s, and the 1990s. The results show that, during this period, about 50-60 per cent were in decline, while 35-40 per cent remained stable, and only 5-10 per cent increased.

Clearly there are limitations to this analysis. The sample includes every vertebrate species for which information on population trends over the last three decades could be found. While this sample covers a wide taxonomic and geographic range of species, fish and amphibians are under-represented – amphibians are believed by biologists to be declining more rapidly than perhaps any other freshwater group – as are species from tropical countries.

Freshwater ecosystems index

For 70 out of the 227 species it was possible to estimate populations at two or more points in time. These time-series data were averaged to construct an index of the changes in freshwater ecosystems (Figure 2b). This index represents the changes from 1970 to 1995 in a hypothetical population that is typical of the sample as a whole. Map 4 shows the changes in populations of selected species from the freshwater index and their approximate location in the world. The 70 species are listed on page 25.

Freshwater lakes

Figure 11 compares two global surveys of 93 freshwater lakes to give a qualitative indication of the overall change in their ecological state between the 1960s and the 1980s or 1990s. The comparison focused particularly on threats and impacts from overfishing, coastal development, siltation, and pollution. Each lake was classified according to whether its condition had become better or worse, or was unchanged, and the percentage of the lakes in each category was compared for each region.

Fig. 10:
FRESHWATER SPECIES POPULATION TRENDS
Percentage of species worldwide, 1970–present

