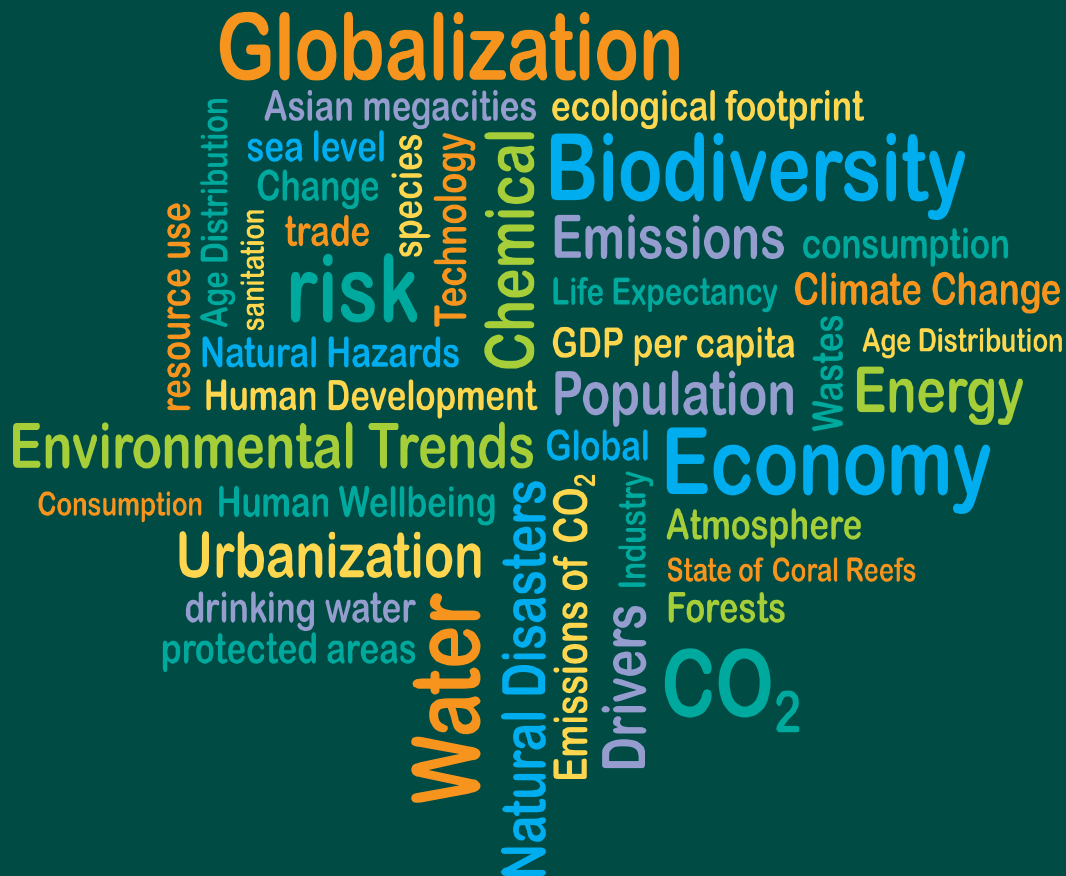


KEEPING TRACK

of our changing environment
in Asia and the Pacific



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KEEPING TRACK OF OUR CHANGING ENVIRONMENT IN ASIA AND THE PACIFIC

FROM RIO TO RIO +20 (1992-2012)



FOREWORD

Over the last quarter of a century, Asia Pacific as a region has enjoyed rapid economic growth, which has dramatically reduced the number of poor people and improved human development. However, there is a large unfinished agenda. While the region is less poor, it is also more unequal and is still home to half of the world's poor. There is social and economic inequality between subregions, between countries and within countries, between the rural areas and cities and within the cities where over 1.6 billion people now live.

The rapid economic growth has also often come at the expense of environmental degradation that not only undermines the long term sustainability of growth, but also has an immediate impact on people, most notably through air pollution, water contamination and scarcity, chemicals in soils and food and the significant health impact that these have. And to compound this, climate change is expected to magnify existing vulnerabilities throughout the region, especially in the small islands of the Pacific and the low lying coastal areas and deltas.

This is the underlying message from this UNEP report: *Keeping Track of Our Changing Environment in Asia and the Pacific*, a unique scientific and indicator-based assessment report produced by UNEP, with contributions from experts and UNEP National Focal Points from the region. The report analyzes emerging and persistent development and environmental challenges in the region. The report also traces the patterns of economic development and resource use and degradation since 1992 when leaders from countries around the globe made their commitment to sustainable development at the UN Conference on Environment and Development in Rio de Janeiro, Brazil.

What this report clearly demonstrates is that tackling resource use and efficiency, promoting sustainable energy production and access, halting depletion of natural capital, and eliminating air and water contamination are not simply environmental concerns, but a vital part of the region's aspirations for inclusive growth. Confronting these challenges with the same intensity as the region tackled poverty over the past two decades is the only way to ensure sustained and sustainable growth.

I hope the findings of the report provide a valuable benchmark for countries in the region which are in the process of developing the post-2015 global development agenda and sustainable development goals. Bringing about the transformation in finance, policy and action for an inclusive green economy is our biggest collective challenge in the next stage of our development in Asia and the Pacific. UNEP is committed to be a partner in the process.

Kaveh Zahedi

Regional Director and Representative
for Asia and the Pacific
United Nations Environment Programme

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INTRODUCTION AND SCOPE

Keeping Track of Our Changing Environment in Asia and the Pacific was conceived to illustrate how the region has changed in two decades since decision-makers met at the United Nations Conference on Environment and Development in Rio De Janeiro in 1992. To convey this information in a compelling and succinct manner, environmental and related socio-economic trends are charted and presented using globally, regionally and nationally-aggregated data sets collected by international agencies, research bodies and other official entities. This regional publication was produced following the structure of the global **Keeping Track of Our Changing Environment report**.

In this regional report, major economic, environmental, social and technological trends are shown through numerically-based graphs, with their upward, downward or stable trend lines as dictated by the data. While most of these trends speak for themselves, short explanations of the phenomena observed are also provided for further elucidation. Also included are a number of illustrative “before and after” satellite images, primarily covering the same time period of 1992-2012 and showing environmental changes at the local level. In some cases, impacts are ongoing.

SCOPE & METHODOLOGY

Most of the time-series data were collected directly from countries and aggregated to national, regional and global levels by authoritative international agencies. The indicators presented here are based on the best and most comprehensive data available to date. Three main criteria were used to select the indicators employed in this publication. First, an approximately 20-year temporal data record on which the trend charts could be based was required, so as to accurately portray the time period in question. In a few cases, a correspondingly shorter time period was used to provide at least a partial picture to date (e.g. carbon trading). Second, the data on which the charts

are based had to be global and regional in coverage – that is, covering all or at least most countries in Asia and the Pacific so as to represent the entire region and not only selected countries. Third, the data had to be clearly sourced from authoritative and reliable institutions with extensive experience in the thematic areas treated in each case.

To ensure reliability, indicator charts are only presented for areas where all three requirements are met. For thematic areas where one or another of the criteria was not met (i.e. freshwater, chemicals and waste, land degradation and biodiversity indicators) any analysis might not be reliable and so trends are not provided.

The implications of any shortcomings in the data are clear. To promote evidence-based environmental policies and actions, the underlying data needed to support sound decision-making must be part of the equation and be of proven scientific quality. Today, there are several reasons why the quality of international statistics varies greatly. First, statistics may not be available at the national level; second, the statistics that are collected may be of poor quality or outdated; and third, the comparability of statistics over time and between countries inherently presents challenges. These deficiencies and issues demonstrate the need for a comprehensive data and information system to optimally support the vast array of related policy, scientific, technical, methodological and practical issues.

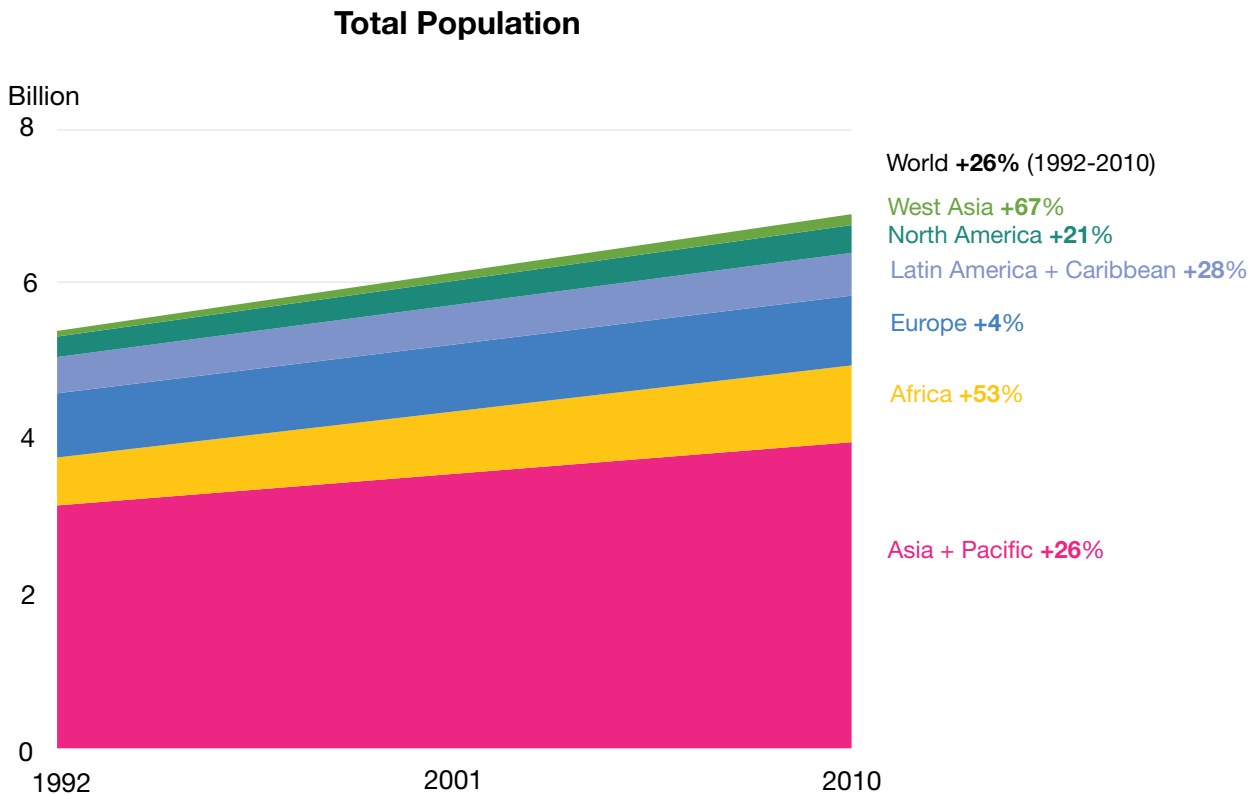
Thus, a comprehensive capability is needed at the global scale to pull together and analyze the wealth of data collections that are available, and to enhance data collection for areas where information may be lacking. Within these limitations, it is hoped that this publication provides a clear and reasonably comprehensive twenty-year story on the state and trends in environment and development in Asia and the Pacific since 1992.

POPULATION AND HUMAN DEVELOPMENT



UN Photo/Kibae Park (June 2010)

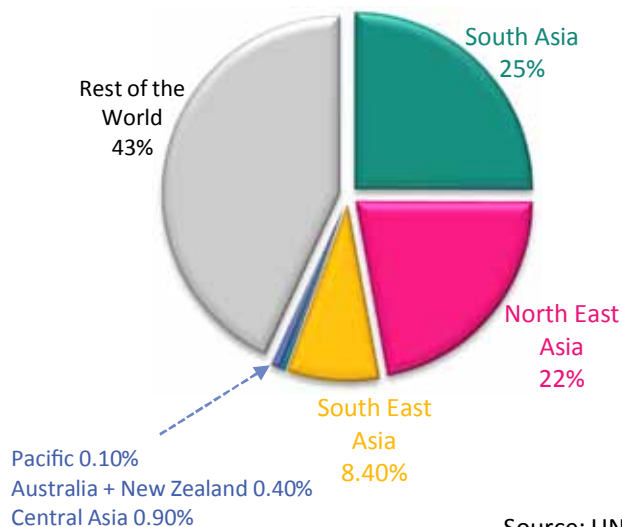
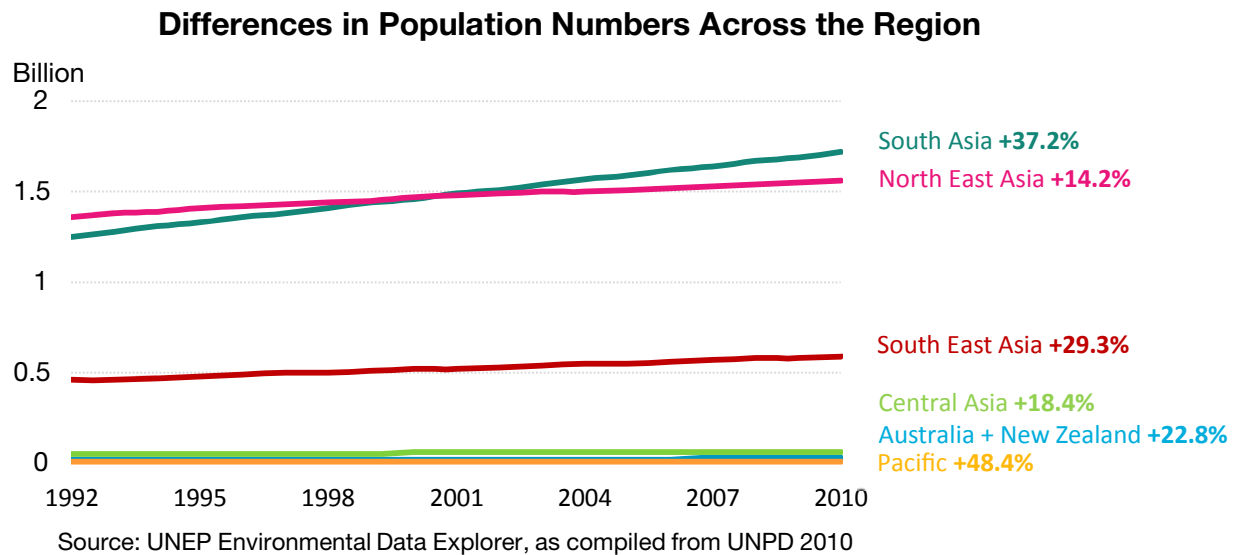
Between 1992 and 2010, population of Asia and the Pacific has grown by 810 million people



Source: UNEP Environmental Data Explorer, as compiled from UNPD 2010

The world's population reached 7 billion as of 31 October 2011, from 6 billion in 1999, representing 1 billion increase in 12 years (UNFPA 2011).

In 2010, 83 % of the region's population lived in North East Asia and South Asia

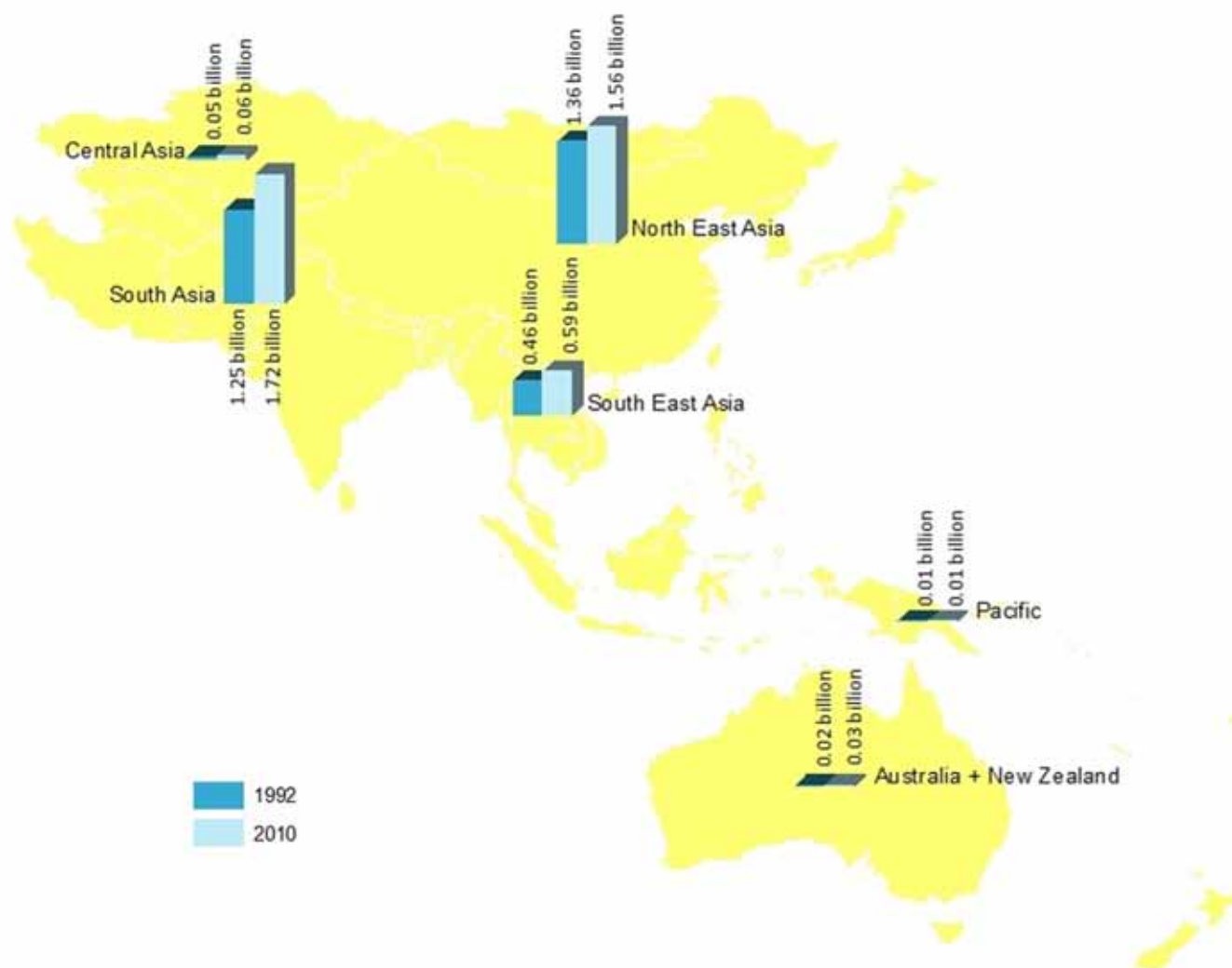


Proportion of Asia and the Pacific's Population (2010)

There are large differences in population numbers and growth rates between Asia and the Pacific sub-regions. In 2010, nearly 83% of the region's total population lived in South Asia (43%) and North East Asia (40%) combined, nearly 3.3 billion people (47% of the world population); 14% in South East Asia, 1.5% in Central Asia, 0.7% in Australia and New Zealand, and 0.1% in the Pacific.

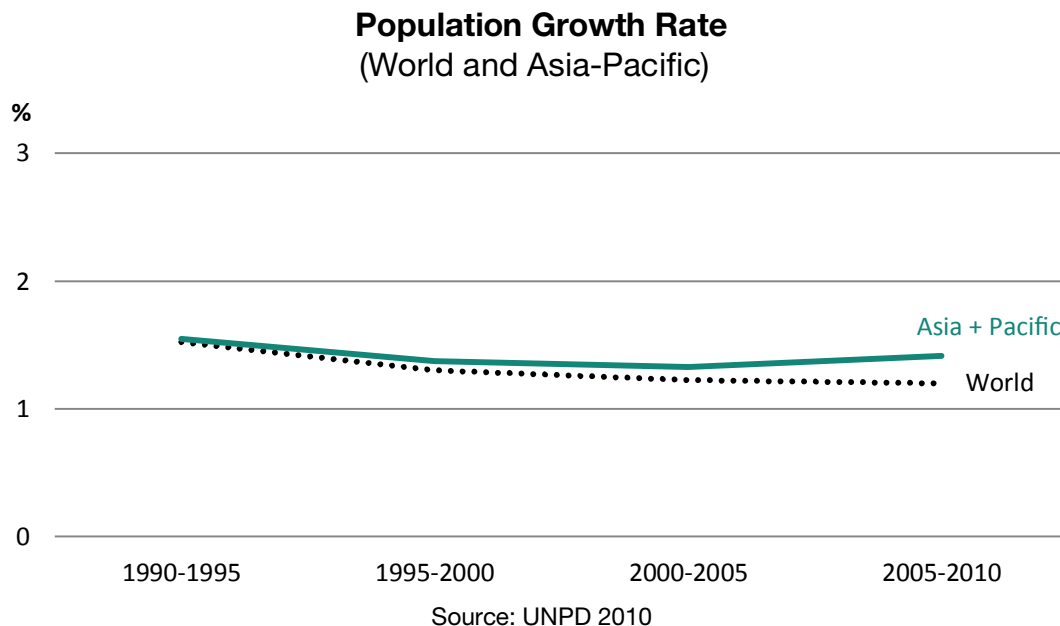
Source: UNPD 2010

Population in the Sub-regions of Asia and the Pacific (1992 and 2010)



Source: UNPD 2010

There was a 24 % decline in population growth rate between 1990 and 2010



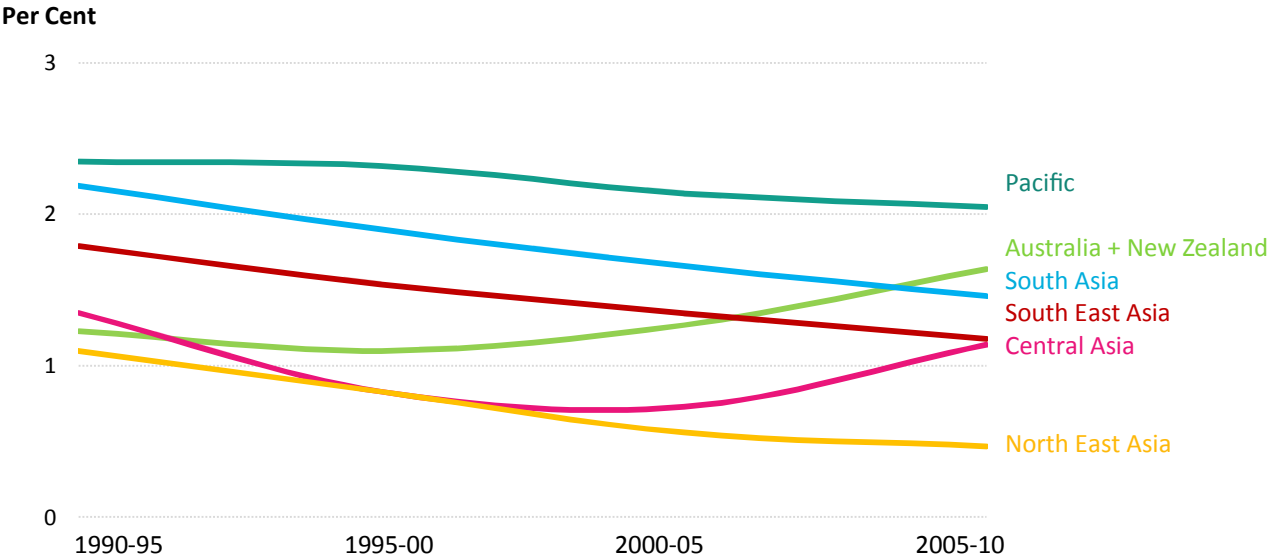
This overall, global “decrease in population growth rates” means that the world’s population is increasing more slowly, and could eventually stabilize at around 10 billion people in 2100 (UN 2011). The decrease in growth rate is also reflected in Asia and the Pacific¹, dropping from around 1.5% per year in the early 1990s to 1.4% in the late 2000s. This represents a 24% decline in population growth rate between 1990 and 2010.

There is a strong correlation between a country’s economic state and its population growth rate: developing countries tend to have 2-3 times higher population growth rates than developed countries (UNEP 2011). Since 1990, population growth rates have declined in all Asia and the Pacific sub-regions.

¹ Especially from the results of family planning in China from the 1980s



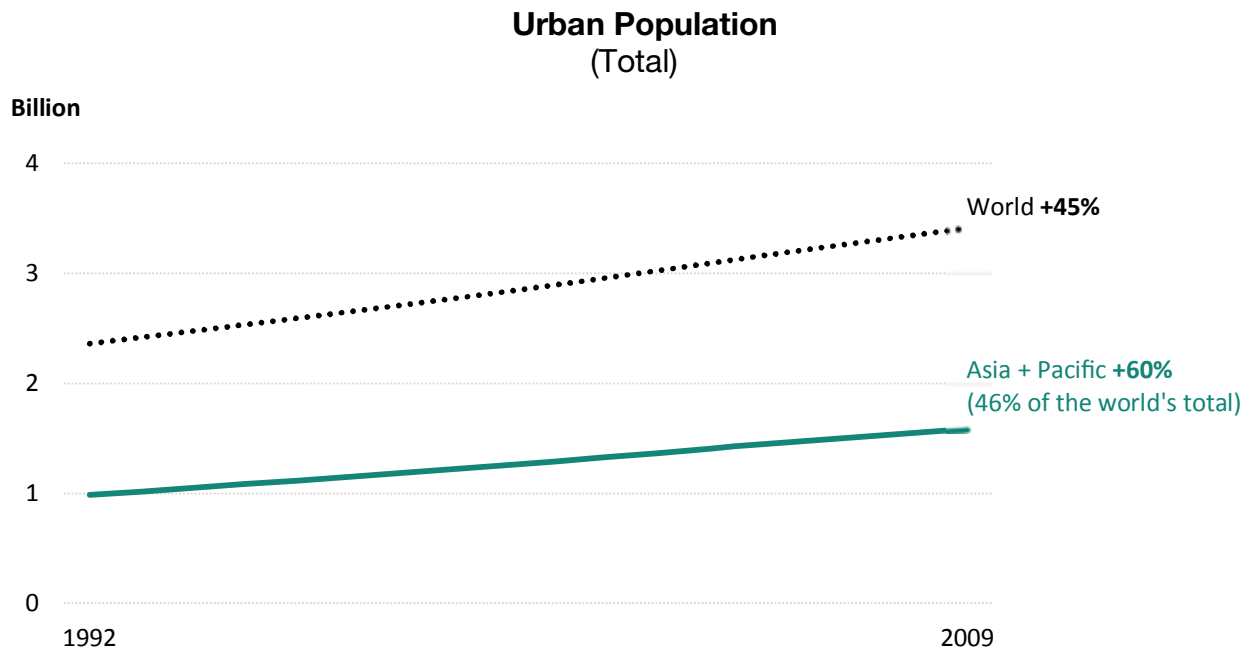
Population Growth Rate (Asia-Pacific sub-regions)



Source: UNPD 2010

However, since 2000 population growth rates started to increase in Central Asia, Australia and New Zealand reversing the declining trend. Australia and New Zealand have an active immigration policy, thus the driver for the population growth there is different from most places (such as birth rates and mortality rates).

In 2009, the region's urban population reached to nearly 1.6 billion, a 60% increase since 1992

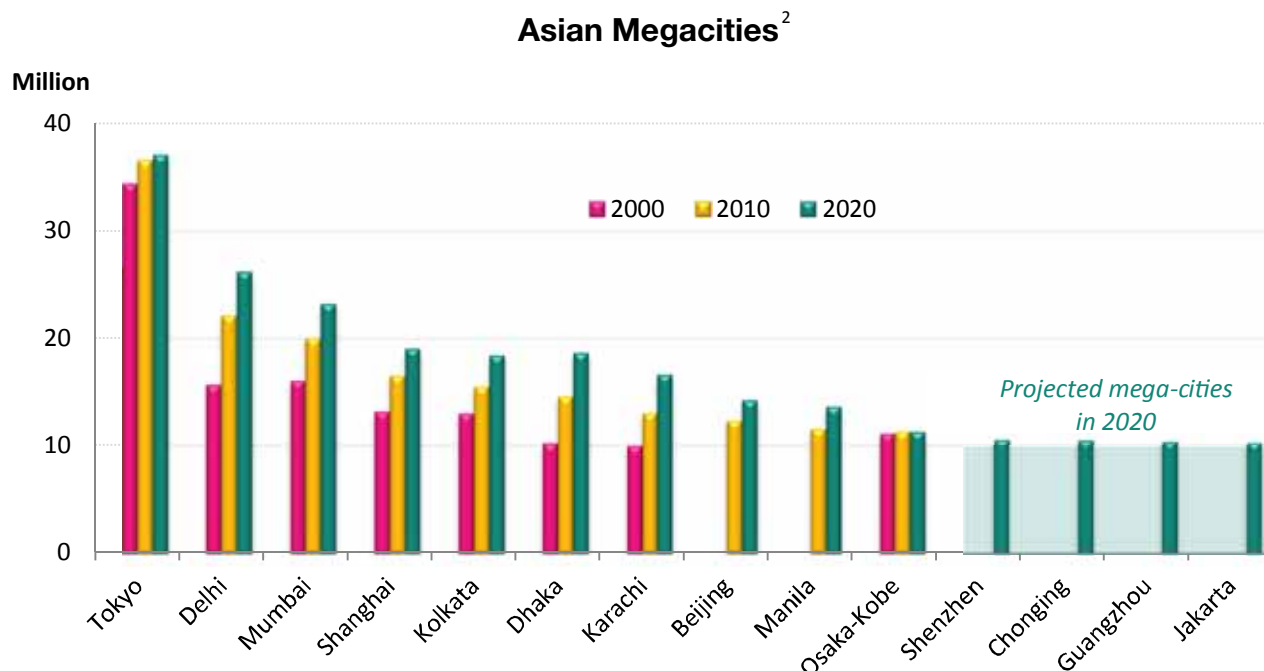


Source: UNEP Environmental Data Explorer, as compiled from UNPD 2009

In 1992, 985 million of Asia and the Pacific's population lived in urban areas, representing 46% of the world's total urban population. By 2009, the number had climbed to 1,585 million, representing a 60% increase since 1992, or 46% of the world's total urban population.

This unprecedented urban population growth is projected to continue in coming decades (UNEP 2011). Although the global urban population only accounts for about 45% of the total population, it is growing by 62 million per year, while the Asia and the Pacific urban population accounts for 40% of its total population, gaining 34 million per year.

Asia is currently home to 10 of the world's 21 megacities²



Source: State of the Asian Cities 2010/2011 (UN-Habitat 2010)

Globally, the number of megacities climbed from 10 in 1992 to 21 in 2010. By 2010, 10 out of these 21 megacities were found in Asia: Tokyo, Delhi, Mumbai, Shanghai, Kolkata, Dhaka, Karachi, Beijing, Manila, and Osaka-Kobe (UN-Habitat 2010). Furthermore, it is projected that Shenzhen, Chongqing, Guangzhou and Jakarta will become megacities by 2020.

Tokyo, the world's largest megacity is home to 26% of Japan's total population. It is one of the world's three leading financial centres along with New York and London. Dhaka is one of the fastest expanding megacities in the world, with its population growing an average of 5.6% per year (UN-Habitat 2010).

² Megacities are high density metropolises with 10 million or more inhabitants (UN-Habitat 2010)

*Population of China's Pearl River Delta tripled since 1992
and includes two of the world's megacities*



1979

2009

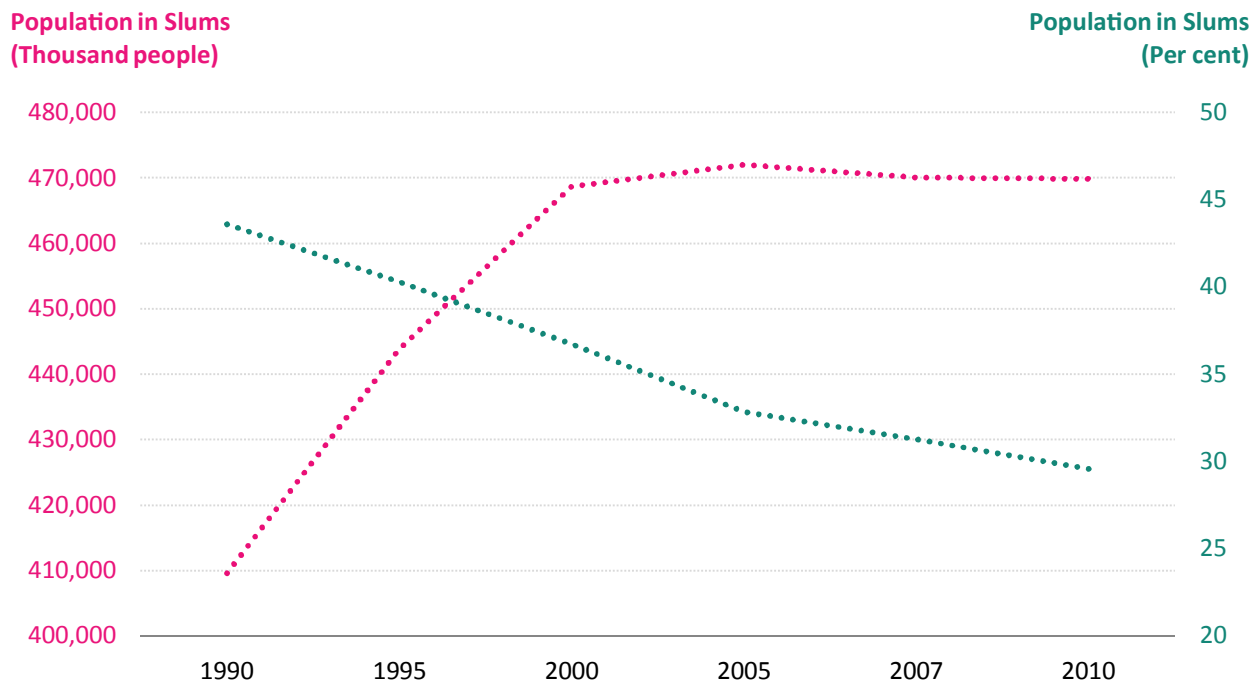
Source: UNEP-GRID Sioux Falls 2010 and USGS

The Greater Pearl River Delta area in South Eastern China is the world's largest "mega-region" with a population of approximately 120 million people (UN 2010). In 1979, the Peral River Delta had roughly 14 million people; by 2009 population had tripled to 44 million. Over the past two decades, the populations of the delta cities of Guangzhou and Shenzhen have each reached nearly 10 million people (UN-Habitat 2010). The area has been an important and productive agricultural area for China but it is losing farmland to one of the fastest growing urban areas in the world (Seto and Kaufmann 2003; UNEP 2010).

Between 1990 and 2010, the proportion of the urban population in the region living in slums dropped from 44% to 30%, but their absolute number had risen to about 470 million



People Living in Slums*

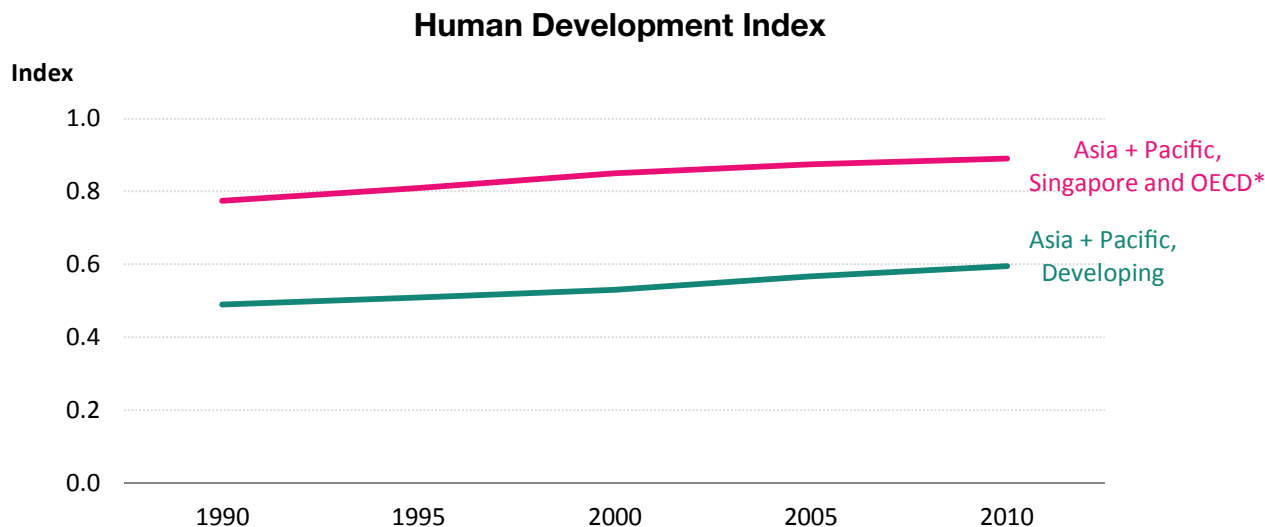


*Average figures were calculated based on UN-Habitat sub-regional groupings: East Asia, South East Asia, and Pacific

Source: UN-Habitat 2010

Since 1990, the overall share of the urban population living in slums in Asia and the Pacific has decreased. This decrease indicates that coverage of slums access to improved water or sanitation, and/or more durable housing has improved. However, the absolute number of urban population living in slums increased from 410 million in 1990 to 470 million in 2000, and the number has remained nearly the same since 2001.

Human development in the region has improved over the past two decades



*Australia, Japan, New Zealand and Republic of Korea

Source: UNEP Environmental Data Explorer, as compiled from UNDP 2010

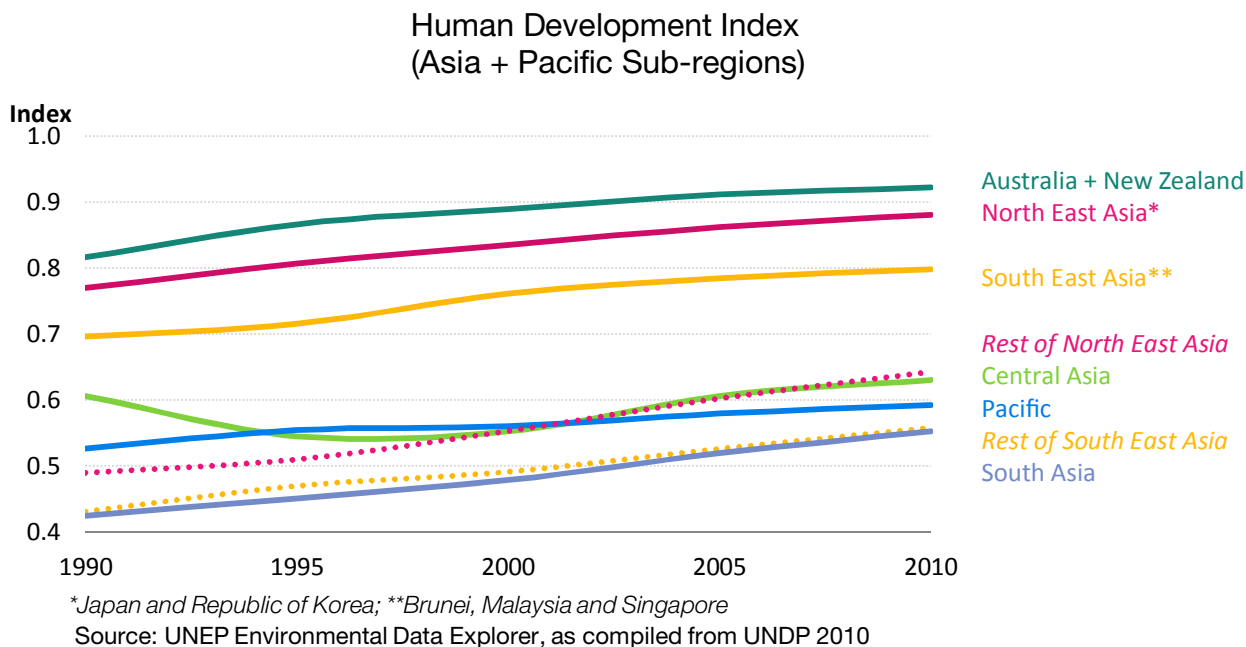
The past 20 years have seen substantial progress in many aspects of human development. Most people today are healthier, live longer, are more educated and have more access to goods and services. Even in countries facing adverse economic conditions, people's health and education have greatly improved (UNDP 2011).

Over the past 20 years, the Human Development Index³ (HDI) has grown at various rates across the region. The HDI in more developed countries (including Australia, Japan, New Zealand, Republic of Korea and Singapore) has grown from 0.77 to 0.89; while in the developing countries, the HDI has grown from 0.49 to 0.59.

Countries in North East Asia, South East Asia, Australia and New Zealand also have higher income inequality today than a few decades ago, due to growing gaps between urban and rural areas (UNDP 2010).

³ The HDI is a summary measure of human development. It measures the average achievements in a country in three basic dimensions of human development: 1) a long and healthy life, as measured by life expectancy at birth, 2) knowledge, as measured by the adult literacy rate (with two-thirds weight) and the combined primary, secondary and tertiary gross enrolment ratio (with one-third weight), 3) a decent standard of living, as measured by GDP per capita (PPP US\$)

...however large differences in HDI exist between countries and sub-regions

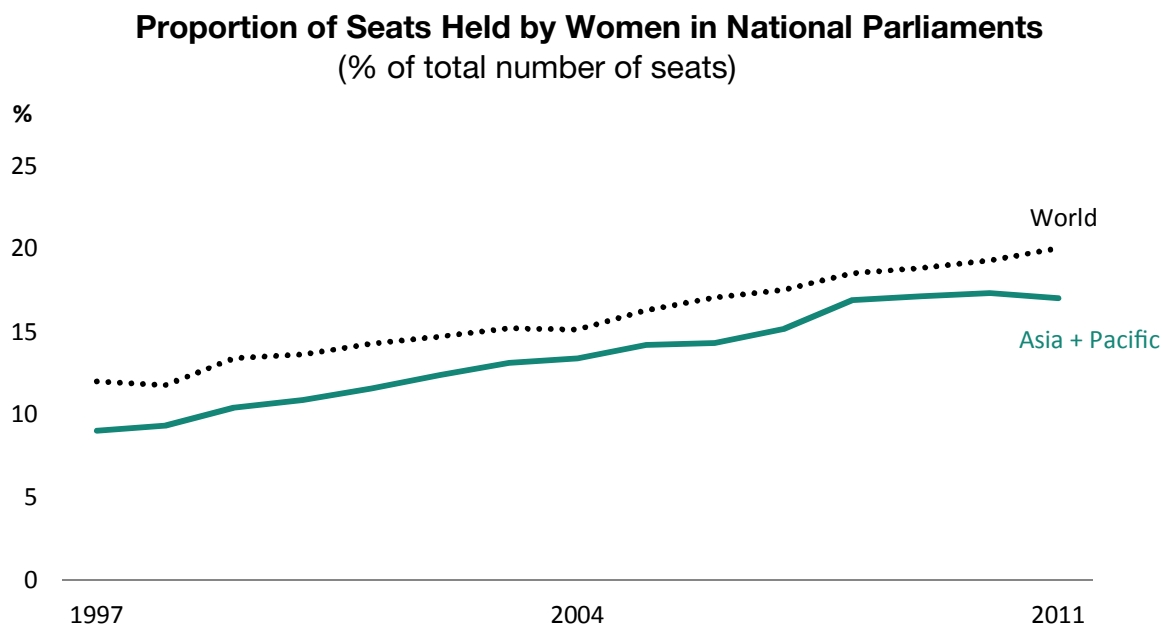


However, healthier lifestyles, better educated people living longer and with better incomes do not occur equally across the region. The difference in HDI reflects an increase in inequality.

The top HDI movers (countries that have made the greatest progress in improving the HDI) include well known income “growth miracles” such as China (driving North East Asia, the “strongest” improver), Indonesia and Republic of Korea; but they include others such as Nepal – where progress in the non-income dimensions of HDI has been equally remarkable (UNDP 2010).

In Central Asia, human development levels continue to rise, with greater inequality, particularly for public health, education, widening income gaps and increasing environmental pressures (UNDP 2011 a). Central Asian countries got their new status in 1992. This led to a collapse of existing elements (infrastructure, supplies, economy), which drew the HDI down. It took years to get things organized differently and from 1998 the HDI is curving up again, now reaching the pre-1992 levels.