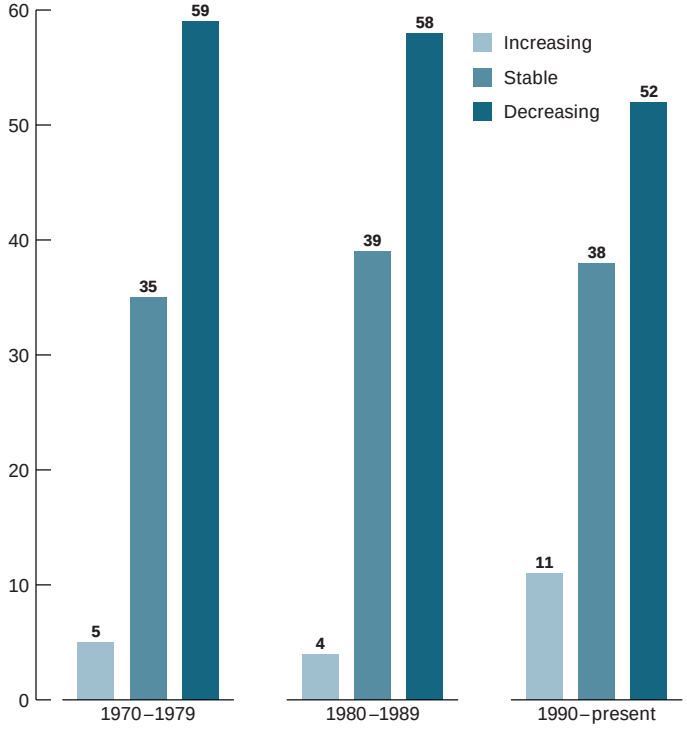


Fig. 2b:
FRESHWATER ECOSYSTEMS INDEX
1970–1995

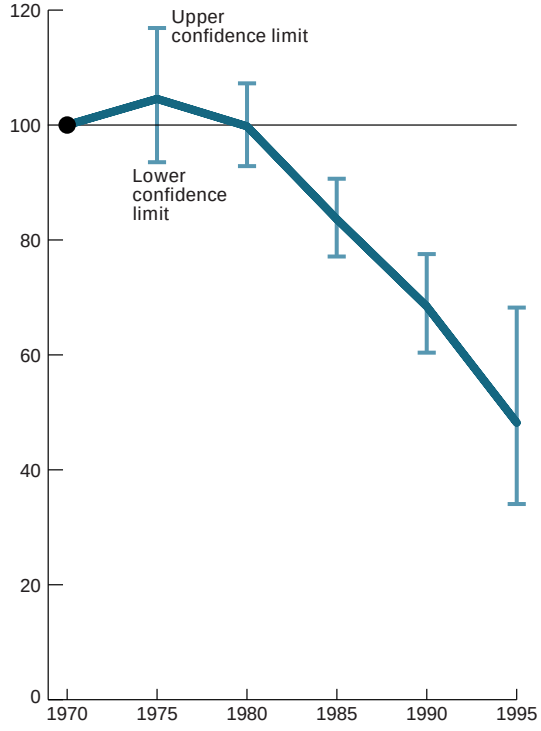
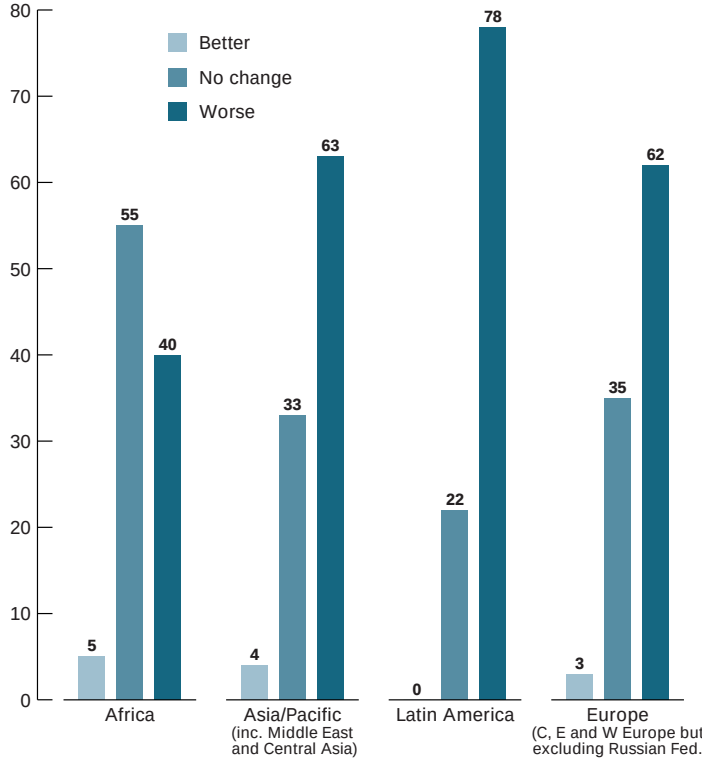
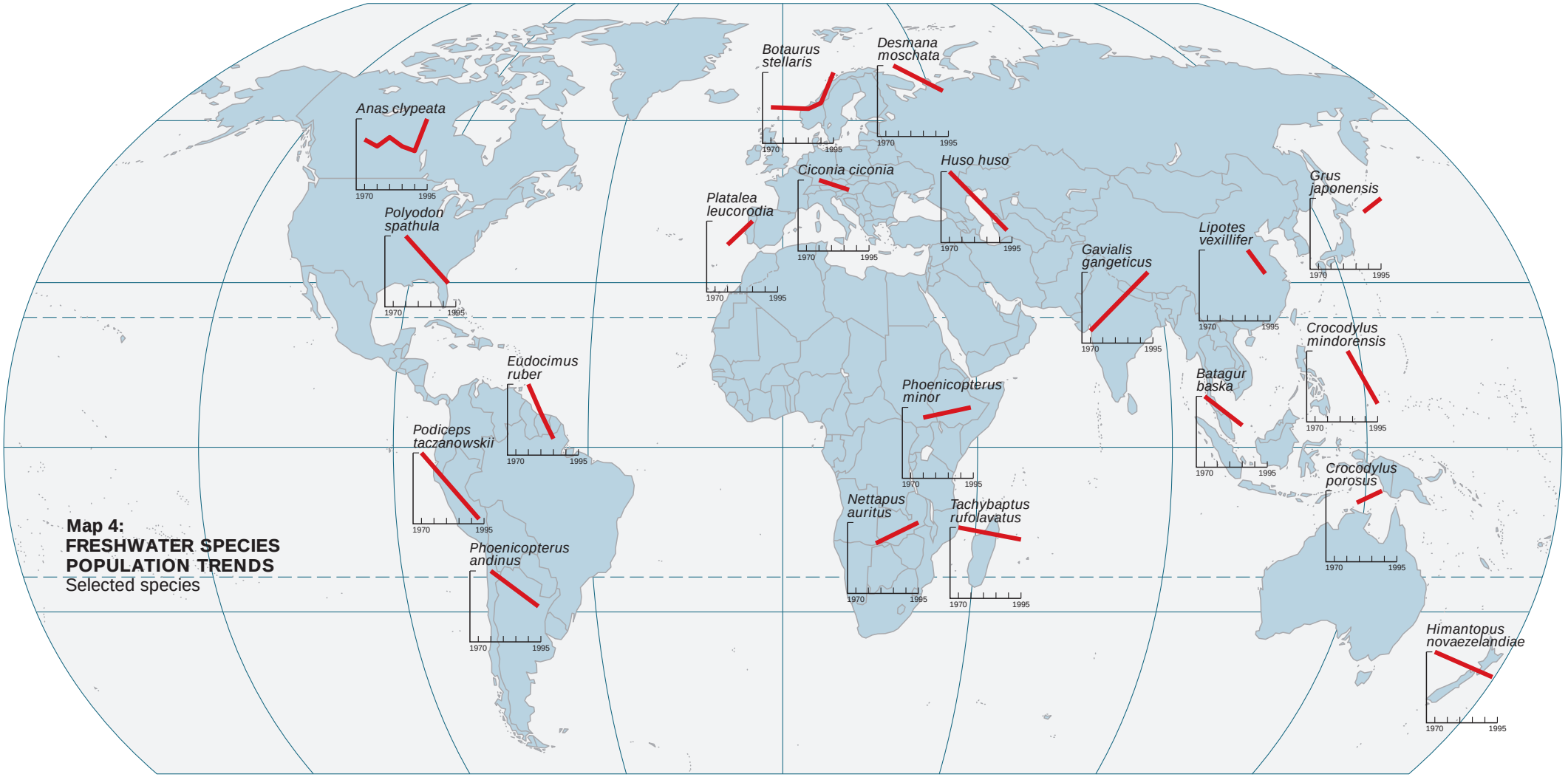