Women's influence in the region, as measured by seats in national parliaments, has almost doubled since 1997, but is still far below the MDG-target of 30%



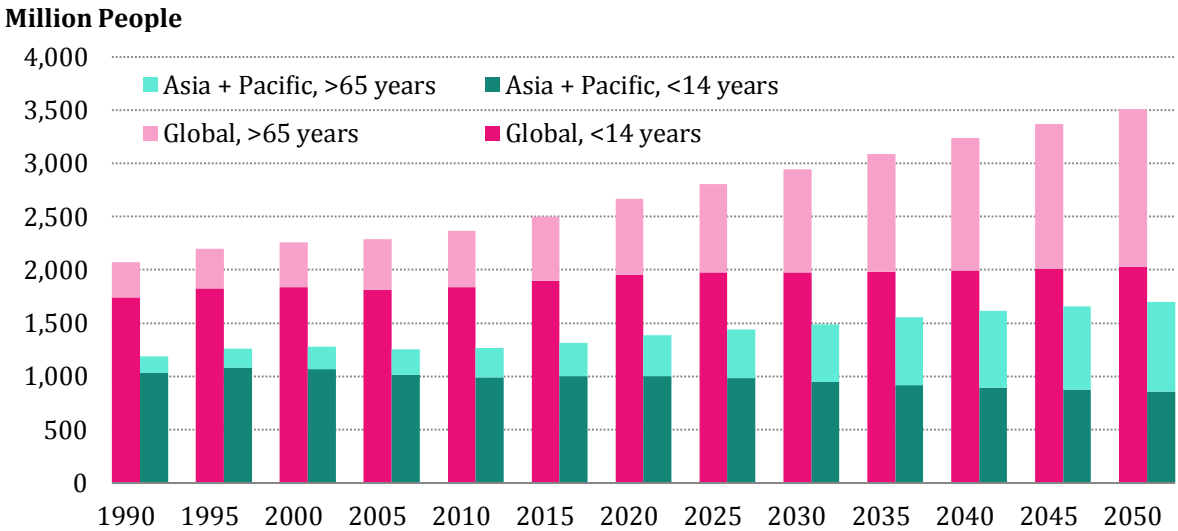
Source: World Bank 2011, as compiled from UN Women's Indicators and Statistics

Women's influence in the region as measured by seats in national parliaments is steadily rising from an Asia and the Pacific average of 9% in 1997 to 17% in 2011, representing about 90% increase - which however remains below the world's average. This number falls short of the MDG target for gender parity of 30% of women in leadership positions that was to be met by 2015 (UN 2010). Women play a key role in improving environment-related legislation and safeguarding that these measures are adequately funded and implemented (UNEP 2011).

Population aged over 65 is growing at a faster rate than the population aged below 14 across the region, and is projected to continue



Age Distribution
(High and low age groups)

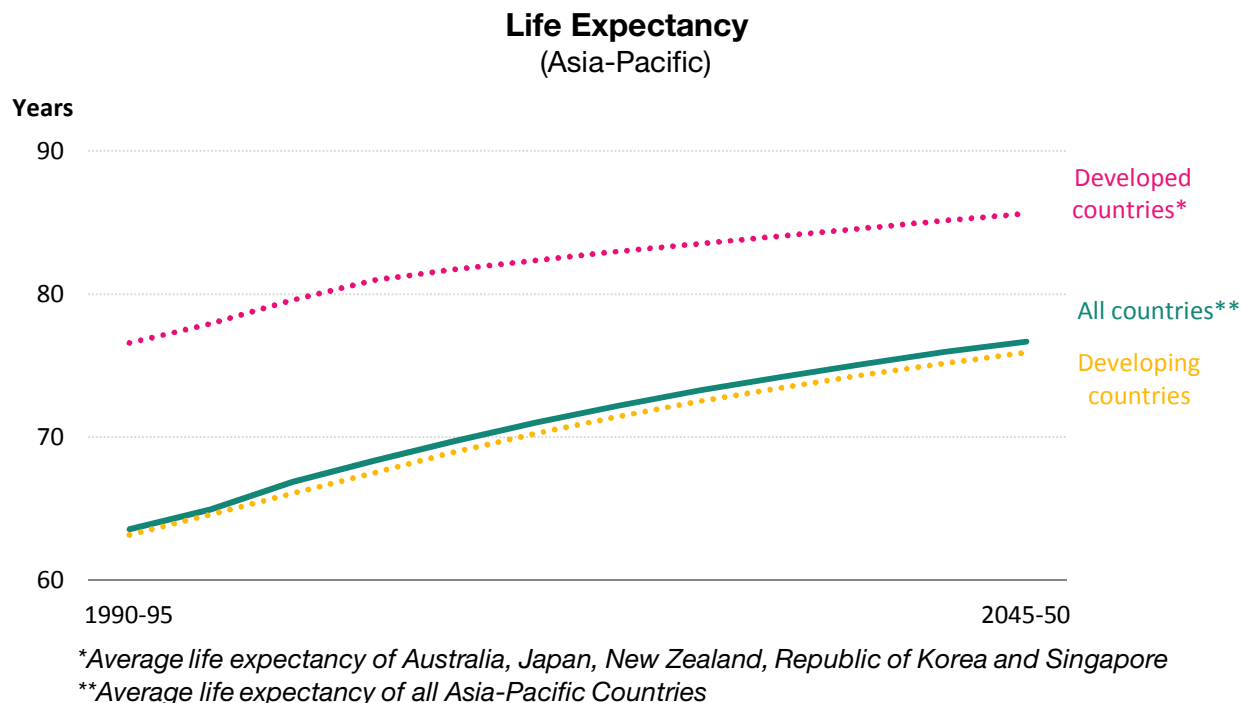


Source: UNEP Environmental Data Explorer, as compiled from UNPD 2011

The region's population in the age group below 14 years decreased from 1,034 to 992 million people, a 4% decrease, between 1990 and 2010. It is projected that this age group will decrease further from 992 to less than 860 million people between 2010 and 2050, a 14% decrease.

However, the region's population in the group over 65 years has increased by 7%, from 153 to 272 million people between 1990 and 2010. It is projected that this group will experience a faster rate of growth across the region in the coming decades, from 272 to 844 million people.

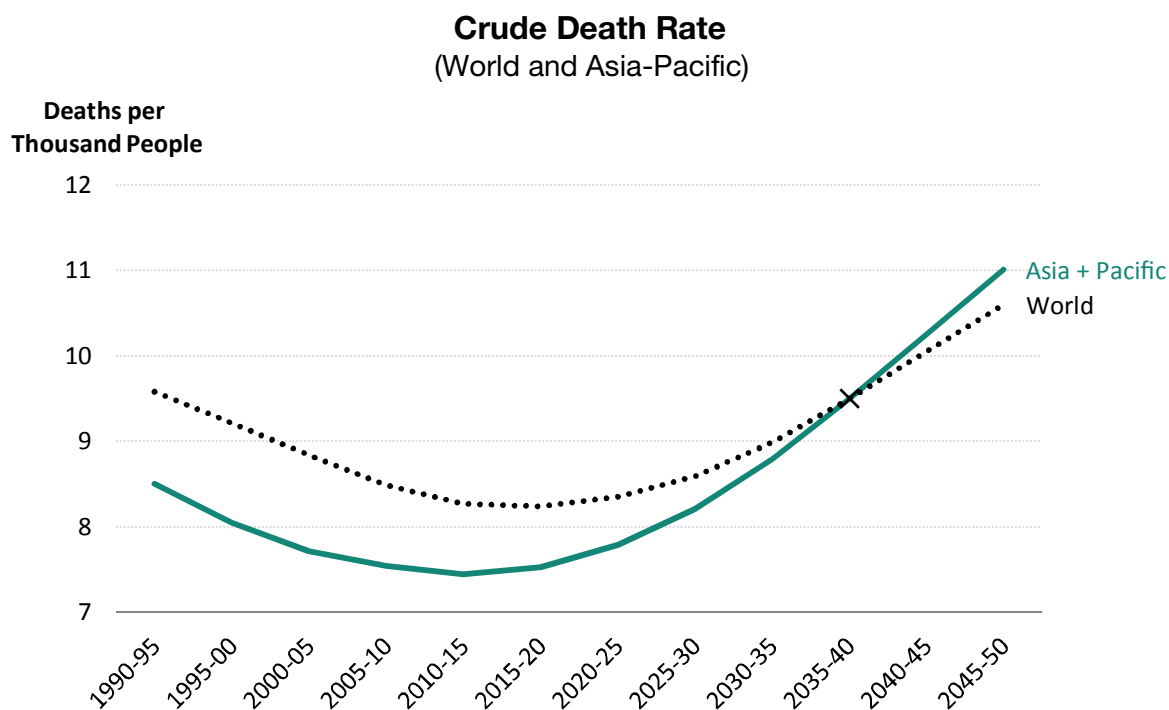
The average life span increased and shows a positive trend in the coming decades ... noting that there are large differences between sub-regions



Source: UNEP Environmental Data Explorer, as compiled from UNPD 2011

Since 1990, the average life span in the region has increased and is projected to continue to increase in the coming decades, but there are large differences between sub-regions. Countries with a higher life expectancy are the more developed countries such as Australia, New Zealand and some North East Asian countries. Developing countries in South Asia and the Pacific lag behind.

Between 1990 and 2010, the yearly number of deaths per 1,000 people has decreased and was lower than the world's average.



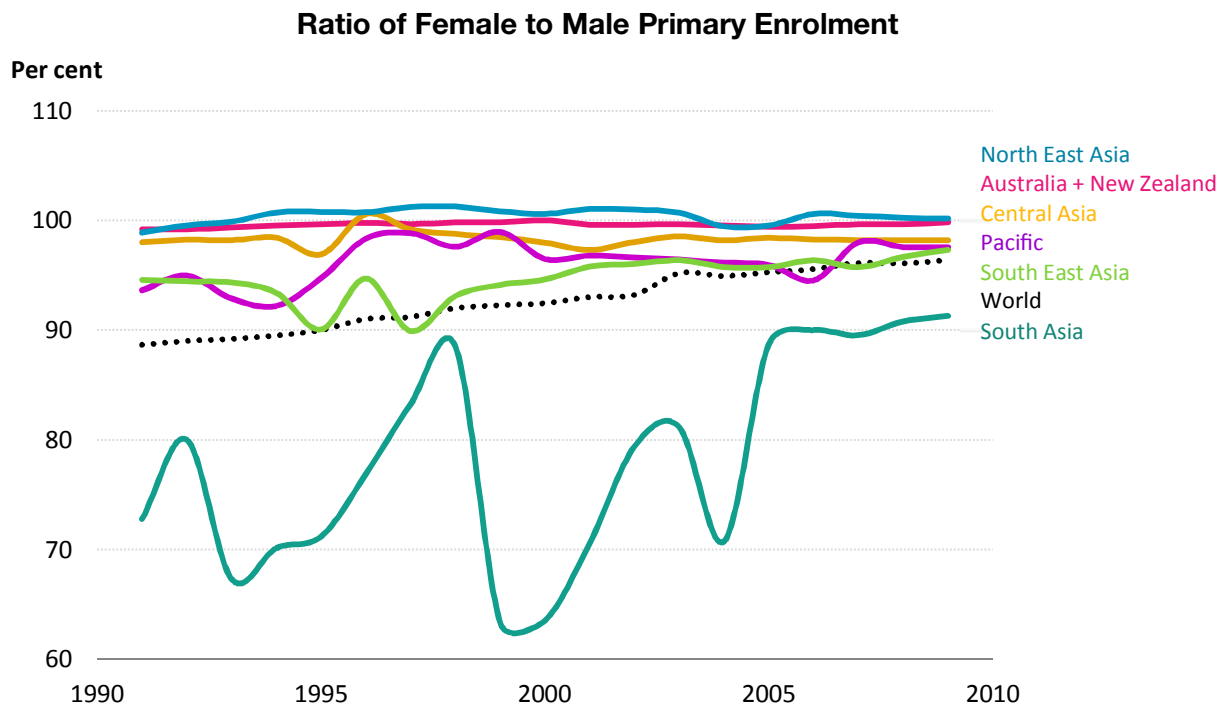
Source: UNEP Environmental Data Explorer, as compiled from UNPD 2011

The region's crude death rate⁴ has improved, dropping from 8.2 to 7.3 deaths per 1,000 people (lower than the global average changing from 9.4 to 8.2 per 1,000 people) between 1990 and 2010.

On the other hand, the region is projected to experience higher crude death rates in the next 4 decades and overtaking the global trend (higher than the projected global average) by 2045. This is because the proportion of the region's population at the older, high-mortality ages will be increasing.

⁴ Crude death rate: number of deaths over a given period divided by the person-years lived by the population over that period. It is expressed as number of deaths per 1,000 persons

Overall, the ratio of female to male primary enrolment has improved with the exception of the trends in South Asia



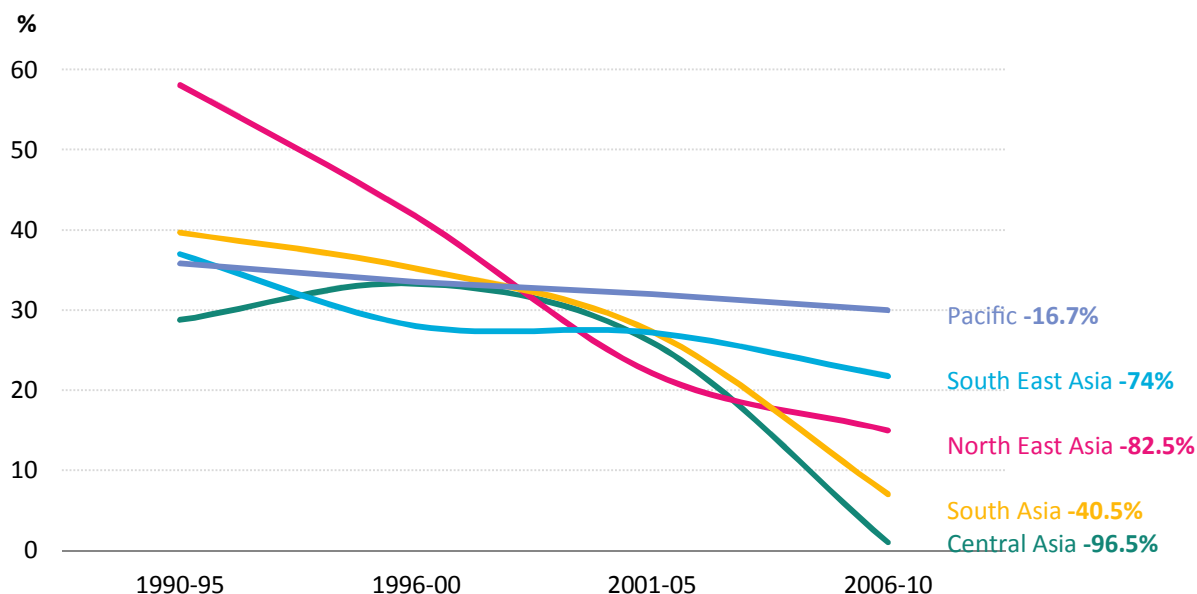
Source: UNDP 2011

Overall, the region's ratio of female to male primary enrolment has improved over the past two decades, noting increasing female to male primary enrolment. The trends conceal widening educational inequality in South Asia (UNDP 2011).

South Asia's ratio of female to male primary enrolment was unstable (around 65% to 90%) between 1992 and 2005, but improved to slightly over 90% between 2006 and 2009.

South East Asia and the Pacific showed some improvement, increasing from around 93% in 1992 to over 97% in 2010. Australia and New Zealand had over 99% since 1990 and in North East Asia over 100% since 1994.

Asia-Pacific Sub-regional Population Living Below US\$1.25 per Day Consumption (% of total population)



Central Asia: Kazakhstan, Kyrgyzstan, Tajikistan and Uzbekistan

North East Asia: China

South Asia: Bangladesh, Bhutan, India, Iran, Maldives, Nepal, Pakistan and Sri Lanka

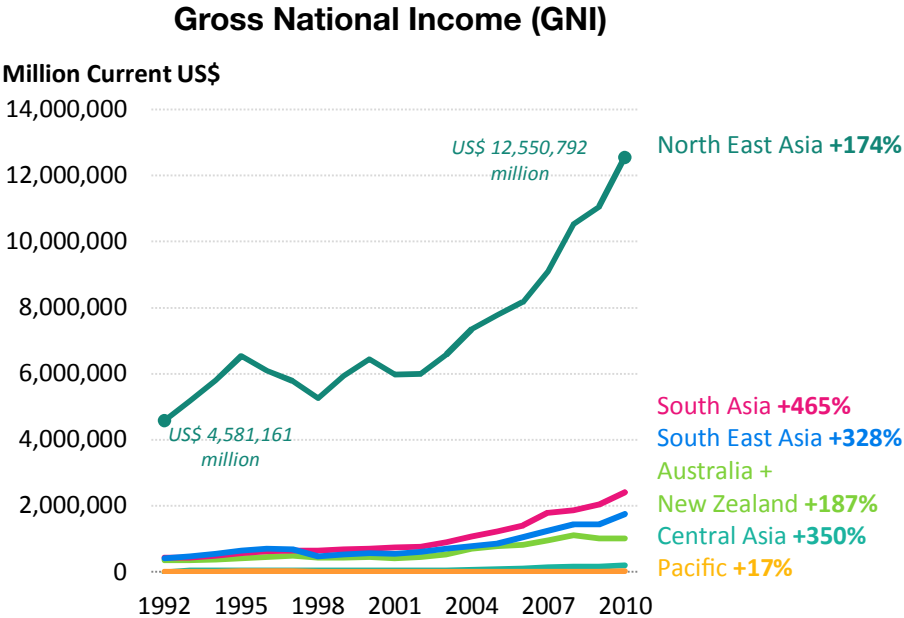
South East Asia: Brunei, Cambodia, Christmas Island, Indonesia, Lao PDR, Malaysia, Myanmar, Philippines, Singapore, Thailand, Timor-Leste and Viet Nam

Pacific: Micronesia (Federated States of) and Papua New Guinea

Source: UNEP Environmental Data Explorer, as compiled from World Bank 2011

Over the past two decades, population living below US\$1.25 per day consumption has decreased in Central Asia by more than 96.5%, followed by 82.5% in North East Asia (mainly in China), 74.0% decrease in South East Asia, 40.5% in South Asia, and 16.7% in the Pacific.

North East Asia leads the increase in gross national income in the region



Source: UNEP Environmental Data Explorer, as compiled from World Bank 2010

Overall gross national income (GNI)⁵ of Asia and the Pacific has increased over the past two decades. North East Asia, South Asia, South East Asia, Australia and New Zealand have experienced a rapid increase since the early 2000s; noting a much higher GNI in North East Asia since early 1992 compared to the rest of the region. However, it is important to note that the high GNI in North East Asia was mainly due to the very large population of China and developed countries such as Japan and Republic of Korea. North East Asia and South East clearly suffered from the 1997 Asia economic crisis causing a drop in the GNI.

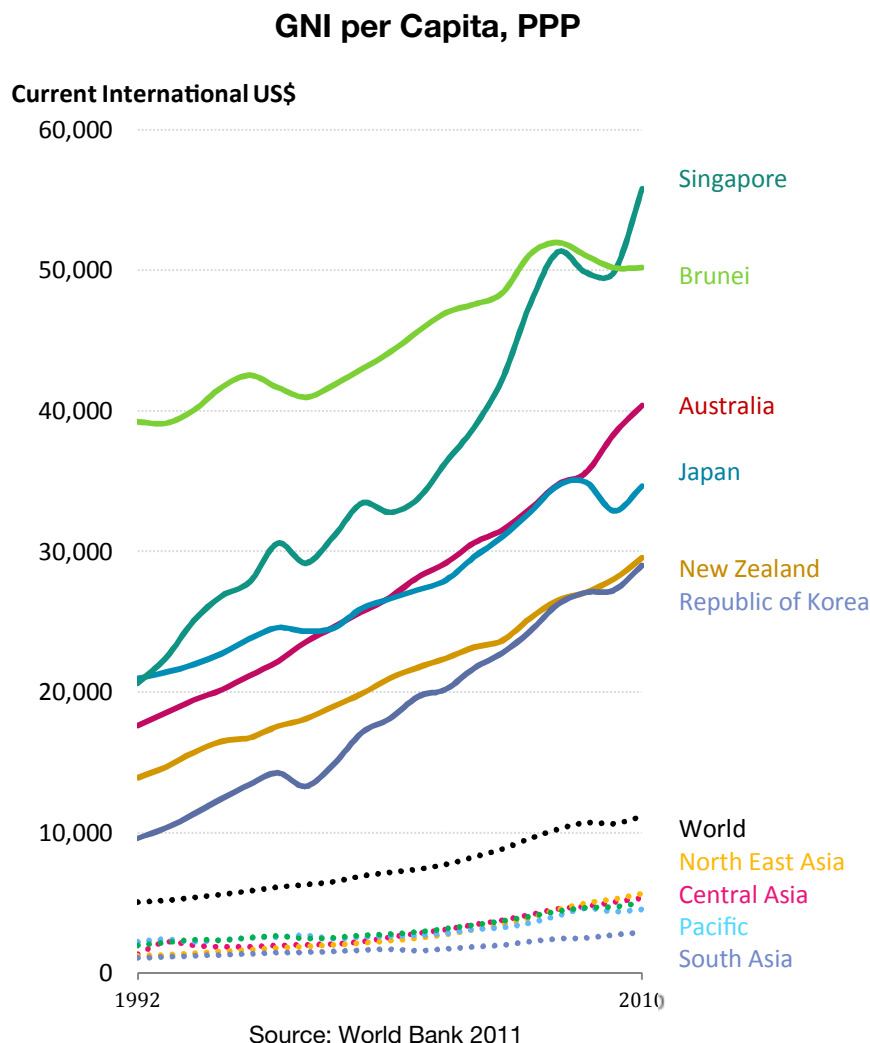
In 1992, North East Asia's GNI was US\$ 4,581,162 million, about 3.7 times higher than the other regions combined.

By 2010, North East Asia's GNI has grown by 175% to US\$ 12,550,792 million (adding nearly US\$ 8,000,000 million since 1992), about 2.3 times higher than the others combined.

Between 1992 and 2010, GNI increased significantly in other sub-regions by 465% increase in South Asia (average cumulative growth rate of 9.5% per year), by 328% increase in South East Asia (average cumulative growth rate of 8.0% per year), and by 350% in Central Asia (8.2% per year), a stronger growth than North East Asia's 5.4% per year during the same period.

⁵ GNI (formerly GNP) is the sum of value added by all resident producers plus any product taxes (less subsidies) not included in the valuation of output plus net receipts of primary income (compensation of employees and property income) from abroad (UNEP Environmental Data Explorer, World Bank national accounts data, and OECD National Accounts data files)

However, there are large differences in GNI per capita between Asia-Pacific countries and sub-regions



Purchasing Power Parity Gross National Income (PPP GNI)⁶ per capita varies between countries across the region.

Singapore's GNI per capita has increased rapidly between 1992 and 2010, from US\$20,630 to US\$55,790 (a 170% increase) compared to other Asia and the Pacific countries and the world's average.

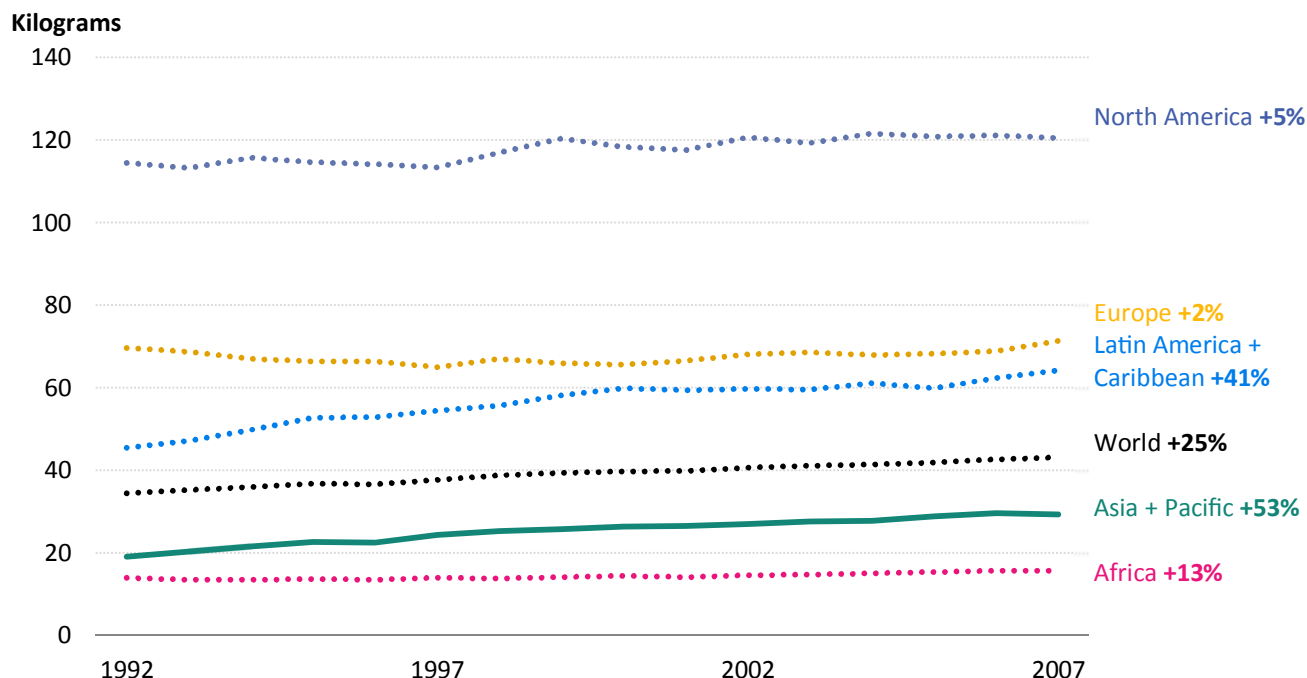
The GNI per capita of Singapore, Brunei, Australia, Japan, New Zealand and Republic of Korea is significantly higher compared to the rest of the region and the world's average.

North East Asia's GNI increased by more than 350%, Central Asia by more than 290%, Republic of Korea by more than 200%; while South Asia is close with 170%. The poorest performers are Japan (65%) and Brunei (30%).

⁶ GNI per capita based on purchasing power parity (PPP). PPP GNI is gross national income (GNI) converted to international dollars using purchasing power parity rates. An international dollar has the same purchasing power over GNI as a U.S. dollar has in the United States. GNI is the sum of value added by all resident producers plus any product taxes (less subsidies) not included in the valuation of output plus net receipts of primary income (compensation of employees and property income) from abroad (World Bank)

Average consumption of meat was 29 kg per capita in 2007,
up from 19 kg in 1992, a nearly 53% increase

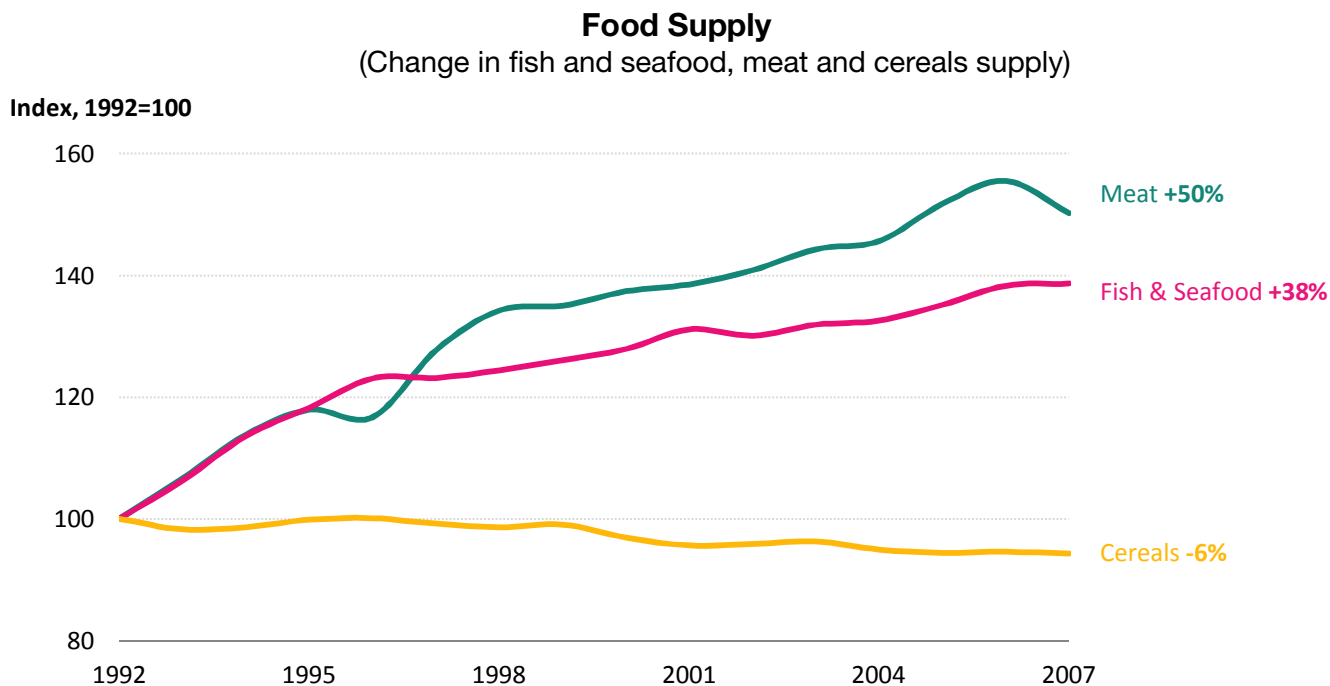
Food Supply (kg) per Capita - Meat (Kilograms per capita per year)



Source: UNEP Environmental Data Explorer, as compiled from FAO 2007

Food supply quantities have grown in response to growing population, increasing standards of living and changing consumption patterns. The region's citizen consumed an average of 29 kg of meat per capita per year in 2007, a strong increase of 53% from 19 kg per capita per year in 1992. However, meat consumption remains low compared to the other regions such as North America (120 kg/capita), Europe (71 kg/capita) or Latin America and the Caribbean (64 kg/capita).

Average consumption of fish and seafood per person was 33 kilocalories per capita in 2007, up from 24 kilocalories in 1992

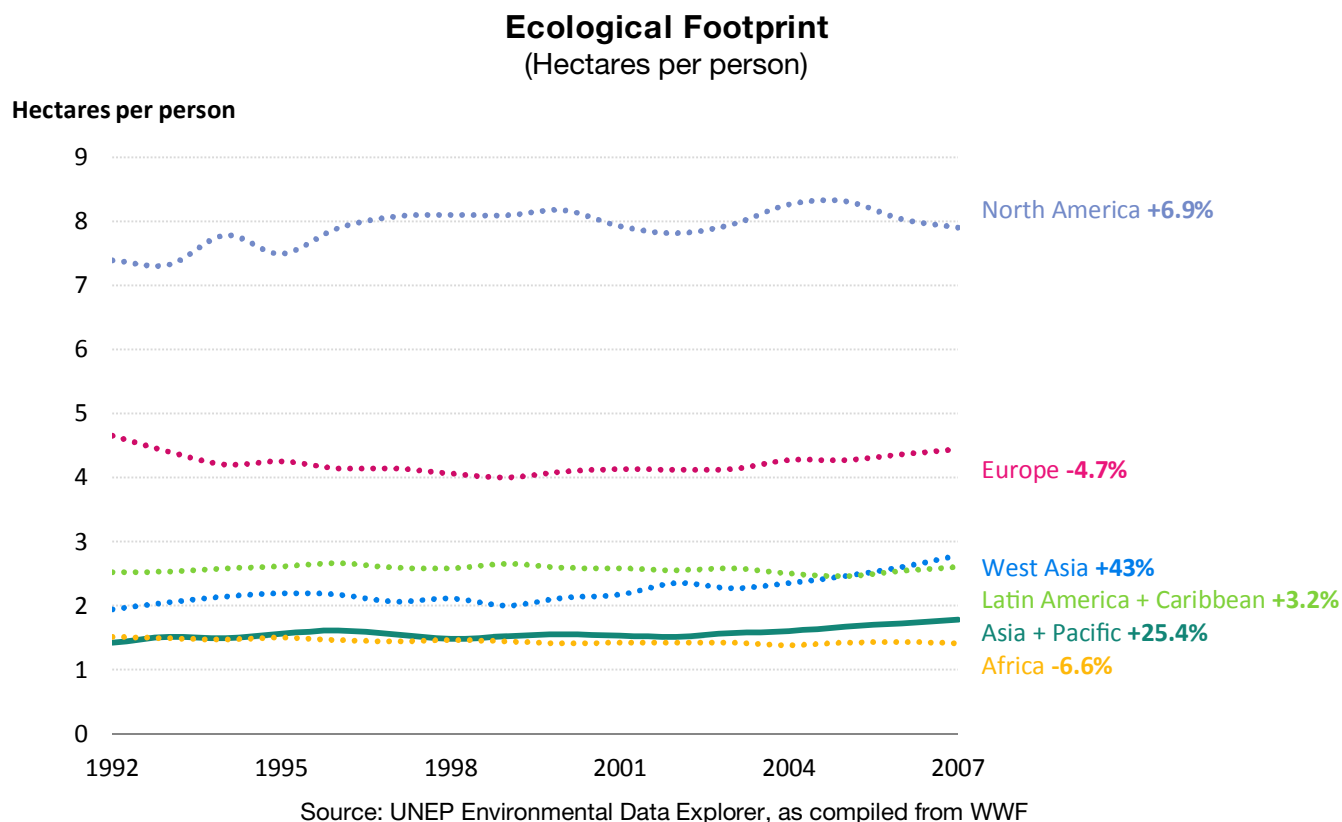


Source: UNEP Environmental Data Explorer, as compiled from FAO 2007

Dietary patterns have changed worldwide. Growth in income, changes in relative prices, improved access to food driven by urbanization and shifts in consumer preferences have altered dietary patterns particularly in developing countries (UNEP 2011).

Diets in Asia and the Pacific have moved away from basic foods, such as cereals, towards livestock products. This shift together with increasing population has resulted in a large increase in the demand for meat and fish. As a result, the supply (as measured by the daily per capita caloric intake) of meat increased by 50% between 1992 and 2007 while the fish and seafood supply increased by 38%. On the other hand, cereals supply has decreased slightly by 6% since 1992.

Between 1992 and 2007, the region's ecological footprint has grown by nearly 25%, while the world's average has grown by only 9%



Between 1992 and 2007, the ecological footprint⁷ across Asia and the Pacific increased by over 25%. However, the ecological footprint of the region remained small compared to other regions. Europe has been increasing since 1998 when it was at its lowest 4.0 hectares per person, while West Asia (the oil producers) has increased quite strongly (43%).

⁷ The Ecological Footprint (EF) is a measure of the consumption of renewable natural resources by a human population, be it that of a country, a region or the whole world. A population's EF is the total area of productive land or sea required to produce all the crops, meat, seafood, wood and fibre it consumes, to sustain its energy consumption and to give space for its infrastructure. The EF can be compared with the biologically productive capacity of the land and sea available to that population (UNEP Environmental Data Explorer, accessed on 14 March 2012)

ECONOMY

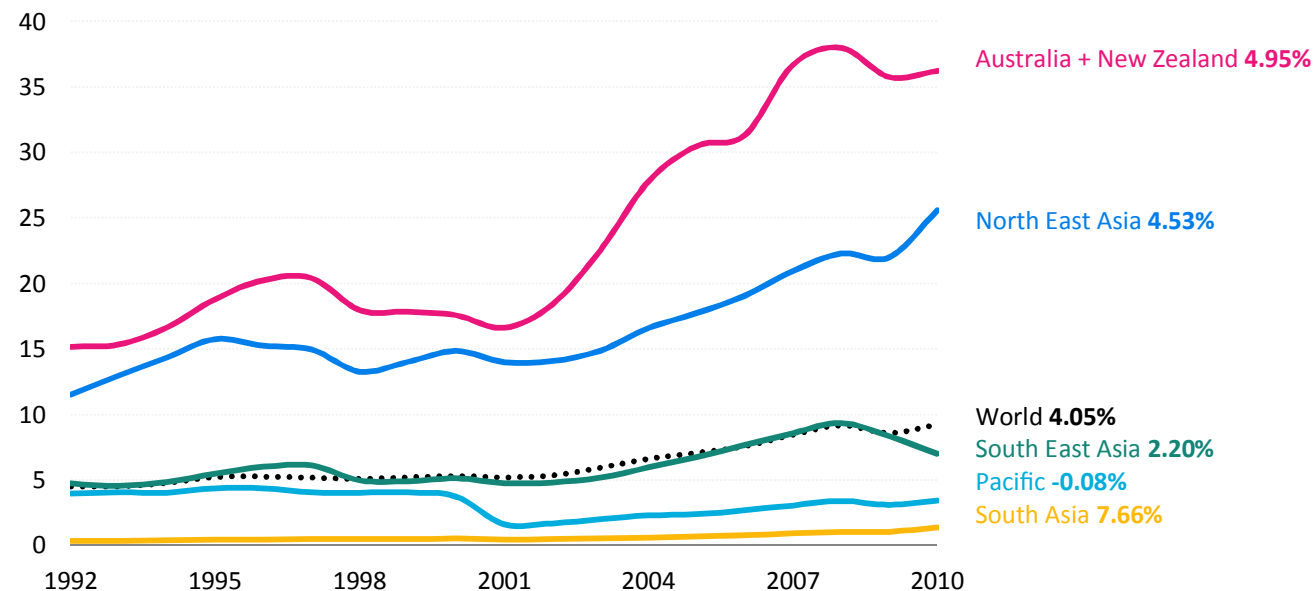


Busan, Republic of Korea's Largest Port City
UN Photo/Kibae Park (July 2011)

The region's GDP has continued to rise at a rapid rate. Since 1992, the developing countries' GDP per capita had increased by 265%, from almost 7.45% per year on average

Asia-Pacific Sub-regional GDP per Capita (Total and change 1992-2010)

Thousand Constant US\$
per year



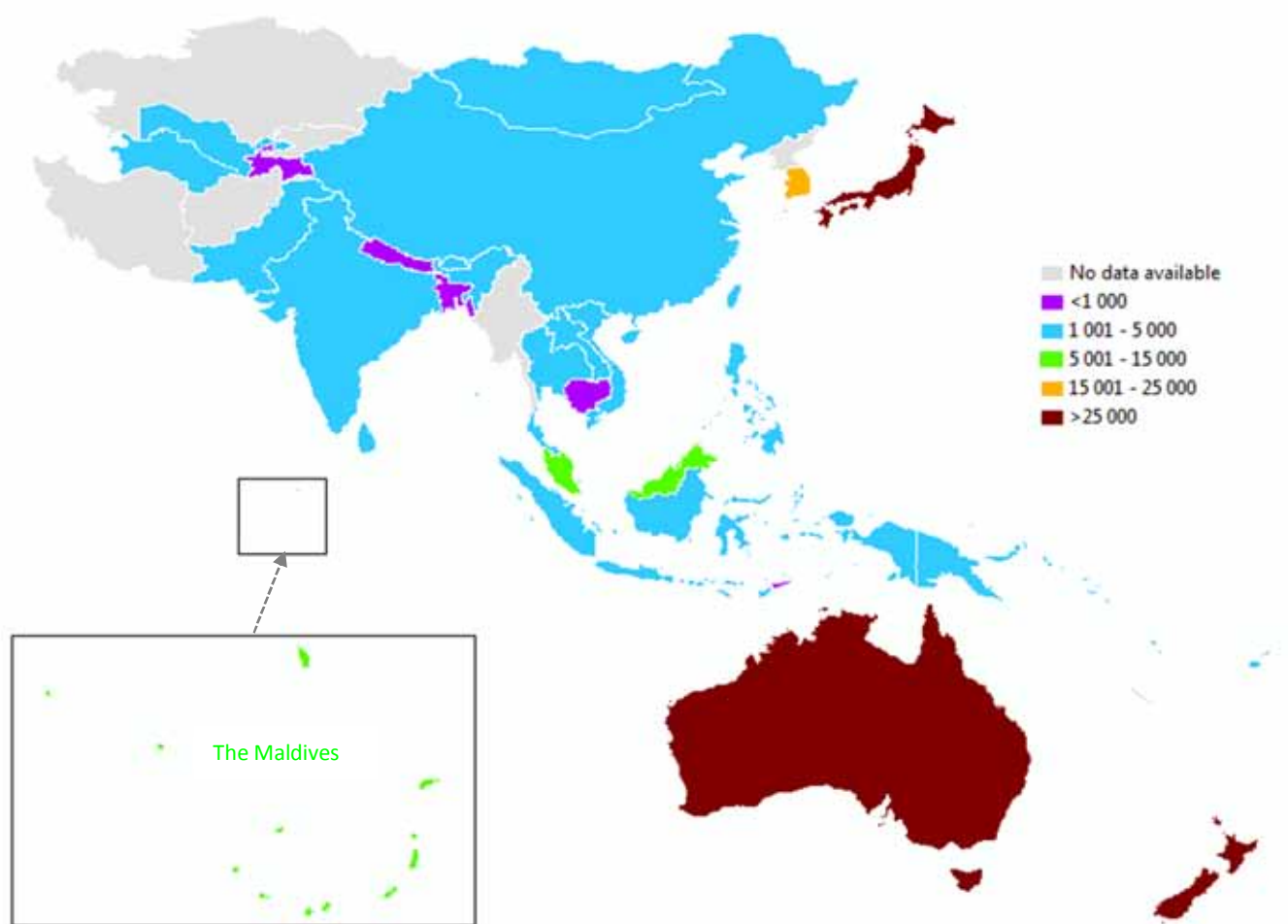
Source: World Bank 2011

Keeping track of trade and economic development is a challenging task particularly for Asia and the Pacific as it is the world's most rapidly-growing region (UNDP 2006). Since 1992, the region's overall Gross Domestic Product (GDP) has increased significantly and at rates varying between the region's developed and developing countries. In developed countries, GDP per capita increased from US\$ 16,727 in 1992 to US\$ 34,903 in 2010, an increase of 109% (or 4.17% per year). At the same time, developing countries experienced a large increase in GDP per capita from US\$ 800 in 1992 to US\$ 2,915 in 2010, an increase of 265% (or 7.45% per year).

...but huge differences in economic wealth persist

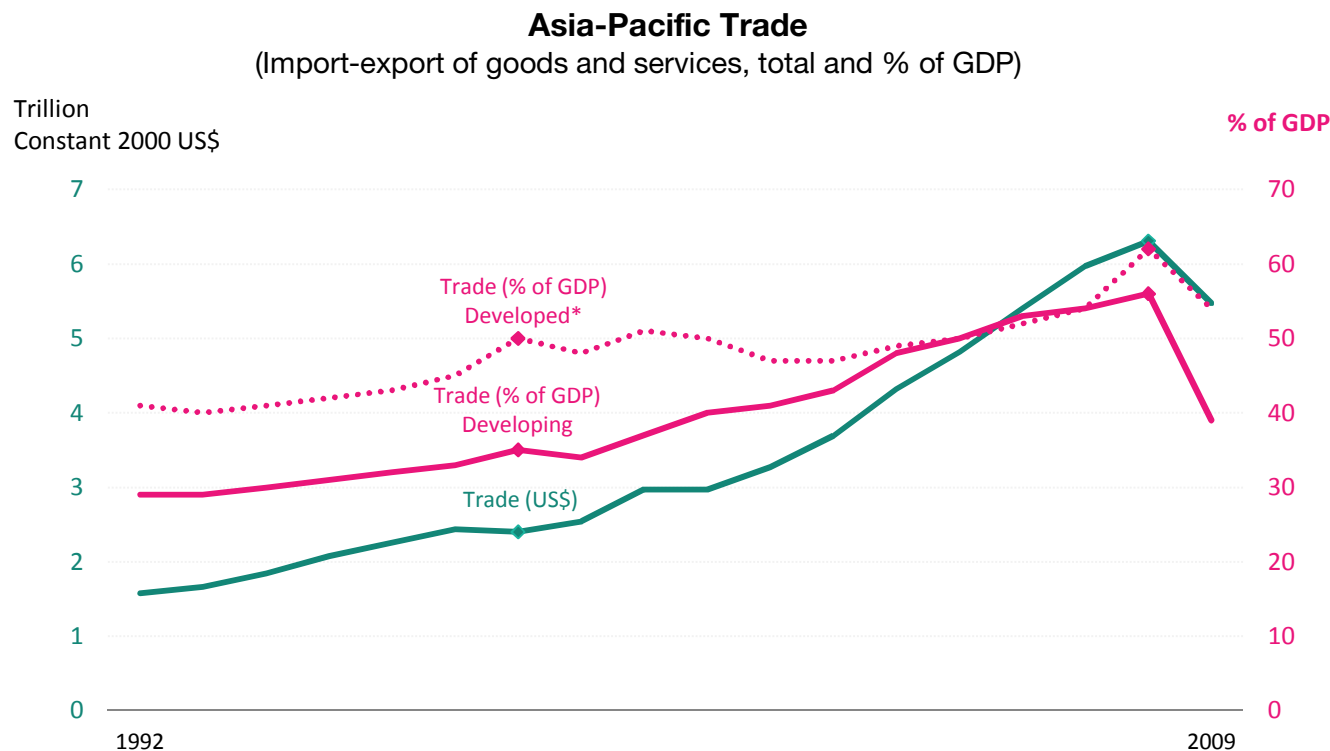


Asia-Pacific GDP per Capita (2010)
(Total, constant 2005 US\$)



Source: UNEP Environmental Data Explorer, as compiled from World Bank 2011

The absolute value of trade has significantly increased in the region



*Australia, New Zealand, Japan, Republic of Korea and Singapore

Source: UNEP Environmental Data Explorer, as compiled from World Bank 2010

The region's value of traded products increased from US\$ 1.6 trillion in 1992 to US\$ 6.3 trillion in 2008, representing an almost 3-fold increase. However, the value suddenly dropped to US\$ 5.5 trillion in 2009, a 13% decrease between 2008 and 2009 due to the global economic crisis.