Fig. 11:
FRESHWATER LAKES: CHANGE IN CONDITION
Percentage of lakes, 1960s–present





Map 4:
FRESHWATER SPECIES POPULATION TRENDS
Selected species

Anas clypeata	**Northern shoveler**
Batagur baska	**River terrapin**
Botaurus stellaris	**Eurasian bittern**
Ciconia ciconia	**White stork**
Crocodylus mindorensis	**Philippines crocodile**
Crocodylus porosus	**Estuarine crocodile**
Desmana moschata	**Russian desman**
Eudocimus ruber	**Scarlet ibis**
Gavialis gangeticus	**Gharial**
Grus japonensis	**Red-crowned crane**
Himantopus novaezelandiae	**Black stilt**
Huso huso	**Beluga (sturgeon)**
Lipotes vexillifer	**Baiji (river dolphin)**
Nettapus auritus	**African pygmy goose**
Phoenicopterus andinus	**Andean flamingo**
Phoenicopterus minor	**Lesser flamingo**
Platalea leucorodia	**White spoonbill**
Podiceps taczanowskii	**Junín grebe**
Polyodon spathula	**Paddlefish**
Tachybaptus rufolavatus	**Alaotra grebe**

MARINE ECOSYSTEMS

FIGURE 12 shows the changes in populations of marine vertebrate species as a measure of the health of the oceans and coasts, in the same way that freshwater species were used as indicators of freshwater ecosystems. Data on the populations of 116 species were analysed to estimate the percentages that were either declining, stable, or increasing in each decade since 1970. The results show that, over this period, about 40 per cent of marine populations have declined, about 25 per cent have maintained stable populations, and 35 per cent have increased.

The sample includes every marine vertebrate species for which information on population trends over the last few decades could be found. Although this covers a wide geographic and taxonomic range, some bias remains because there is more information available on birds and mammals than fishes relative to their numbers in the world's oceans. Similarly, there is more information on temperate species than on tropical ones.

Marine ecosystems index

For 87 out of the 116 species it was possible to estimate population sizes at more than one point in time. As with the freshwater species populations, these data were averaged to produce the marine ecosystems index shown in Figure 2c. The index represents the change from 1970 to 1995 of a hypothetical population that is typical of the sample. Map 5 shows the changes in population of selected species from the marine ecosystems index. The list of 87 species can be seen on page 26.