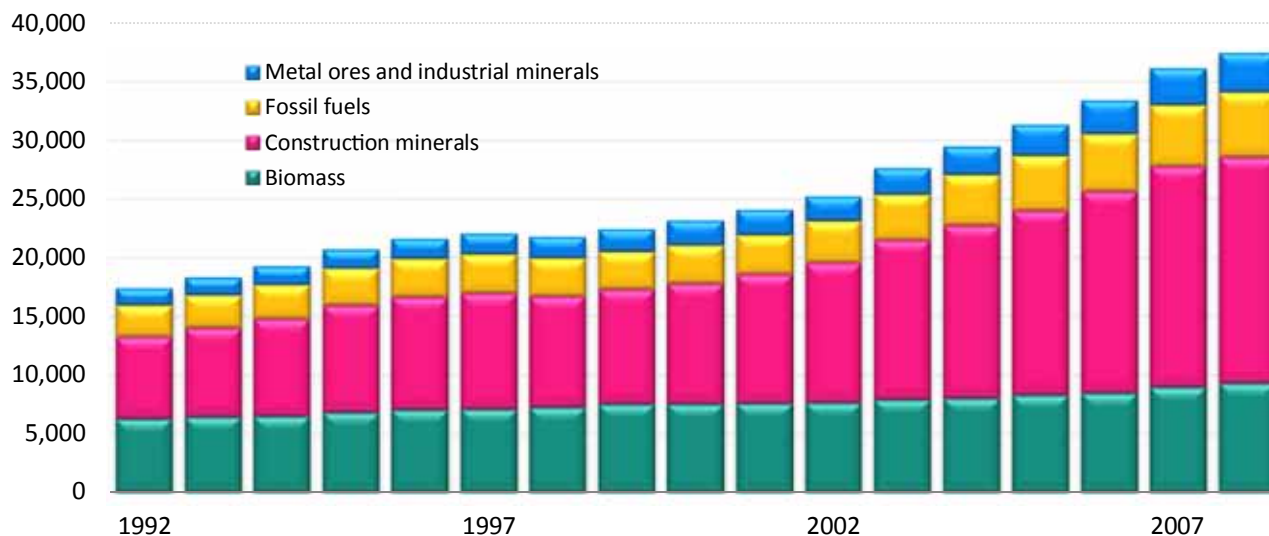
At the same time, developed countries' share of trade as a proportion of GDP increased from 41% in 1992 to 62% in 2008, while developing countries' increased from 29% in 1992 to 56% in 2008. Between 2008 and 2009, that share also suddenly decreased across Asia and the Pacific (including developed countries), to 39% in developing countries and to 54% in developed countries within just one year due to the global economic crisis in 2008.

Material use is growing faster than GDP resulting in a higher material intensity



Domestic Material Consumption in Asia and the Pacific

Million tonnes

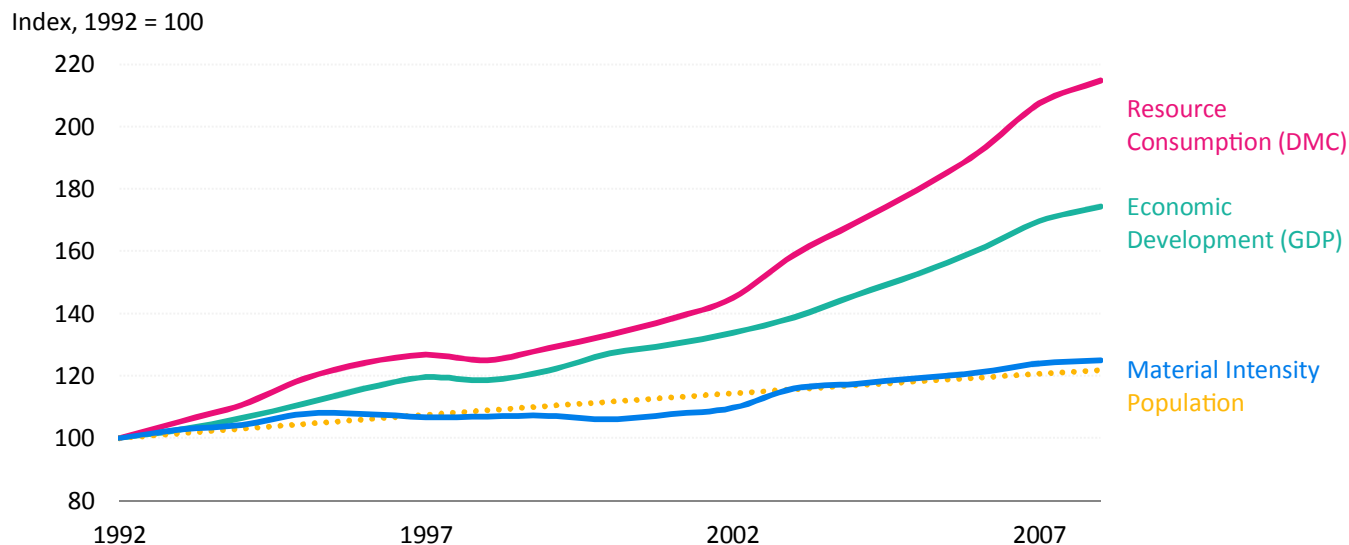


Source: CSIRO-UNEP 2013

Compared to 1992, the use of materials in Asia and the Pacific more than doubled from 17.4 billion tonnes to over 37.4 billion tonnes in 2008. The consumption of construction materials grew fastest (176%), followed by metal ores and industrial materials (130%) and fossil fuels (106%), with the slowest growth occurring in biomass (47%) (CSIRO-UNEP 2013).

The growth in material use is driven by the rapid industrial transformation and urbanization, as well as the growth in per capita incomes, changing lifestyles and consumption patterns which typically accompany this transition. Large quantities of materials are required to construct new buildings and transport infrastructure in fast growing cities, and in establishing globally dominant manufacturing capacity. This trend began as early as the 1970s (Schandl and West 2010), and over the period 1992 to 2008 it has been mainly the result of growth in China. The global financial crisis of 2008 appears to have had little impact on the rate of growth in materials consumption within Asia and the Pacific, in contrast to the clear impact it had in the rest of the world (Schandl and West 2012).

Resource Use Intensity in Asia and the Pacific



Source: CSIRO-UNEP 2013

Over the last two decades, growth in material use has outpaced GDP growth within Asia and the Pacific, leading to an increase in the material intensity (the ratio of resource consumption and economic development) of the region's economy, contrary to the trend for the rest of the world (UNEP 2011). In 2008, Asia and the Pacific required 22% more materials per unit of economic output compared to 1992. This contradicts any expectation that technological innovation and increasing resource efficiency will emanate spontaneously and act to slow growth in natural resources consumption. Asia and the Pacific is rapidly modernizing its cities and infrastructure, and replacing traditional technologies with industrial technologies, which typically facilitate much higher total resources throughput and produce more emissions. While this transition is usually accompanied by improved material intensity at the individual country level, this effect is more than being offset at the regional level as the relative share of economic activity performed in more materials intensive economies increases at the expense of the more efficient economies (Schandl and West 2010, UNEP 2011). This dynamic is currently preventing any decoupling of economic growth and wellbeing from resource use and emissions production. Overcoming this will require well designed policies and targeted investments to increase resource efficiency and systems innovation in the housing, transport, food, and energy sectors.

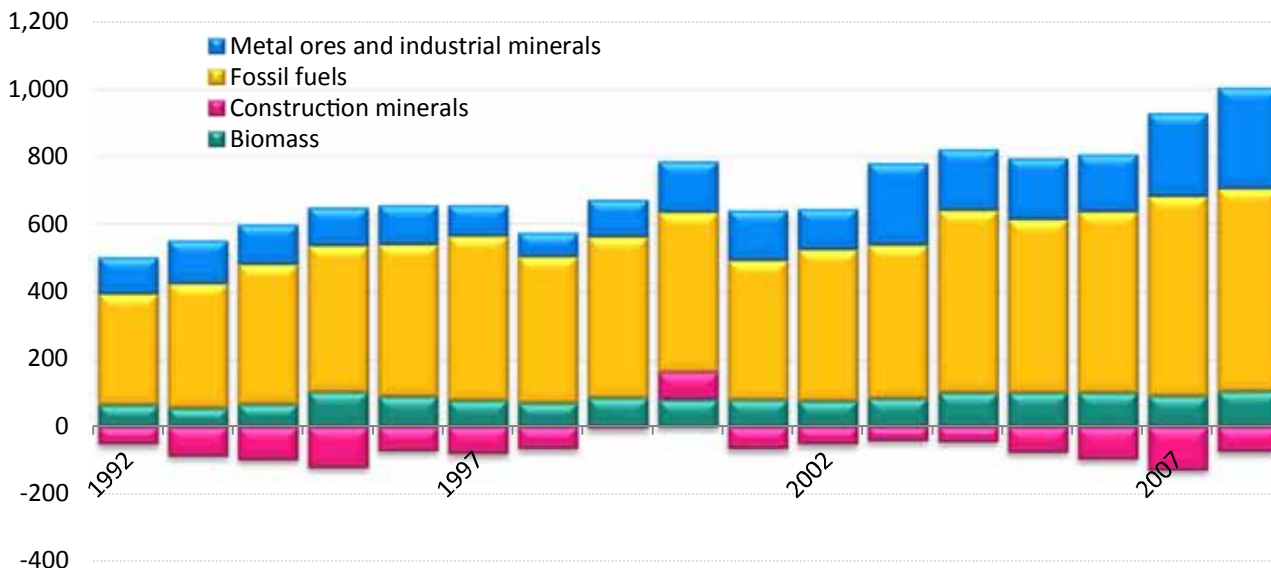
The industrial and urban transformation has changed the resource base, from renewable to non-renewable resources



Physical Trade Balance of Asia and the Pacific

(Major categories⁸ 1992-2008)

Million tonnes

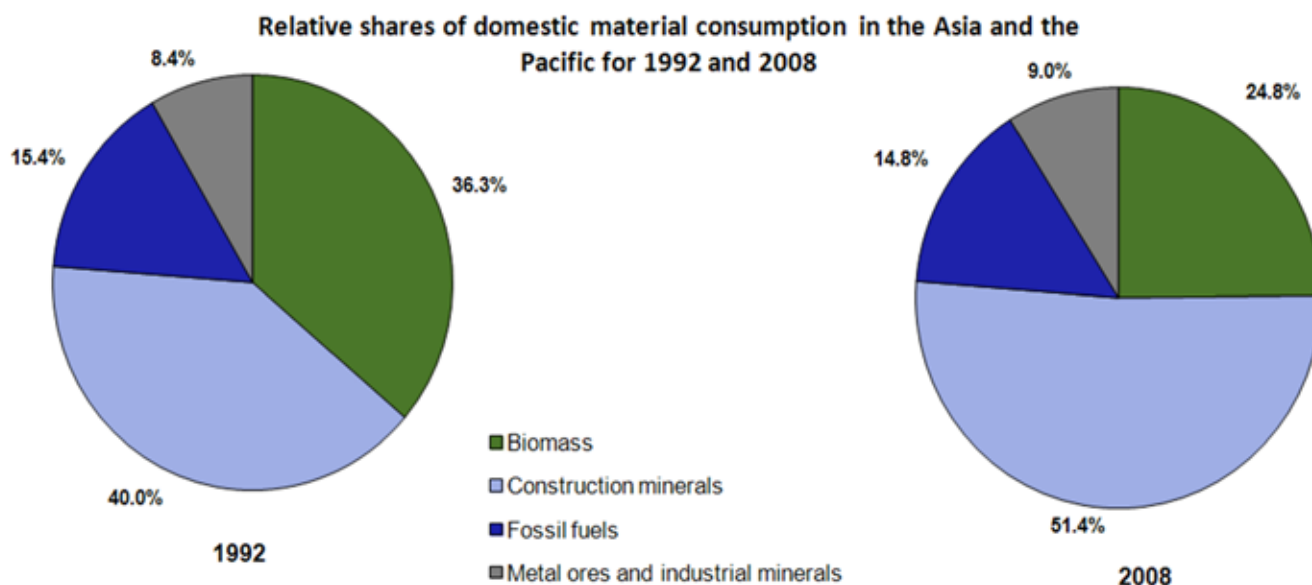


Source: CSIRO-UNEP 2013

Imports required to supply Asia and the Pacific with raw materials have doubled since 1992, from just over 500 million tonnes to around 1 billion tonnes in 2008. The greatest dependencies on imports from outside the region are for fossil fuels and metal ores, with biomass imports also becoming more important. As countries in Asia and the Pacific deplete their domestic resource bases, the region's dependence on foreign resources can be expected to grow, making the economic future of the region more dependent on world markets for strategic materials, and thus increasing vulnerability to fluctuations in international prices.

⁸ These are imports and exports (negative scale). Construction minerals are exported.

The share of renewable biomass resources consumption is declining, with implications for future environmental impacts



Source: CSIRO-UNEP 2013

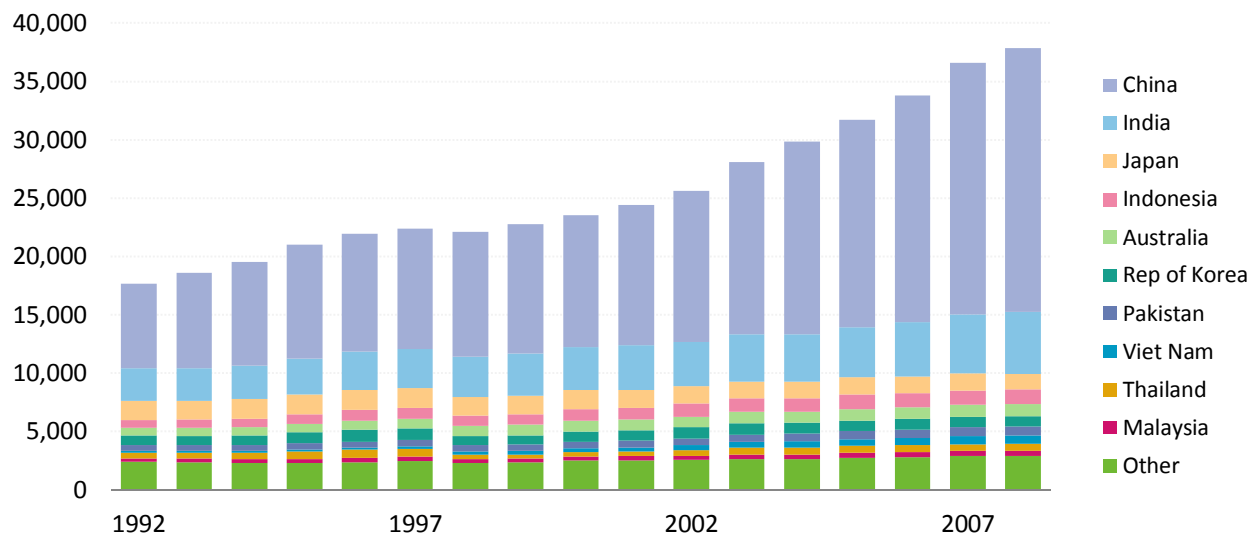
The societal transition taking place in many countries in Asia and the Pacific, from biomass based agricultural economies to minerals and fossil fuel based industrial economies, leads to an increase in the overall share of non-renewable, mineral material resources in the region's materials consumption, and a decrease in the share of renewable biomass resources. This continues a pattern clearly evident in data extending back to at least the 1970s (UNEP 2011d). This ongoing process of industrial transformation and the related changes in the resource base have resulted in new environmental impacts on human and ecosystem health, and changed the rate at which different resources are being depleted. While deforestation pressures have decreased in some countries as the energy system has become decoupled from wood fuel and the extensive land areas required to produce it, industrial waste products and emissions of toxic substances have increased. The new and rapidly changing environmental impacts associated with changing modes of production and consumption in the region call for new and innovative policies to address them.

China now dominates material consumption in Asia and the Pacific, with global implications



Ten Highest Domestic Material Consumers of Asia and the Pacific

Million tonnes

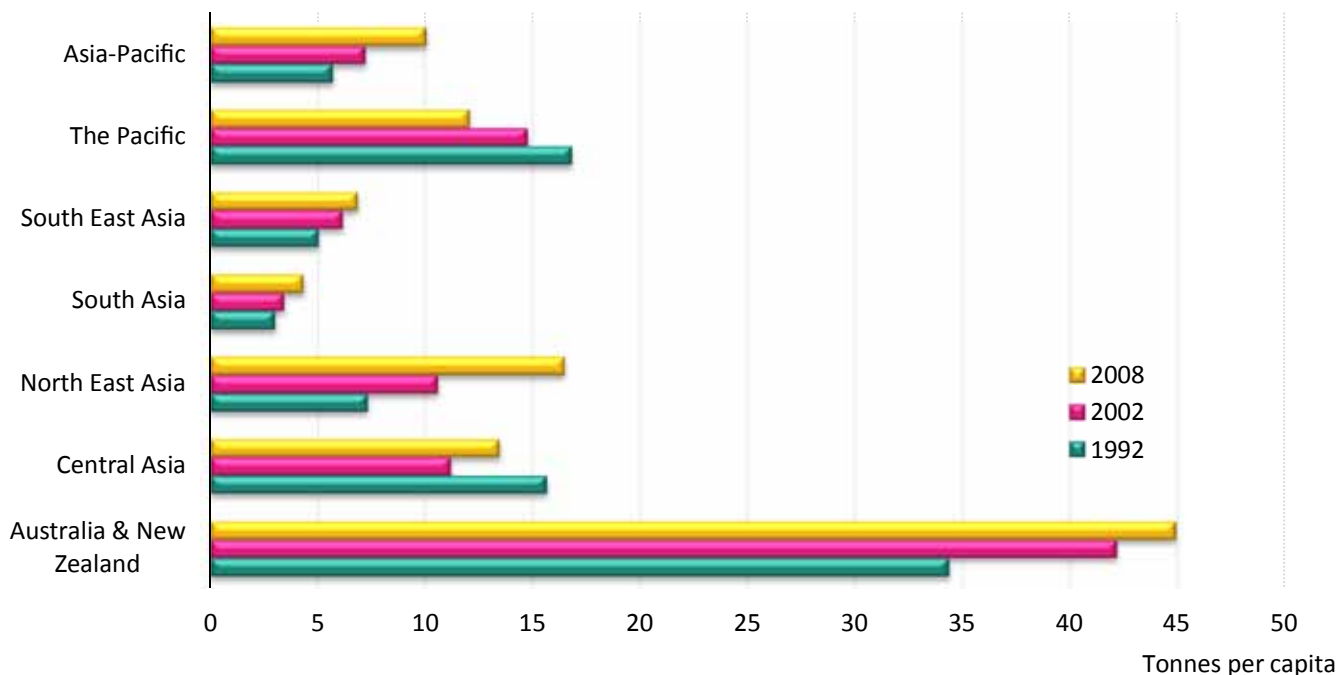


Source: CSIRO-UNEP 2013

Most of the growth in material use in Asia and the Pacific can be attributed to a small number of countries, most notably, China and India. China in particular has experienced very rapid growth in materials use, which more than tripled over the last two decades. This massive growth in natural resource use has enabled China to grow and modernize its cities and manufacturing base, and has helped to lift hundreds of millions of people out of poverty. Growth in material use in India was less pronounced and reflects slower economic growth, much lower levels of investment in infrastructure compared to China, and greater inequality in living standards. There is significant potential for future growth in material use in India, and also in countries such as Indonesia, Pakistan and Viet Nam, suggesting that the current annual materials consumption of 37 billion tonnes could reach about 80 billion tonnes by 2050 (UNEP 2011d). The only country in the region which managed to reduce its consumption of materials since 1992 is Japan. This resulted from a combination of very active resource management policies, very low economic growth, and relocation of material intensive industries to other countries (Schandl and West 2012).

Large differences in per capita material use between the sub-regions persist

**Domestic materials consumption per capita for Asia-Pacific
and its sub-regions (1992, 2002 and 2008)**
(Tonnes per capita)



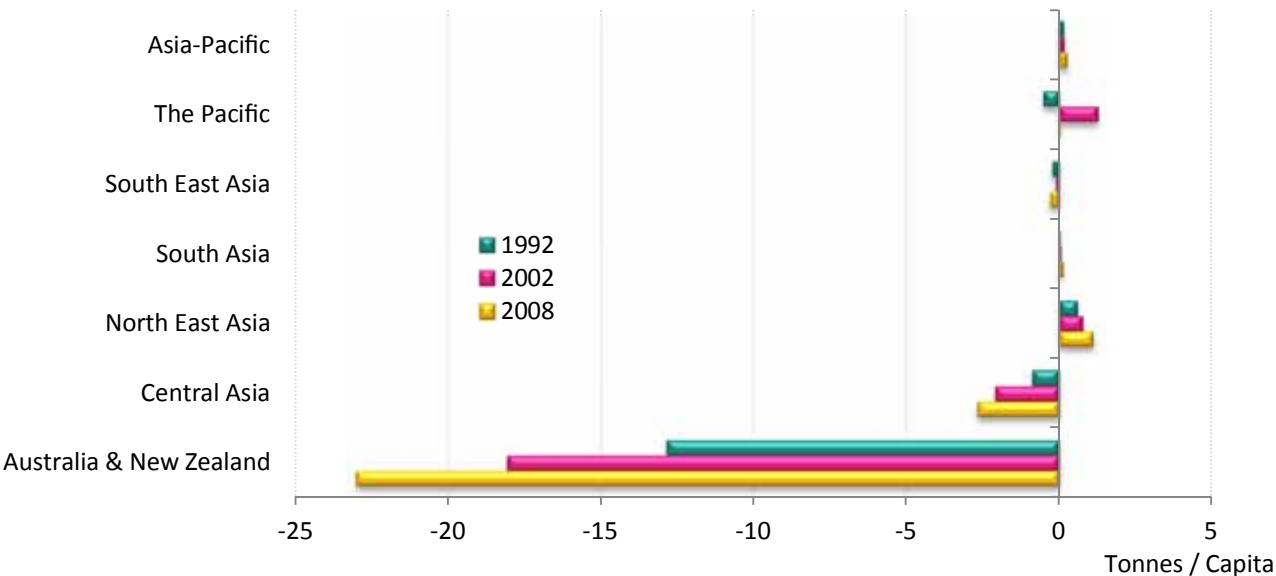
Source: CSIRO-UNEP 2013

Despite large efforts made to promote the Millennium Development Goals in many countries, material standards are still very unequal, with many countries not achieving high development as measured by the Human Development Index. These disparities in development and living standards are also reflected in differences in per capita materials consumption among sub-regions. Australia and New Zealand are by far the largest per capita material consumers in the region, followed by North East Asia, which has more than doubled its per capita material consumption over the past two decades. South-East Asia, and to an even greater extent South Asia, show a very low per capita material use, suggesting high potential for growth in the future as people's aspirations for modern lifestyles are achieved via further economic growth and increases in natural resource use.

Australia, New Zealand and Central Asia are the main suppliers of natural resources



**Physical trade balance per capita for Asia-Pacific
and its subregions (1992, 2002 and 2008)**
(Tonnes per Capita)



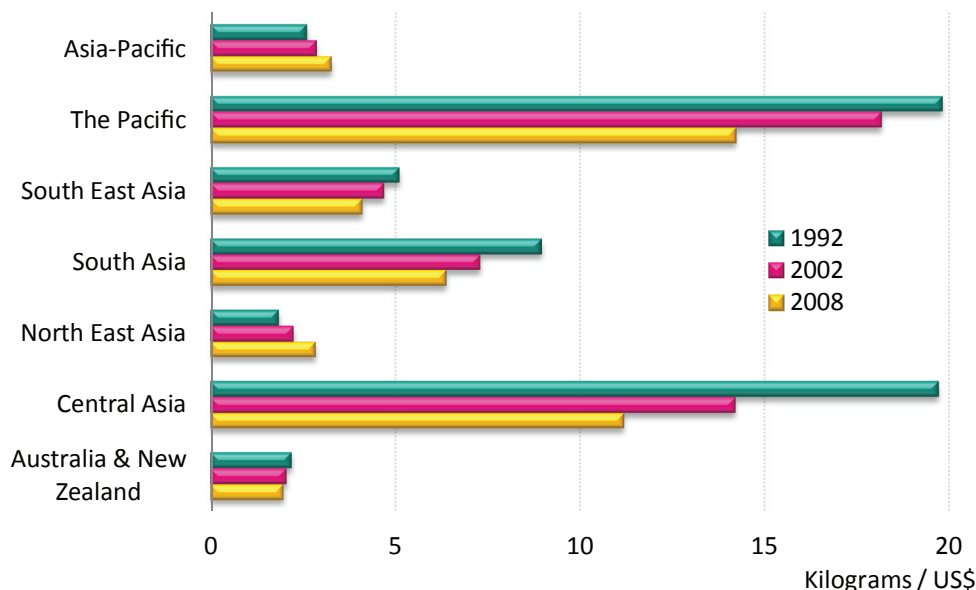
Source: CSIRO-UNEP 2013

The Physical Trade Balance for the different sub-regions in Asia and the Pacific shows Australia and New Zealand⁹ as a very large and rapidly growing net exporter of primary resources on a per capita basis. More detailed (by country and material category) data at <http://www.csiro.au/AsiaPacificResourceFlows> indicates that this is dominated by fossil fuels, metal ores and industrial minerals. Central Asia has also continued to increase its per capita primary net exports, mainly of petroleum, but also metal ores. In all other sub-regions, the per capita trade balance has remained very small over the last two decades, however the growth trajectory for North East Asia signals the magnitude of growth in net imports that may lay ahead for both South-East Asia and South Asia, as both regions have relatively high population densities and so will have limited ability to meet the higher per capita resource requirements which accompany industrialization, from their domestic resources.

⁹ Australia (with its dominant mining industry) is a primary resource, while New Zealand is an importer.

While most sub-regions have improved material efficiency, the region as a whole has a decline in material efficiency, due to shifts in North East Asia

Material Intensity for Asia and the Pacific and its Sub-regions (Year 2000 constant US\$)



Source: CSIRO 2012

Most sub-regions and countries in Asia and the Pacific have improved material efficiency over the last two decades, with quite large improvements in Central Asia and the Pacific. North East Asia has become much less efficient in converting natural resources to economic output. The region as a whole experienced a decline in material efficiency, counter-intuitively explained by the large shift in the share of economic activity performed in less materials intensive countries, at the expense of more resource efficient countries. The most resource efficient economy in Asia and the Pacific, Japan, has reduced its relative share of regional economic activity over the period, while China, a much more materials intensive producer, has greatly

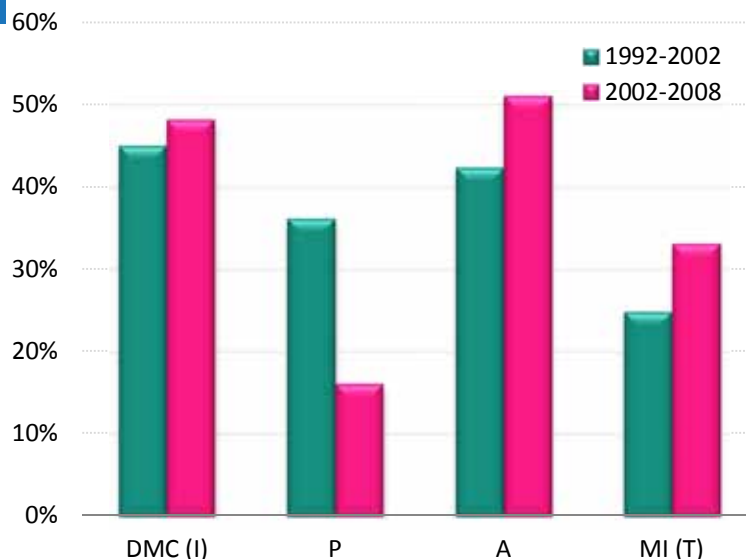
increased its share. It is important to note that Japan's very low materials intensity is related to its off-shoring of materials intensive industries (Schandl and West 2012), which is not an option open to all countries.

Increasing resource prices and greater price volatility in recent years has highlighted the need for countries and businesses to invest in resource efficiency, to remain competitive and to secure their future prosperity. However it is apparent that market forces alone are not sufficient to halt the deterioration in resource efficiency at the regional scale, which implies a central role for policies directly targeted.



Increasing consumption, rising incomes and new industrial technologies have been the major drivers of increasing material use

Drivers of Increased Materials Consumption in Asia and the Pacific



IPAT analysis of changing relative importance of drivers of environmental impact for two periods 1992 to 2002, and 2002 to 2008. I, the environmental impact of interest here, is domestic material consumption (DMC). The three drivers are changing population (P), affluence (A, calculated as GDP in exchange rate based constant year 2000 \$US / population), and a technological coefficient (T, in this case material intensity, which is calculated as DMC / GDP). Note that $P + A + T = 100\%$.

Source: UNEP 2013

Material use in Asia and the Pacific grew by 45% in the decade between 1992 and 2002, and another 48% in the following six years to 2008, IPAT analysis can be used to analyse different drivers of environmental impacts (UNEP 2011). In summary, rising per capita incomes, i.e. affluence, and the changes in consumption behaviour which accompany them have been the most important driver of increasing material use since 1992. Affluence accounted for 42% of the growth in materials use from 1992 to 2002, and for over 51% from 2002 to 2008. Population has become less important as a driver of material use as birth rates have declined throughout Asia and the Pacific. Technology and innovation can moderate material growth caused by rising populations and affluence, through lowering materials intensity. While usually true at the country level, materials intensity has increased at the regional level, accounting for 25% of the increase in materials consumption from 1992 to 2002, and 33% from 2002 to 2008. Whilst technological innovation and resource efficiency will be important for controlling future growth in resources use, it will not be sufficient to ensure the decoupling of economic growth from materials use and emissions.

ATMOSPHERE



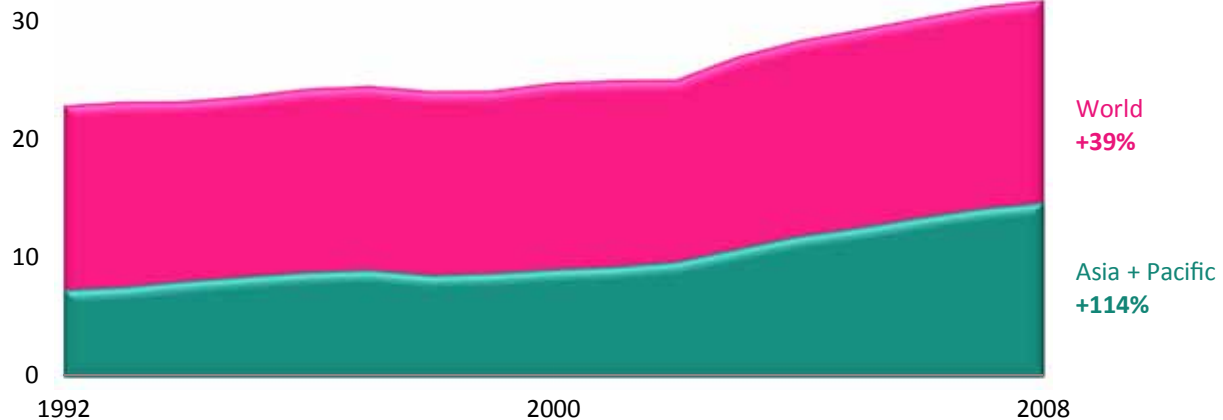
UN Photo/Kibae Park (January 2007)

The region's CO₂ emissions continue to rise and contributed 46% of the world's total emissions in 2008

Emissions of CO₂ in Asia-Pacific and the World (Total*)

Thousand Million
Tonnes of CO₂

World
30,600 million tonnes
in 2010 (IEA 2011)



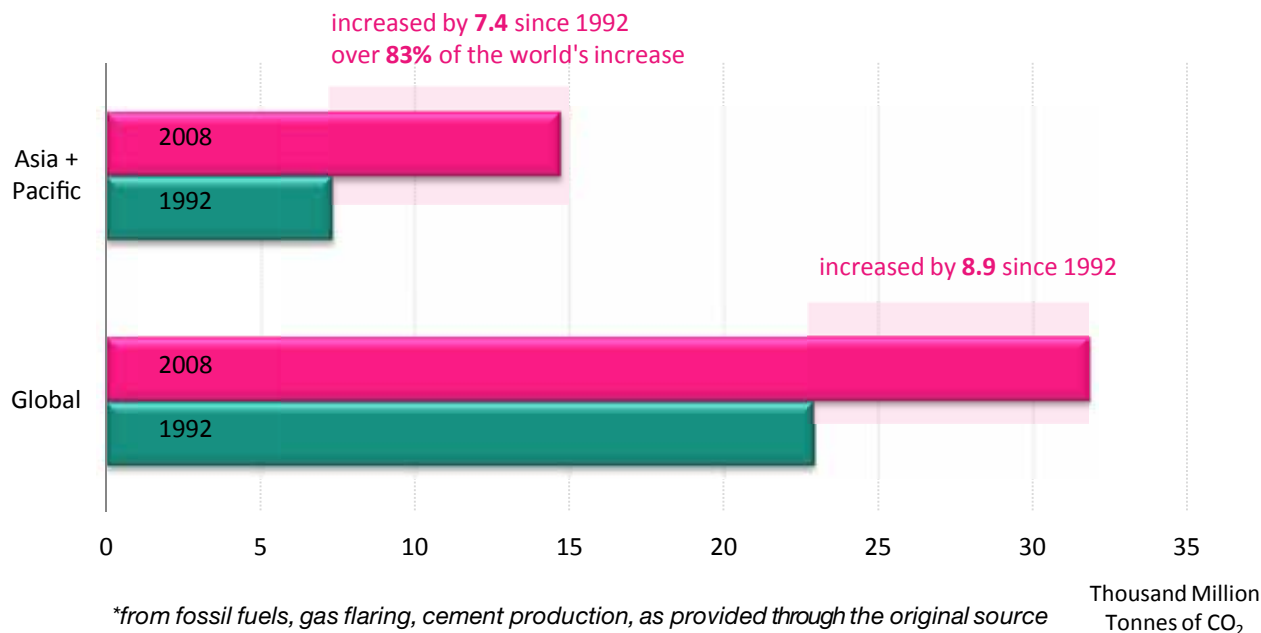
Source: UNEP Environmental Data Explorer, as compiled from CDIAC 2008

Recent estimates show that global CO₂ emissions amounted to 30,600 million tonnes in 2010 (UNEP 2011, as cited from IEA 2011).

About 12% of the change in atmospheric CO₂ stems from deforestation (van der Werf, et al 2009) particularly in Indonesia, Malaysia and Papua New Guinea.

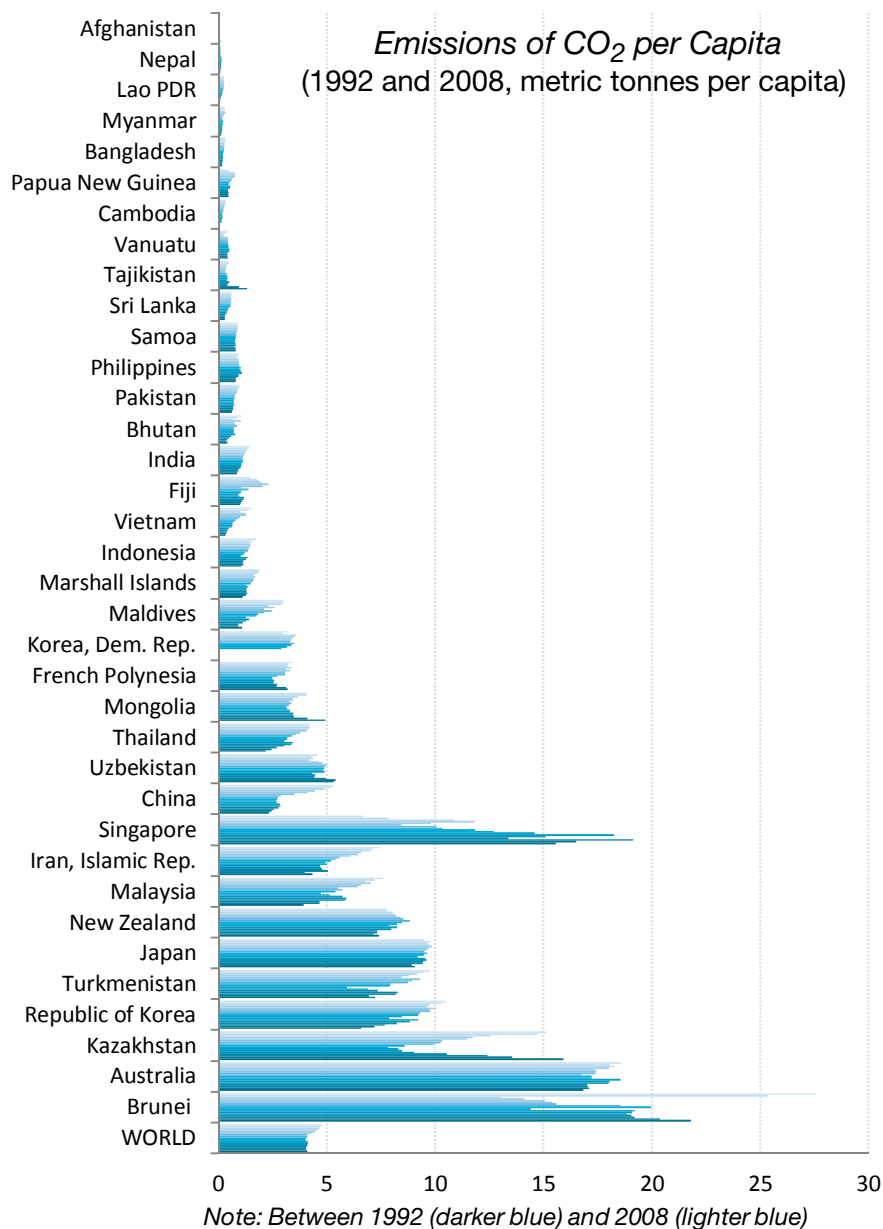
Between 1992 and 2008, 83% of global CO₂ emissions increase is from Asia-Pacific

Emission Growth in Asia-Pacific and the World: 1992-2008



Source: UNEP Environmental Data Explorer, as compiled from CDIAC 2008

Between 1992 and 2008, Asia and the Pacific CO₂ emissions increased by nearly 7.5 thousand million tonnes (or about 114%), up from about 7 to almost 15 thousand million tonnes. By 2008, the region was responsible for over 45% of the global total CO₂ emissions, representing over 83% of the world's total increase.



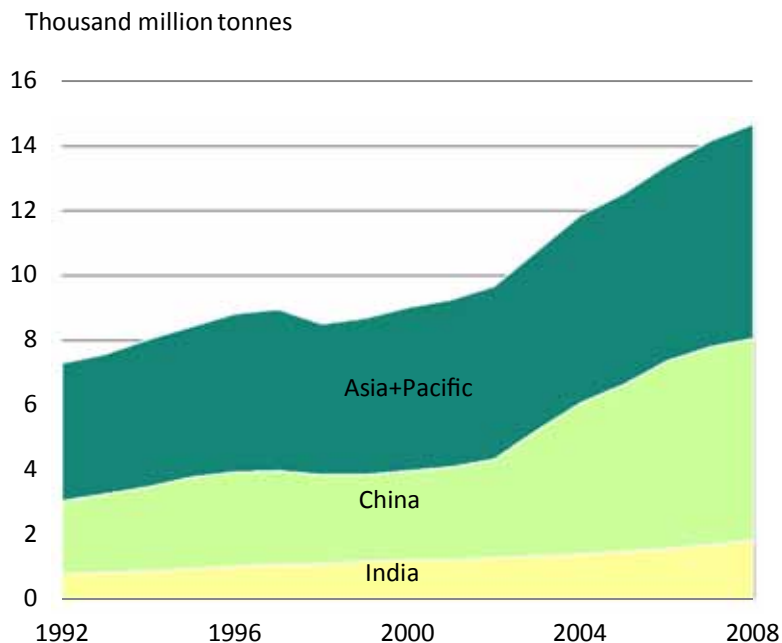
Source: World Bank 2011

Large differences exist between countries across the region. Between 1992 and 2008, in general, Asia and the Pacific's more developed countries emitted more CO₂ per capita and more than the world average.

The region's developing countries emitted a much lower CO₂ per capita than the world's average, but their total emissions increased over that period.

In 2008, CO₂ emissions from fossil fuels and cement production in China and India accounted for 67% of the total emissions in Asia & the Pacific

Emissions of CO₂ (from cement production and fossil fuels)



Source: UNEP Environmental Data Explorer, as compiled from *CDIAC 2008*

With global economic growth, and developing countries like Brazil, China and India investing significantly in large development, infrastructural and manufacturing projects, the growth of CO₂ emissions in developing countries over the last few years rapidly increased (UNEP 2011).

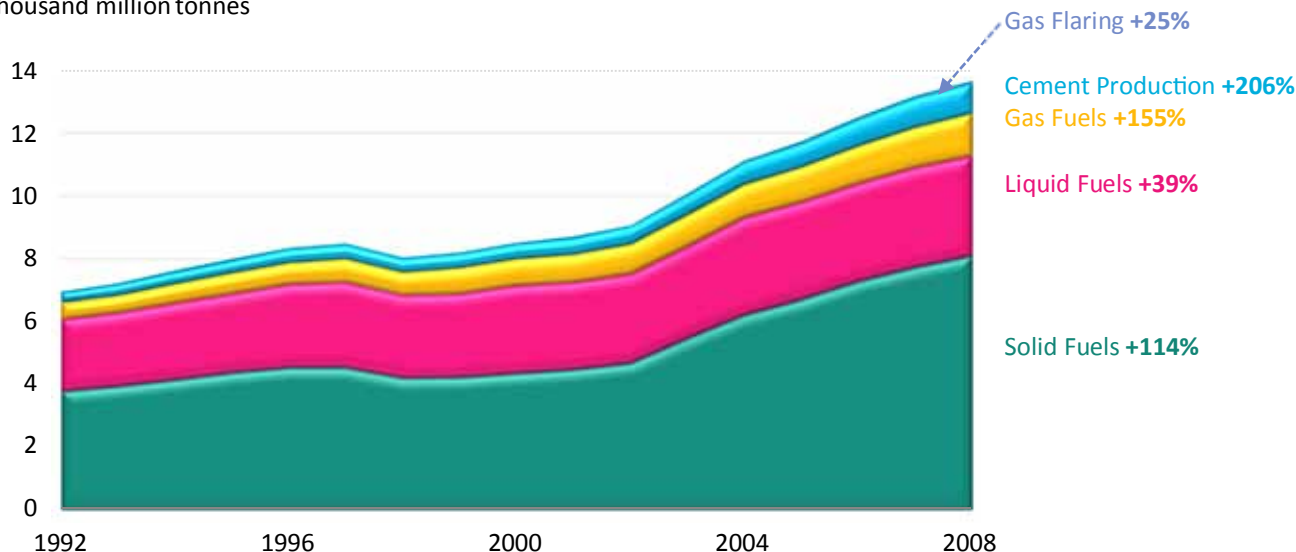
In 2008, China and India's CO₂ emissions from cement production and fossil fuels consumption alone accounted for nearly 10,000 million tonnes: 67% of the region's total, 31% of the world's total, up from 53% of the region's total or 17% of the world's total in 1992.

The production of cement not only demands very high energy inputs, but also releases CO₂ directly through the heating of calcium carbonate, which produces lime and carbon dioxide (UNEP 2011).