Fig. 12:
MARINE SPECIES POPULATION TRENDS
Percentage of vertebrate species worldwide, 1970–present

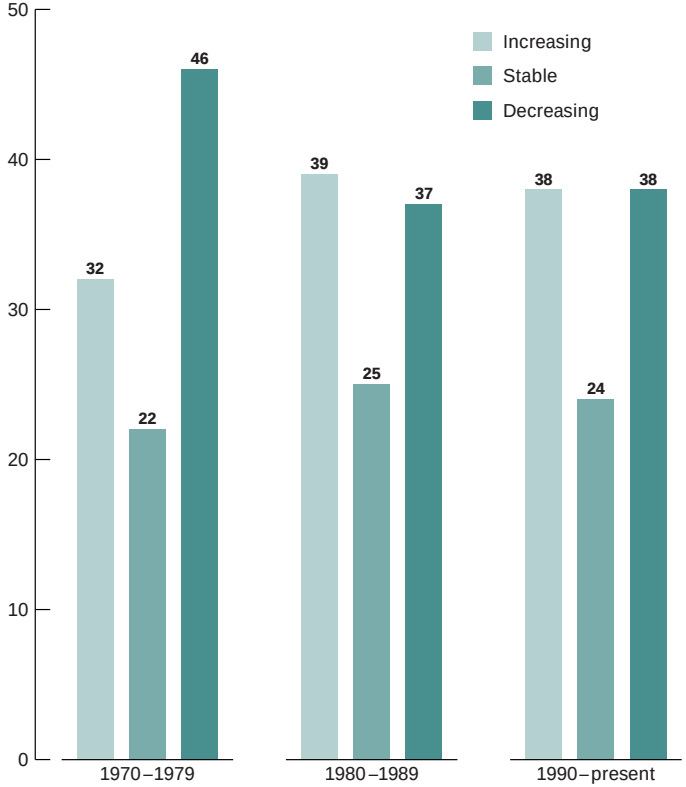
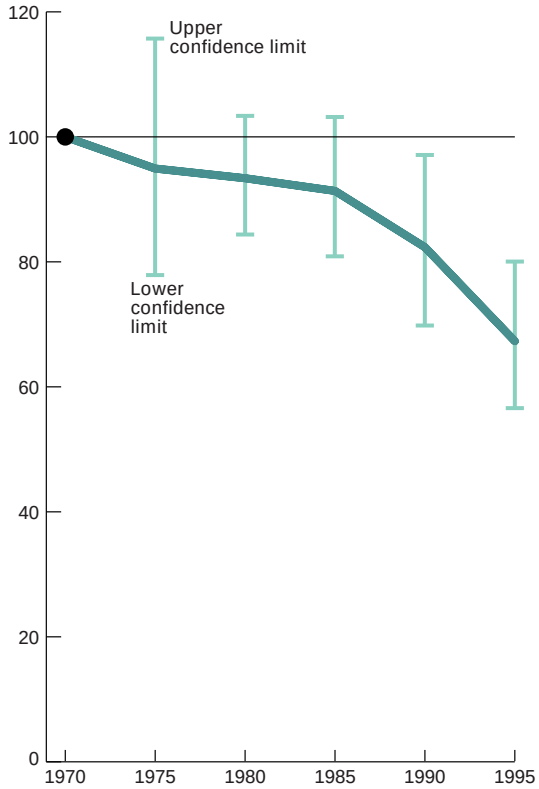
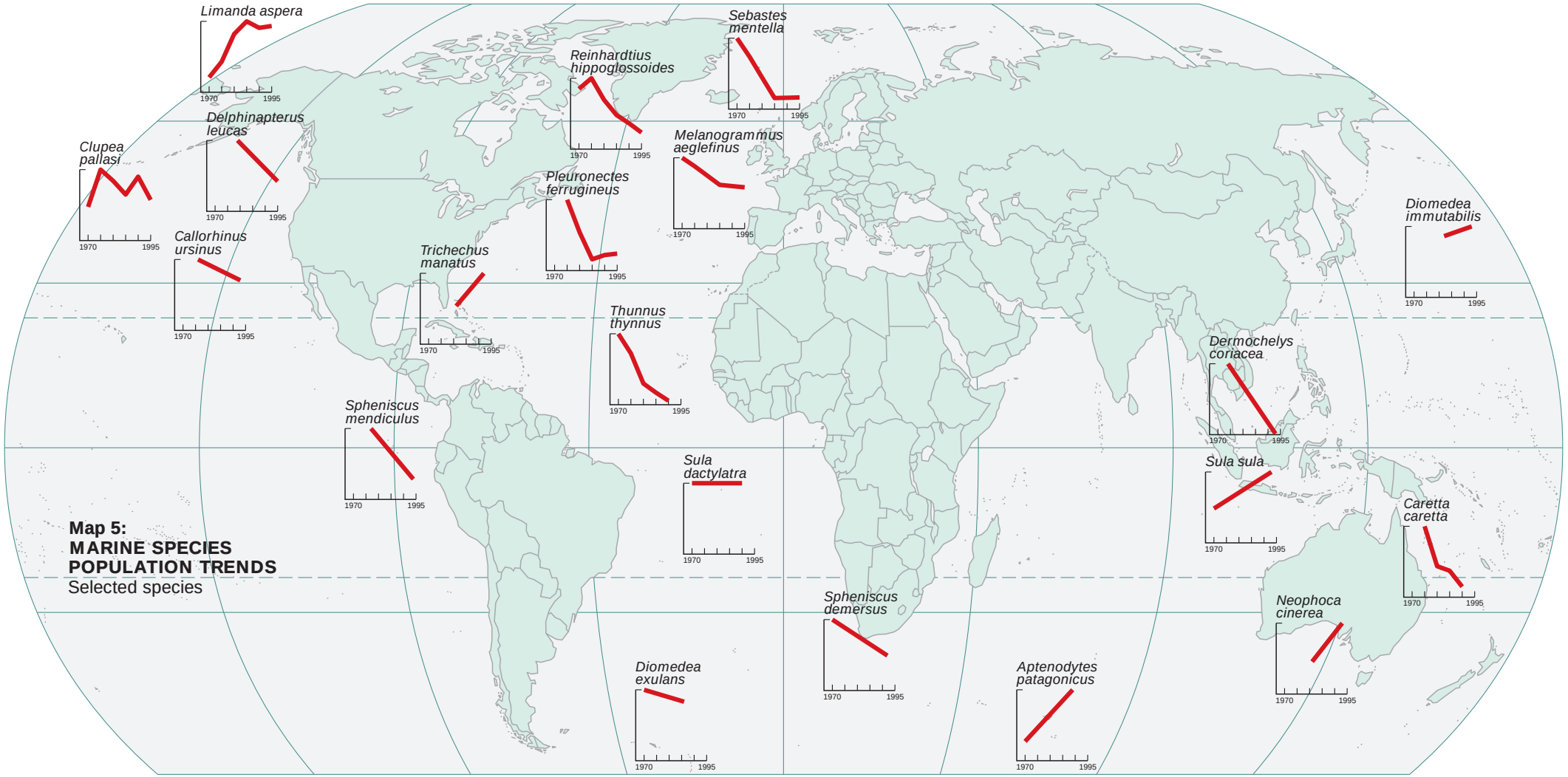