Solid fuels consumption in Asia and the Pacific has increased by 114% between 1992 and 2008

Emissions of CO₂ in Asia-Pacific (Total, by type)

Thousand million tonnes



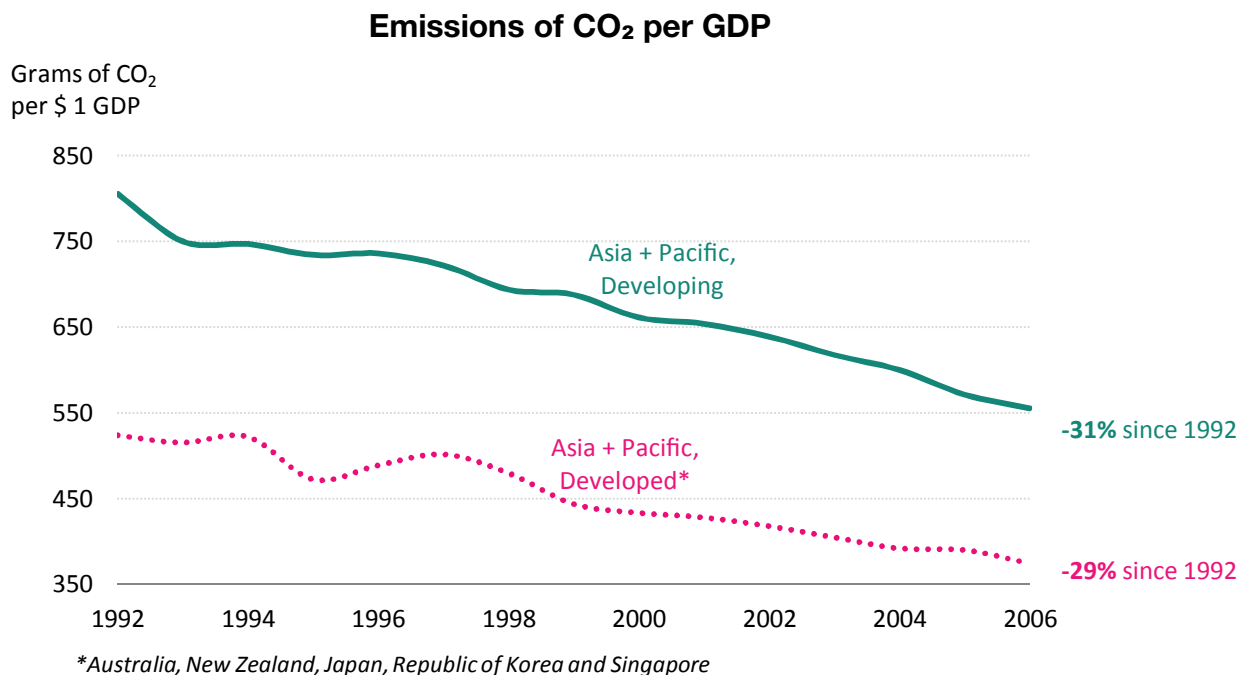
Source: UNEP Environmental Data Explorer, as compiled from CDIAC 2008

The main uses of fossil fuels are for generating electricity, enabling transport and producing heat. Their combustion leads to a release of CO₂ into the atmosphere which in turn influences the earth's climate (UNEP 2011).

Over the past two decades, the highest contribution in Asia and the Pacific to emissions of CO₂ is from solid fuels consumption, increasing by 114% from 3,700 million tonnes in 1992 to over 8,000 million tonnes in 2008.

Like other parts of the world, Asia and the Pacific's cement production the fastest growing source of CO₂ emissions, up 206% from about 300 million tonnes in 1992 (5% of total emissions) to nearly 1,000 million tonnes in 2008 (7% of total emissions).

...however, production processes are becoming more energy-efficient



Source: UNEP Environmental Data Explorer, as compiled from CDIAC 2007

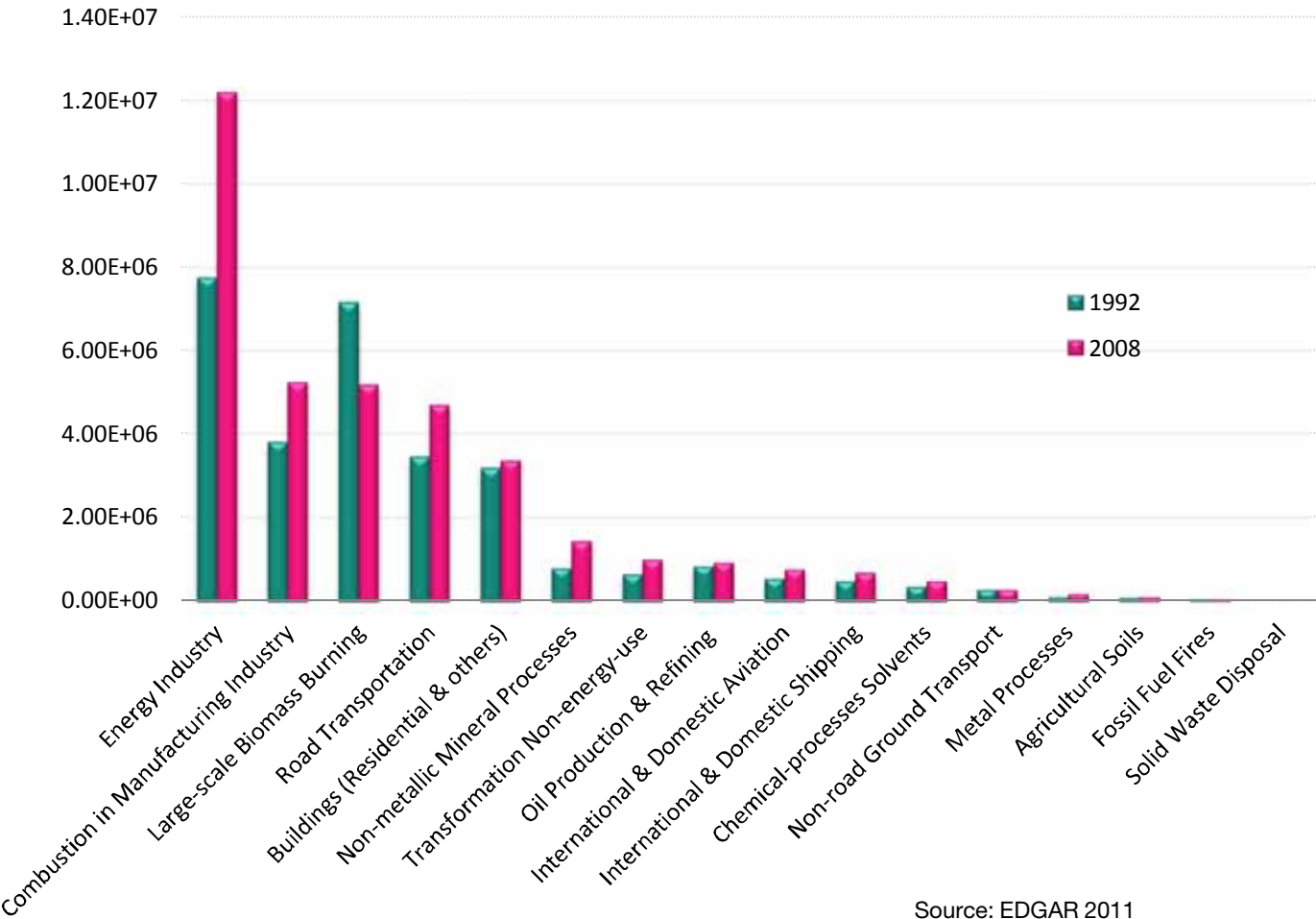
Economic growth continues to increase while efforts to 'decouple' CO₂ emissions (reduction of emissions per unit of GDP) are being witnessed within the region. Applying new technologies to use energy and resources more efficiently is a means towards decoupling (UNEP 2011).

The graph shows a total improvement of 31% in developing countries and 29% in more developed countries, from 1992 to 2006, indicating some relative decoupling of CO₂ emissions for each dollar of GDP generated.

However, this is likely to have been influenced by the increasing value of the service industry, which has less energy- (and thus emissions) intensive impacts (UNEP 2011).

Sectors emit the most greenhouse gases in the world

Kilotonnes of CO₂

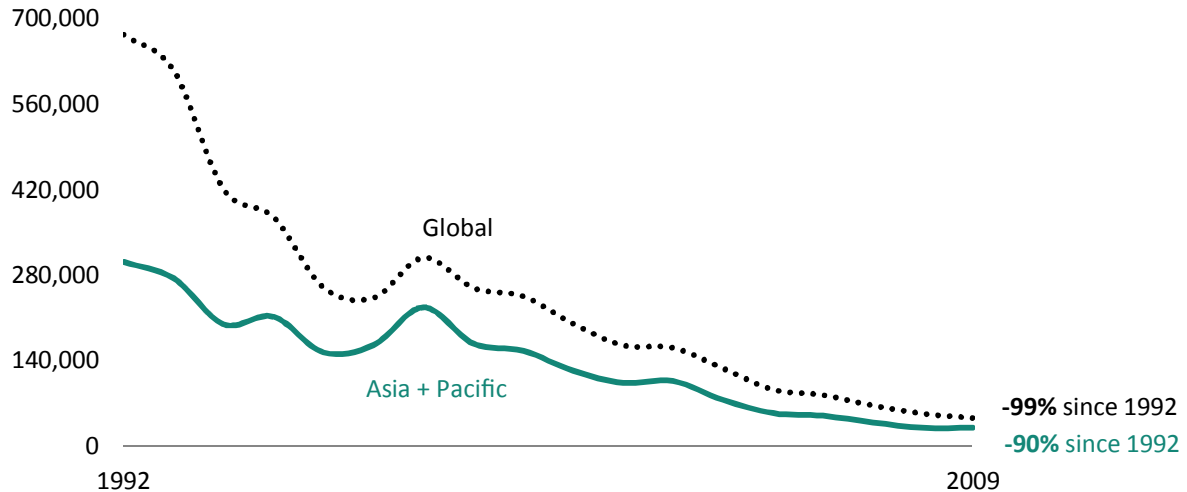


Source: EDGAR 2011

The Montreal Protocol: “... the single most successful international agreement”

Consumption of Ozone-Depleting Substances

Ozone Depleting Potential (ODP)
Metric Tonnes

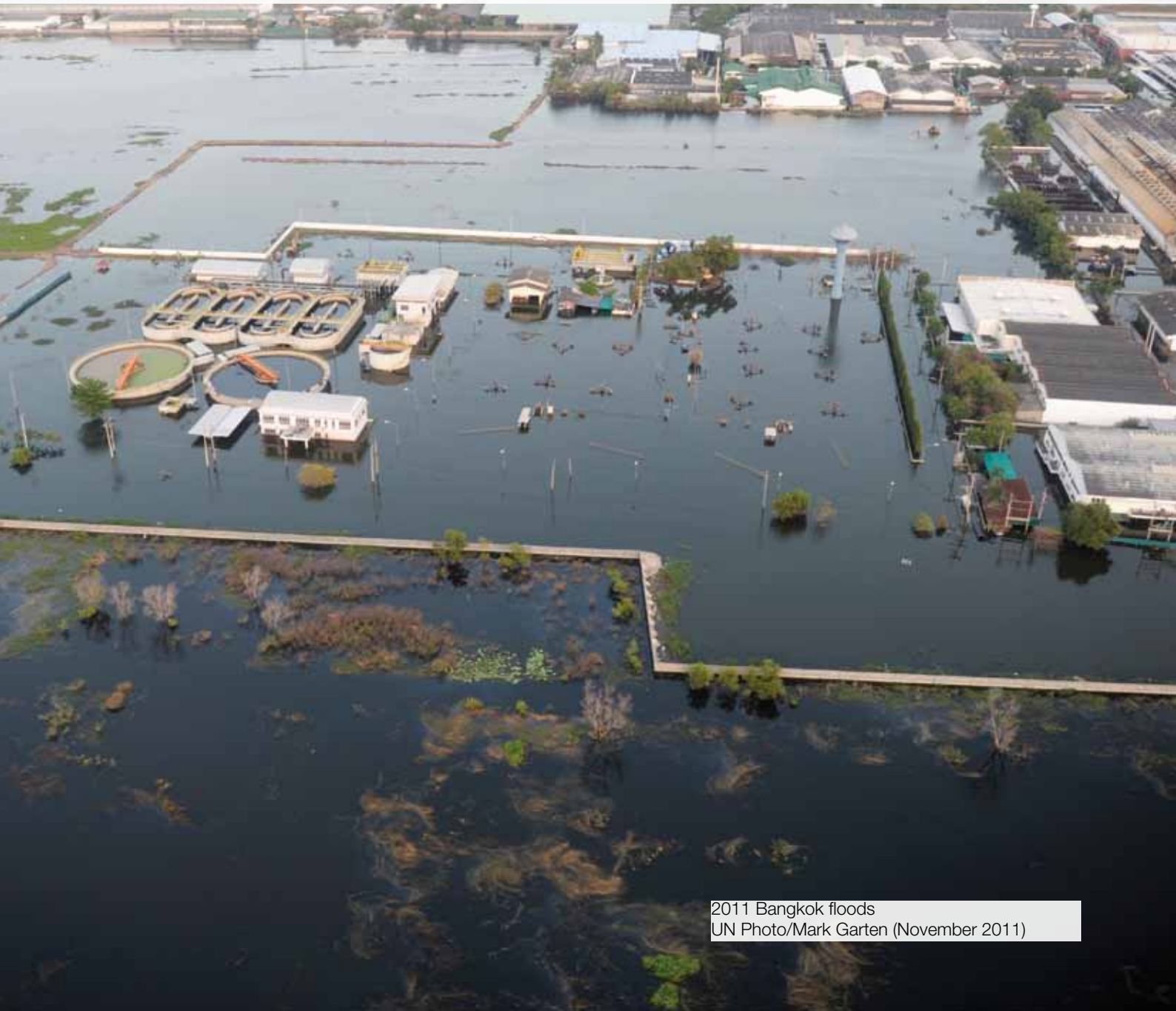


Source: UNEP Environmental Data Explorer, as compiled from UNEP 2009

Between 1992 and 2009, the consumption of ozone-depleting substances in Asia and the Pacific decreased by 90%.

The participation and commitment of nearly all countries (195 in 2011) is perhaps the single most successful international agreement to date. Production and consumption of ozone-depleting substances still continues through exemptions (i.e. for specific agricultural purposes) or illegal use and the use of compounds such as HCFCs and HFCs, which have a global warming potential 90 to 11,700 times higher than CO₂ are still to be phased out (UNEP 2011).

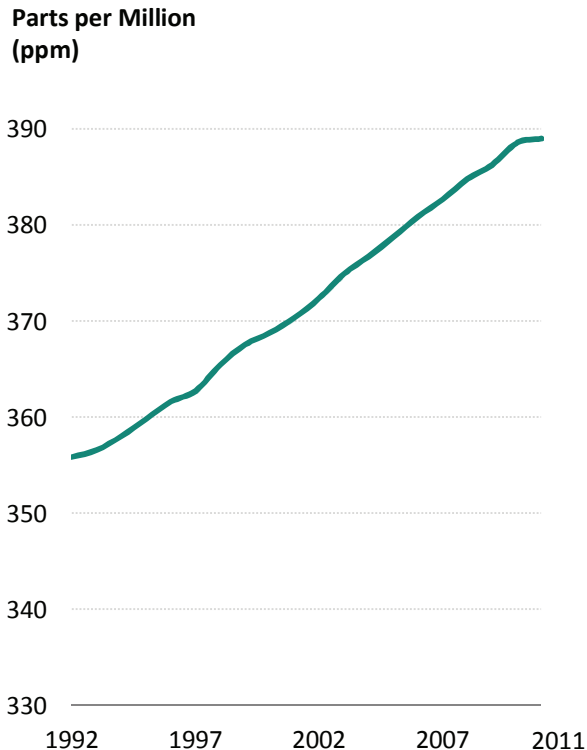
CLIMATE CHANGE



2011 Bangkok floods
UN Photo/Mark Garten (November 2011)

The average amount of CO₂ in the Earth's atmosphere continues to show a steady rise over the last two decades

Global Atmospheric CO₂ Concentration



Source: UNEP Environmental Data Explorer,
as compiled from NOAA 2011

The global concentration of carbon dioxide (CO₂)¹⁰ shows a steady mean increase between 1992 and 2011 from 357 ppm (parts per million by volume) to 400 ppm. Seasonal variations of about 5 ppm each year correspond to changes in uptake of CO₂ by the world's land-based vegetation, influenced by the greater vegetation extent and mass in the Northern Hemisphere (UNEP 2011).



According to CSIRO 2006, climate modeling indicates temperature increases in the region of 0.5-2 °C by 2030 and 1-7°C by 2070. Models also indicate increasing rainfall throughout much of the region in the decades ahead, including greater rainfall during the important summer monsoon. Winter rainfall is projected to decline in South and South East Asia, suggesting increased droughts in the winter monsoon. Asia and the Pacific region will be affected by a rise in global sea level of approximately 3-16 cm by 2030 and 7-50 cm by 2070 in conjunction with regional sea level variability¹¹.

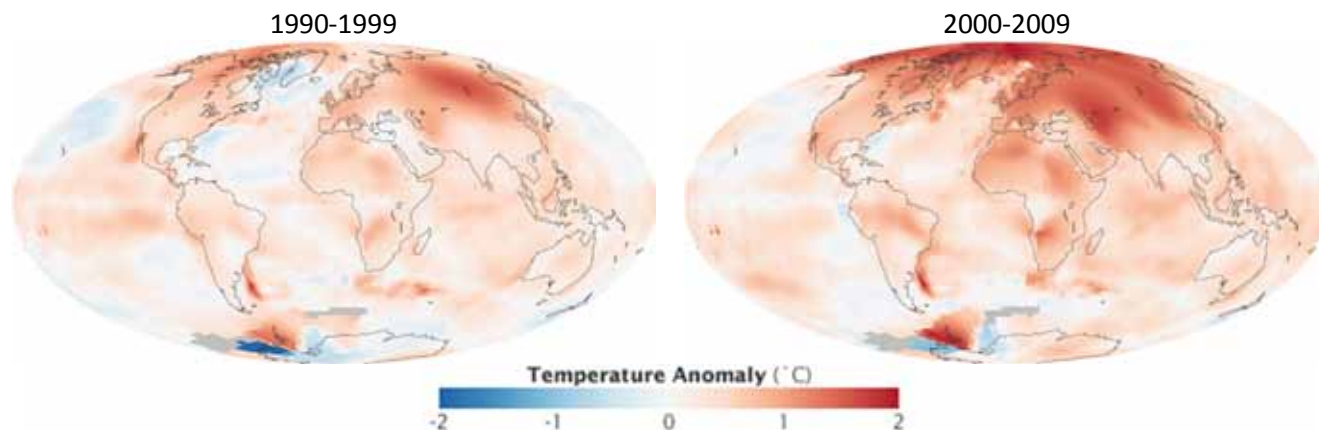
Many countries within the region already struggle to cope with the current climate variability to which they are exposed including tropical cyclones, rainfall extremes, frequent droughts, and extreme tides. This variability is increasing with climate change, leading to more pronounced extremes.

¹⁰ The concentration of carbon dioxide (CO₂) in the Earth's atmosphere is measured at Mauna Loa, Hawaii since 1958, and at five other stations subsequently.

¹¹ More extreme projections are becoming available.

The last decade was the warmest ever recorded since 1880

Temperature Anomaly



Source: NASA 2010c

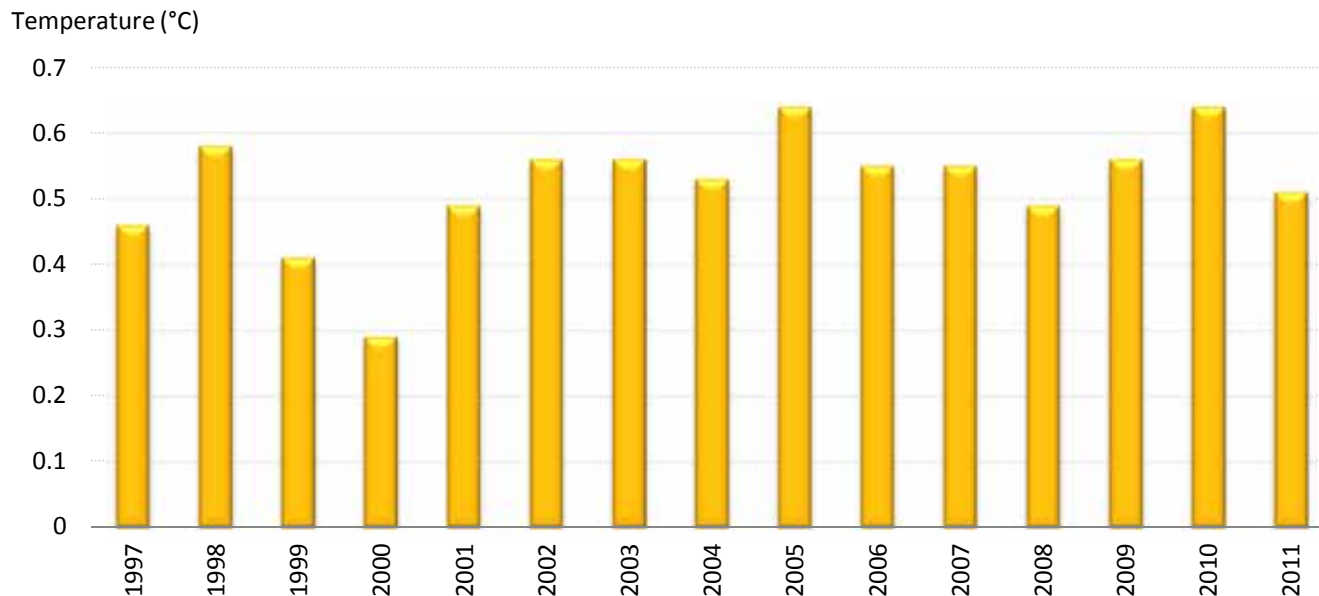
According to the temperature analysis carried out by NASA GISS¹², the average global mean temperature has increased by about 0.8 °C since 1880. Two-thirds of the warming has occurred since 1975, at a rate of about 0.15-0.20 °C per decade. The average mean atmospheric temperatures show yearly variations, caused for example by tropical El Niño – La Niña cycles (UNEP 2011).

The maps above show the distribution of the temperature anomalies for two decades. The warmer than average temperature is shown in red, the cooler in blue. The last decade (2000-2009) was the warmest decade ever recorded since 1880.

¹² NASA Goddard Institute for Space Studies (GISS)

Warmest years on record have been recorded recently

Hottest Years in Record
(Combined ocean and surface temperature, °C)



Source: NASA 2012

Nine of the 10 warmest years in the modern meteorological record have occurred since the year 2000 (NASA 2012).

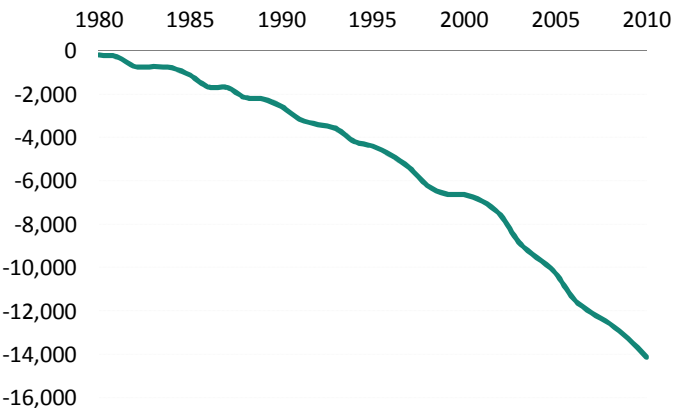
According to NOAA 2012 statistics, year 2011 was the 11th warmest year since records began in 1880. The annual global combined land and ocean surface temperature was 0.51°C above the 20th average of 13.9°C. the warmest years on record were 2010 and 2005, which were 0.64°C above average.