Fig. 2c:
MARINE ECOSYSTEMS INDEX
1970–1995





Map 5:
MARINE SPECIES POPULATION TRENDS
Selected species

Aptenodytes patagonicus	**King penguin**
Callorhinus ursinus	**Northern fur seal**
Caretta caretta	**Loggerhead turtle**
Clupea pallasi	**Pacific herring**
Delphinapterus leucas	**Beluga whale**
Dermochelys coriacea	**Leatherback turtle**
Diomedea exulans	**Wandering albatross**
Diomedea immutabilis	**Laysan albatross**
Limanda aspera	**Yellowfin sole**
Melanogrammus aeglefinus	**Haddock**
Neophoca cinerea	**Australian sea lion**
Pleuronectes ferrugineus	**Yellowtail flounder**
Reinhardtius hippoglossoides	**Greenland halibut**
Sebastes mentella	**Deepwater redfish**
Spheniscus demersus	**Jackass penguin**
Spheniscus mendiculus	**Galapagos penguin**
Sula dactylatra	**Masked booby**
Sula sula	**Red-footed booby**
Thunnus thynnus	**Bluefin tuna**
Trichechus manatus	**Caribbean manatee**

GRAIN CONSUMPTION

GRAINS, such as wheat and rice, are the most important crops for feeding the world's population. About a third of the global grain harvest is fed to animals to produce meat and dairy products, and the world's livestock population is expanding at least as fast as the human population. As people become more affluent and move higher up the food chain, the growing demand for meat, dairy products, and eggs exerts further pressure to increase crop production. Clearing forests to create cropland or pasture is responsible for most of the deforestation in the tropics.

Figure 13 shows that world grain production has more than doubled since 1960. However, the increase per person has flattened since the 1980s. Production is no longer growing faster than the world's population as water resources are reaching their limits and croplands are lost to urban development and soil erosion. Assuming that global grain production can be maintained and distributed evenly, the current harvest of approximately 2 billion tonnes a year would supply about 330kg per person per year, sufficient to provide a healthy diet for the current world population, but not if everyone were to adopt the consumption patterns of the industrialized countries.

Figures 14 and 15 and Map 6 show the consumption of grain-equivalent in each country and region, calculated as the consumption of grain consumed directly by humans, plus the amount consumed indirectly as meat, plus seed, processing losses, and waste grain.

WWF recommendations to reduce pressure on ecosystems from grain and meat consumption

- Protect soil from erosion and degradation caused by overgrazing and bad agricultural practices.
- Preserve existing croplands for agriculture, rather than urban and industrial development, road building, or non-essential crops such as tobacco.
- Increase water-use efficiency of irrigated cropland to cut water losses and expand the area under irrigation, especially in Africa and Latin America.
- Reduce dependence on pesticides and increase the use of biological control and pest-resistant varieties.
- Cut meat and dairy product consumption, especially in Europe and North America.

Fig. 13:
PRODUCTION BY MAJOR COUNTRY/REGION
Million tonnes per year, 1961–1995

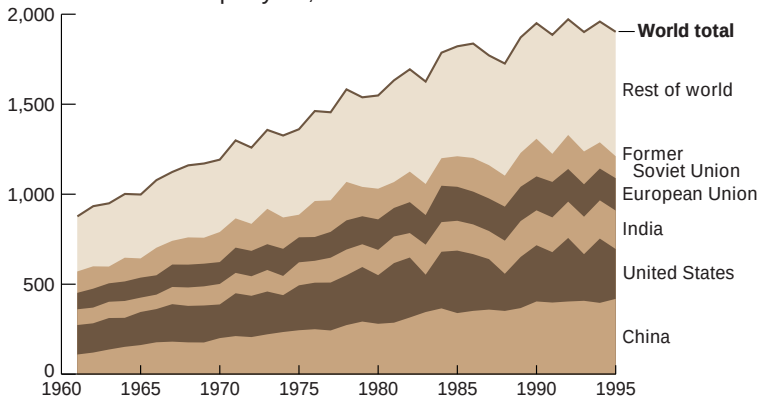


Fig. 14:
CONSUMPTION BY REGION
Kilograms per person per year, 1995 data

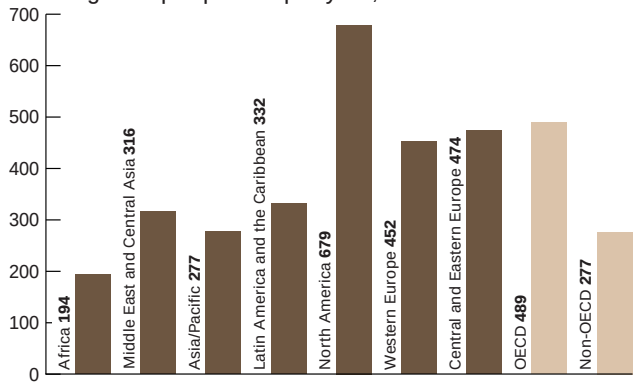
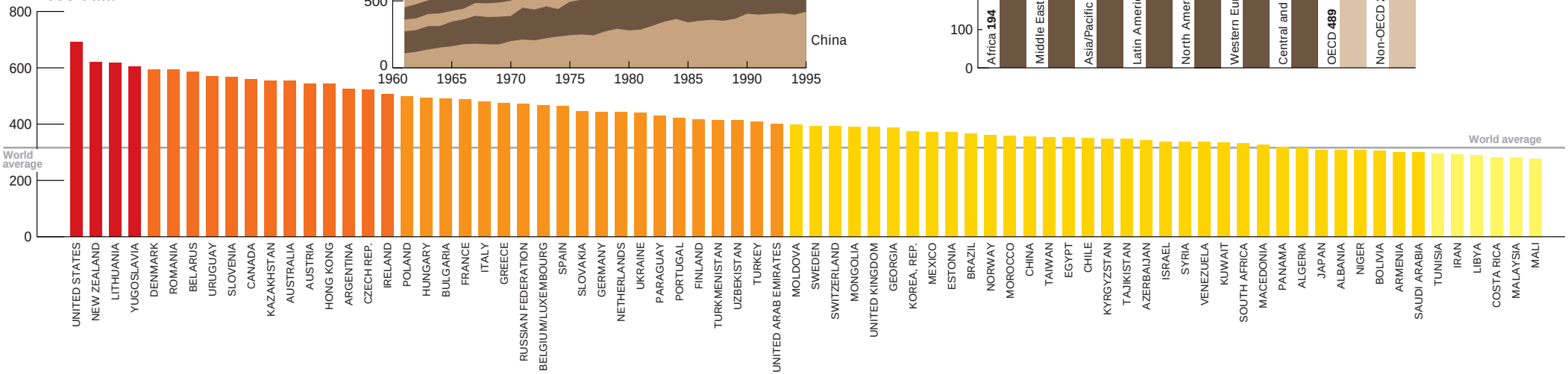
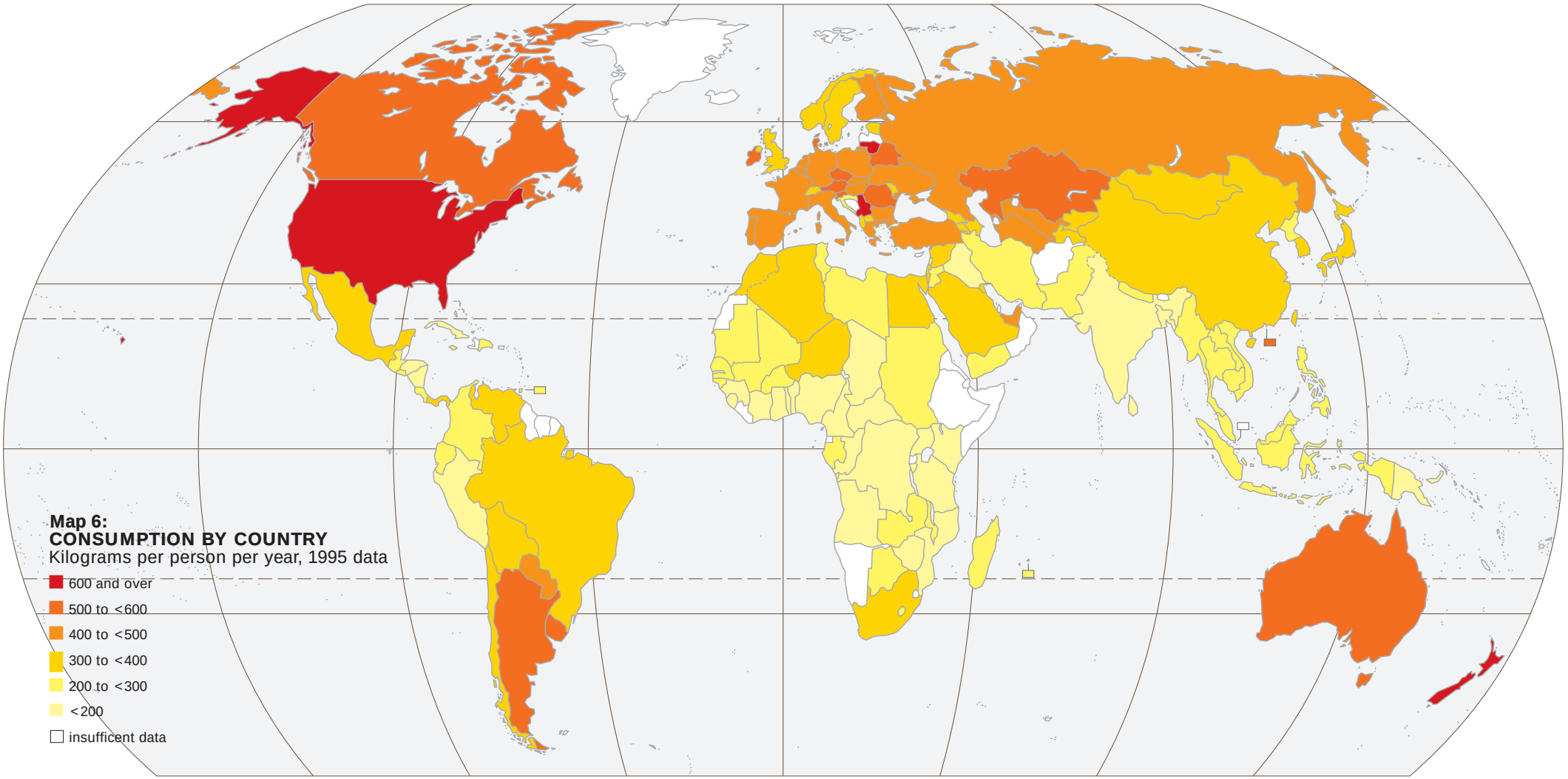
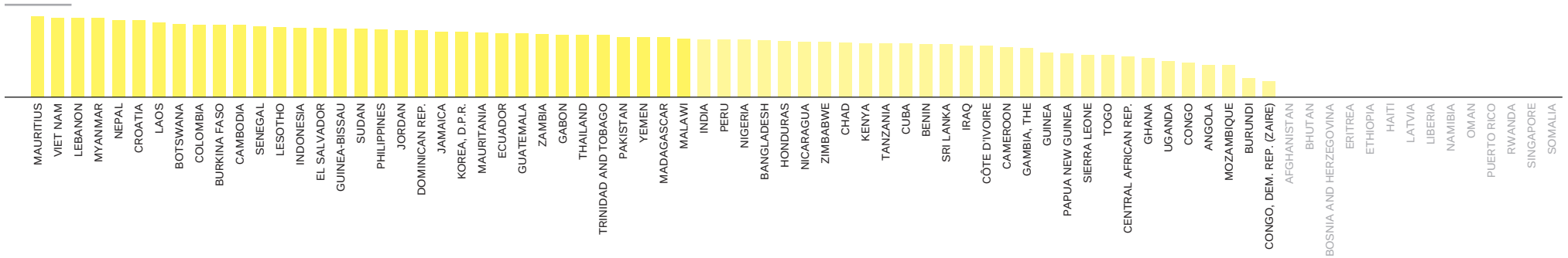


Fig. 15:
CONSUMPTION BY COUNTRY
Kilograms per person per year, 1995 data




Map 6:
CONSUMPTION BY COUNTRY
Kilograms per person per year, 1995 data
600 and over
500 to <600
400 to <500
300 to <400
200 to <300
<200
insufficent data


MAURITIUS
VIET NAM
LEBANON
MYANMAR
NEPAL
CROATIA
LAOS
BOTSWANA
COLOMBIA
BURKINA FASO
CAMBODIA
SENEGAL
LESOTHO
INDONESIA
EL SALVADOR
GUINEA-BISSAU
SUDAN
PHILIPPINES
JORDAN
DOMINICAN REP.
JAMAICA
KOREA, D.P.R.
MAURITANIA
ECUADOR
GUATEMALA
ZAMBIA
GABON
THAILAND
TRINIDAD AND TOBAGO
PAKISTAN
YEMEN
MADAGASCAR
MALAWI
INDIA
PERU
NIGERIA
BANGLADESH
HONDURAS
NICARAGUA
ZIMBABWE
CHAD
KENYA
TANZANIA
CUBA
BENIN
SRI LANKA
IRAQ
CÔTE D'IVOIRE
CAMEROON
GAMBIA, THE
GUINEA
PAPUA NEW GUINEA
SIERRA LEONE
TOGO
CENTRAL AFRICAN REP.
GHANA
UGANDA
CONGO
ANGOLA
MOZAMBIQUE
BURUNDI
CONGO, DEM. REP. (ZAIRE)
AFGHANISTAN
BHUTAN
BOSNIA AND HERZEGOVINA
ERITREA
ETHIOPIA
HAITI
LATVIA
LIBERIA
NAMIBIA
OMAN
PUERTO RICO
RWANDA
SINGAPORE
SOMALIA