Melting glaciers and ice caps are “canaries in the coal mine” for climate change

Global Change in Glacier Mass

Mean Cumulative Net Balance



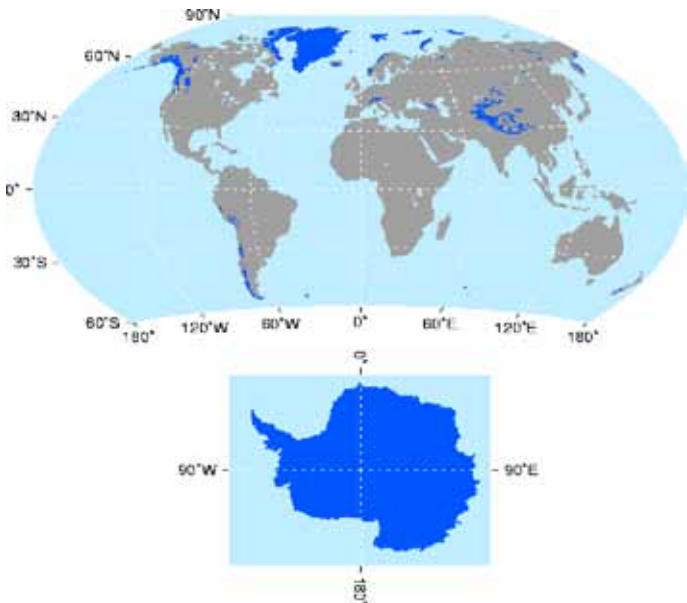
Millimeters

Source: UNEP Environmental Data Explorer, as compiled from WGMS 2010

Changes in glaciers and ice caps provide some of the clearest evidence of climate change, and as such they constitute key variables for early detection strategies in global climate-related observations. These changes have impacts on global sea level fluctuations, the regional to local natural hazard situation, as well as on societies dependent on glacier meltwater. (UNEP and WGMS 2008).

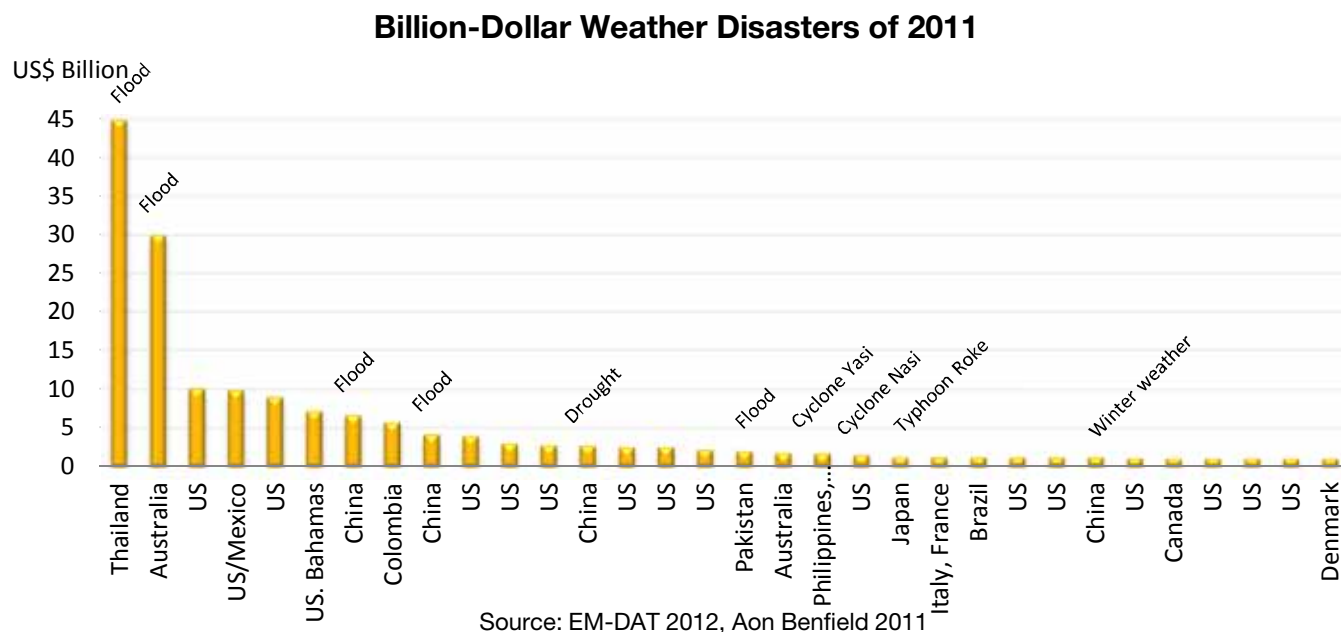
The previous record loss in the year 1998 was exceeded three times in the years 2003, 2004 and 2006, with the losses in 2004 and 2006 being almost twice as high as the previous 1998 record loss. UNEP emphasized that climate change is triggering a shrinking and thinning of many glaciers worldwide, which may eventually put at risk water supplies for hundreds of millions of people (UNEP 2010a).

NSIDC lists the following countries in Asia and the Pacific having glaciers: Afghanistan, Bhutan, China, Indonesia, India, Nepal, New Zealand, Pakistan, and the French Southern Territories in the Pacific.



Source: GLIMS Glacier Database at NSIDC 2012

The cost of weather-related disasters is constantly increasing



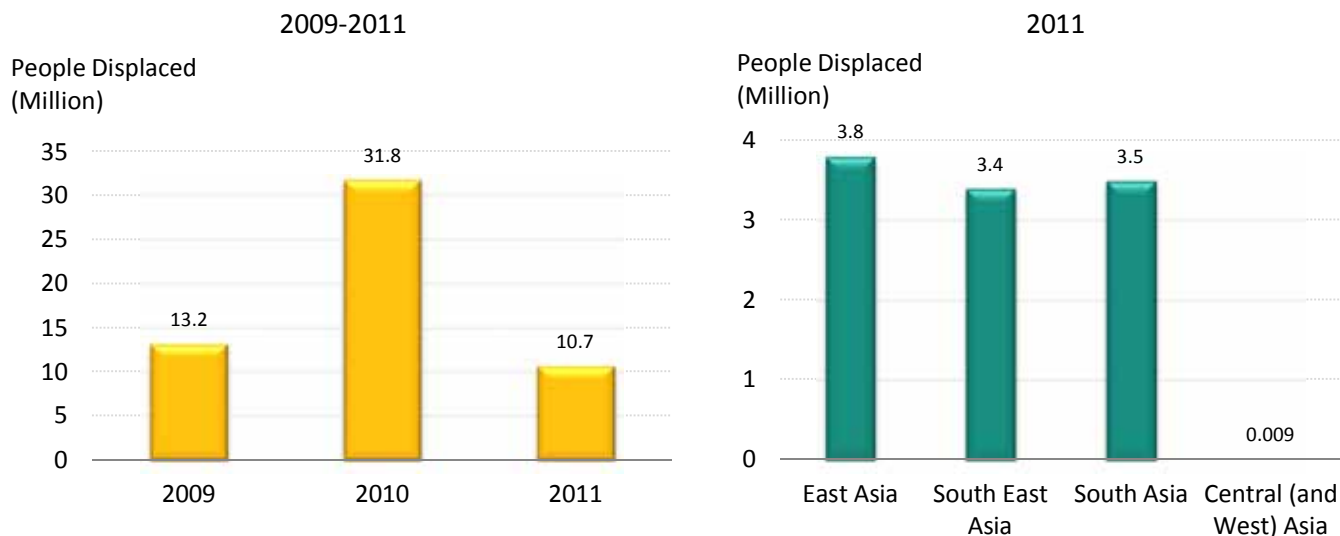
In 2011 ten out of 32 weather disasters worldwide with more than 1 billion-dollar damage occurred in Asia and the Pacific, specifically Thailand, Australia, China, Pakistan, the Philippines, and Japan (EM-DAT 2012, Aon Benfield 2011):

- The Thailand flooding in 2011 was the most expensive natural disaster in Thai history, as a result of heavy monsoon and tropical cyclone rains enhanced by La Niña conditions.
- The Australia flooding was also the most expensive natural disaster in Australian history. Heavy rains enhanced by La Niña conditions and record-warm ocean temperatures led to unprecedented rains and flooding.
- In the Philippines, the second deadliest weather disaster in the country's history, Tropical Storm Washi, hit the southern Philippine island of Mindanao. Washi was unusually wet, as the storm was able to tap a large stream of tropical moisture extending far to the east, and drew moisture from an area where sea surface temperatures were nearly 1°C above normal. Washi's rains fell on regions where the natural forest had been illegally logged, and the heavy rains were able to run off quickly on the relatively barren soils creating devastating flash floods.
- The Pakistan flooding was the second most expensive weather disaster in Pakistani history, and led by heavy rains during the monsoon season, triggering devastating floods.

Climate change risks lead to new migration patterns linked with the trend of urbanization

Asia and the Pacific has become the focus of the discussion on climate-induced migration as it is 1) the most affected by disasters, 2) the most populous in the world, 3) with mass movements of people spurred by growing inequalities and regional integration and 4) where climate change is expected to take a heavy toll, particularly from flooding, cyclones, typhoons, and water stress (ADB 2012).

Estimated Displacement by Climate - Related and Extreme Weather Events in Asia



Source: ADB 2012, as compiled from Internal Displacement Monitoring Center

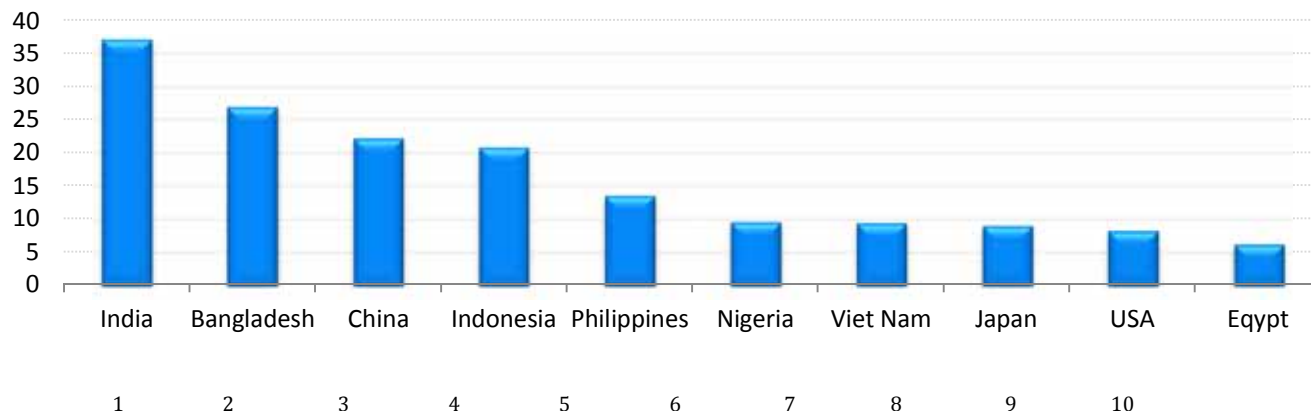
More than 42 million people were displaced in Asia and the Pacific in 2010 and 2011 combined as a result of extreme weather events that occurred in the region. In 2011, an estimated of 3.8, 3.4 and 3.5 million people were displaced in East Asia, South East Asia and South Asia, respectively.

Countries and populations of the region will be affected in different ways, leading to multiple migration patterns and scenarios. Migration flows are tied up with the general trend of rapid urbanization in the region; megacities will struggle even more to accommodate additional arrivals driven primarily or in part by environmental factors (ADB 2012).

Climate change is expected to take the heaviest toll on the Pacific, South Asia and South East Asia

Forecasted population at risk from sea level rise in 2050
(Top 10 countries globally*)

Number of People
(Million)



**Other Asian countries in the Top 20: Republic of Korea (12), Myanmar (13), Malaysia (16), Thailand (20)*

Source: ADB 2012, as compiled from Wheeler 2011

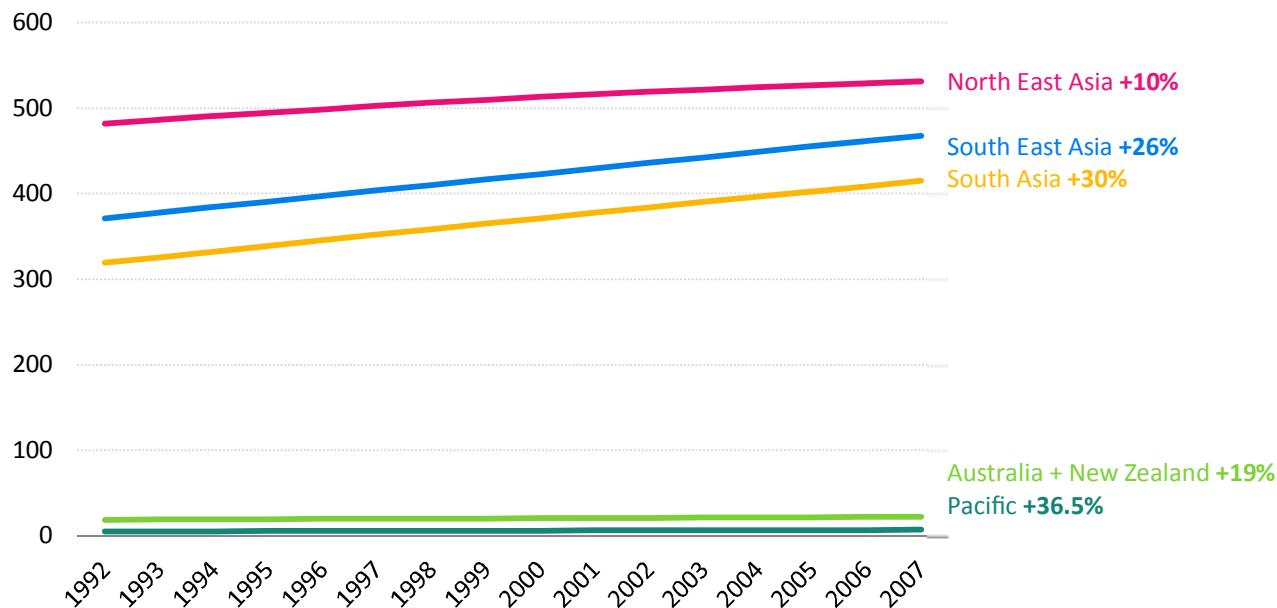
Focusing on the population at risk sea level rise by 2050, a forecasted ranking shows seven of the 10 countries worldwide are Asia and the Pacific countries. Nearly 40 million people in India will be at risk, more than 25 million people in Bangladesh (2nd), more than 20 million people in China (3rd) and Indonesia (4th), nearly 15 million people in the Philippines (5th), and nearly 10 million in Viet Nam (7th) and Japan (8th). Other Asian countries in the top 20 include Republic of Korea (12th), Myanmar (13th), Malaysia (16th) and Thailand (20th). However, it is important to note that these figures are absolute numbers. In relative numbers (per cent of population), Bangladesh is far more vulnerable than other countries.

In 2011, six of ten most vulnerable countries worldwide were in Asia and the Pacific.

By 2007, the region's 100 kilometer coastal zone was populated by 1,400 million people

Population within 100 kilometers¹³ of the Coast

Million People



Source: UNEP Environmental Data Explorer, as compiled by UNEP/DEWA/GRID-Europe 2007

Between 1992 and 2007, the population within 100 kilometers of the coast increased by nearly 250 million people (or about 20%) in Asia and the Pacific. North East Asia (+10% since 1992) tops the list, followed by South East Asia (+26%) and South Asia (+30%). The total populations (living within 100 kilometers of coast) of these three sub-regions combined was almost 1,450 million in 2007, increasing from about 1,200 million people in 1992.

¹³ The EU uses "50 km". Under the 100 km definition, a country like New Zealand is almost completely "coastal zone".

Impact of climate change in the Hindu Kush-Himalaya Mountains on water resources and overall economy in Pakistan

Agriculture is the dominant sector of the Pakistan economy. The country is largely dependent on the availability of irrigation water. It is already short of irrigation supplies to meet the current population growth and the need to improve the economy. Climate change scenarios for the next 50 years project higher temperatures in the high Himalayas resulting in more rapid melting of the glaciers which are an important source of water of the Pakistani rivers. This critical situation requires comprehensive analysis and identification of measures to mitigate the situation, arising mainly from climate change in the high mountains resulting in rapid melting of the glaciers and eventually shrinking of the glacier size and reduction in the resulting river flows (UNEP 2010b).



Pakistan 2010 floods
(Source: NASA 2010b)

Besides changing the lands around Pakistan's rivers, humans have also changed the waterway themselves. Most of the water in the upper Indus River basin runs down from glaciers in the Himalaya and Karakoram mountain ranges. Since the flow is not always sufficient to meet the needs of people downstream, dams, levees, and channels have been built to divert water for irrigation and to hold on to the sparse precipitation that the region usually receives (NASA 2010b).

Climate change vulnerability and adaptation in the livestock sector of Mongolia

Livestock herding is the dominant livelihood activity in Mongolia. The country is experiencing serious land degradation (AIACC 2007, as cited from Batima and others 2005). Over the past 40 years, pasture production has declined 20-30%. Rainfall has stayed relatively constant over this period, increasing slightly in some areas and decreasing in others. However, increases in mean temperatures ranging from near 1°C in the low mountains and on the plains of the Gobi desert to more than 2 °C in the high mountains have resulted in drying of soils and reduced forage production. Overstocking and overgrazing of pastures in the drier conditions has led to degradation of lands in parts of Mongolia. Dry years, combined with severe winters, have had devastating impacts on animal herds and herders. Climate projections indicate that temperatures will continue to rise strongly and suggest that the region may become drier (AIACC 2007).

Climate records show that the Mongolia climate has already changed significantly. Annual mean temperatures have risen by 1.8°C between 1940 and 2003. Water resources are affected by changes in the dates of ice phenology occurrence which corresponds to an increase in air temperature. Ice cover duration has shortened and ice thickness at rivers and lakes has decreased. Snow now contributes less than 20% to the total annual precipitation. Snow plays an important role in livestock herding, since it serves as a water resource for animals in winter. The future of snow cover is expected to decline by 27-56% for 2020-2080. More than 80% of the country's territory has been defined as highly vulnerable to climate extremes, the increased incidence of drought and dzud pose as key risks for livestock. The area where climatic conditions would make it hard for animals to graze is projected to increase from the current 40% to about 70% by 2050, and 80% by 2080 (AIACC 2007).



Mongolia's reindeer herders and their forest homeland are facing unprecedented challenges from unregulated mining, logging, water pollution, climate change and some tourism practices. The taiga – the Dukha homeland – is a hotspot for biodiversity and is rich in natural resources, but it is also one of the regions of Mongolia which could suffer the greatest impacts of climate change over the coming decades (UNEP 2012a).

Source: UNEP 2012a

FORESTS



UN Photo/Eva Fendiaspara
Darma, Indonesia (April 2010)

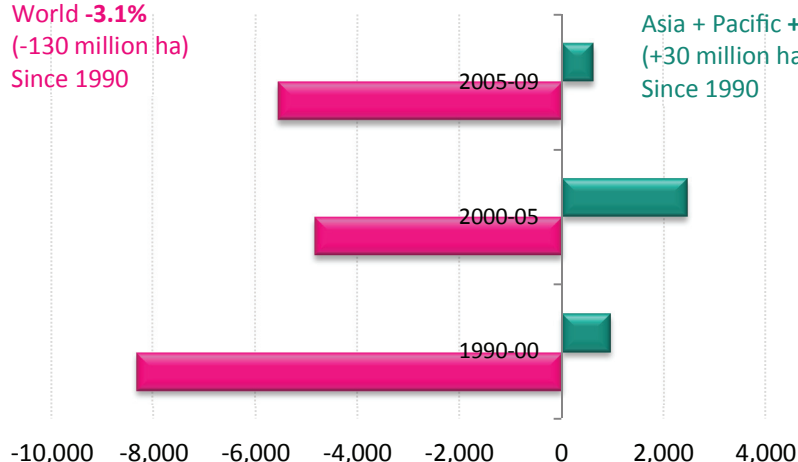
In 1990- 2009, forest cover increased by 30 million hectares in Asia

Forest Average Annual Changes

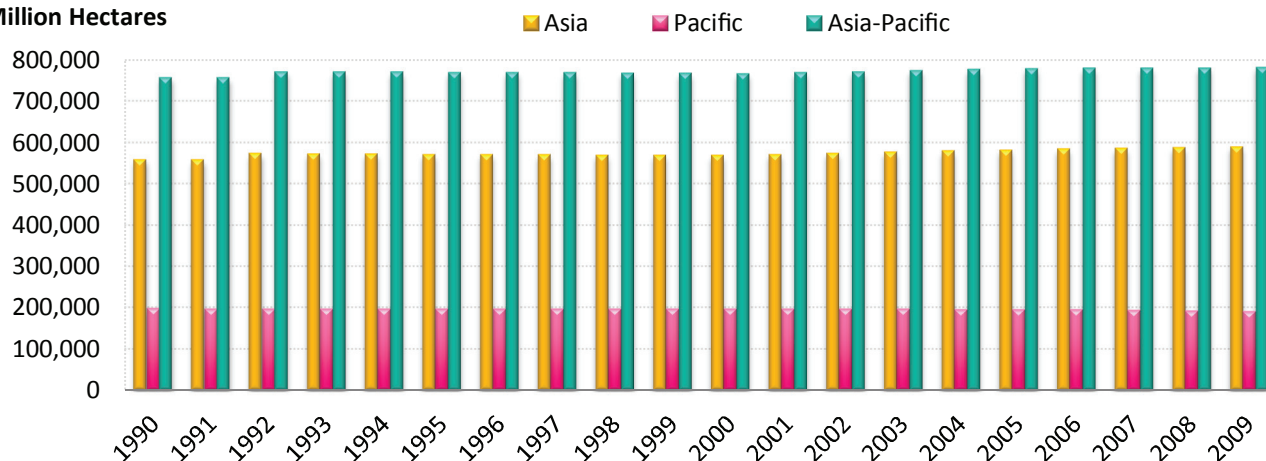
World **-3.1%**
(-130 million ha)
Since 1990

Asia + Pacific **+5.4%**
(+30 million ha)
Since 1990

In contrast with the global trend which shows a decrease of 3.1% (-130 million ha) over the 1990-2009 period, the forested area in Asia-Pacific increased by 3.2% (+24 million ha) over the same period, with the real increase starting in 2001. Discerning between Asia and the Pacific shows that Asia even increased by 5.4% (+30 million ha), while the Pacific followed the global trend with a 3.2% loss (-6 million ha).

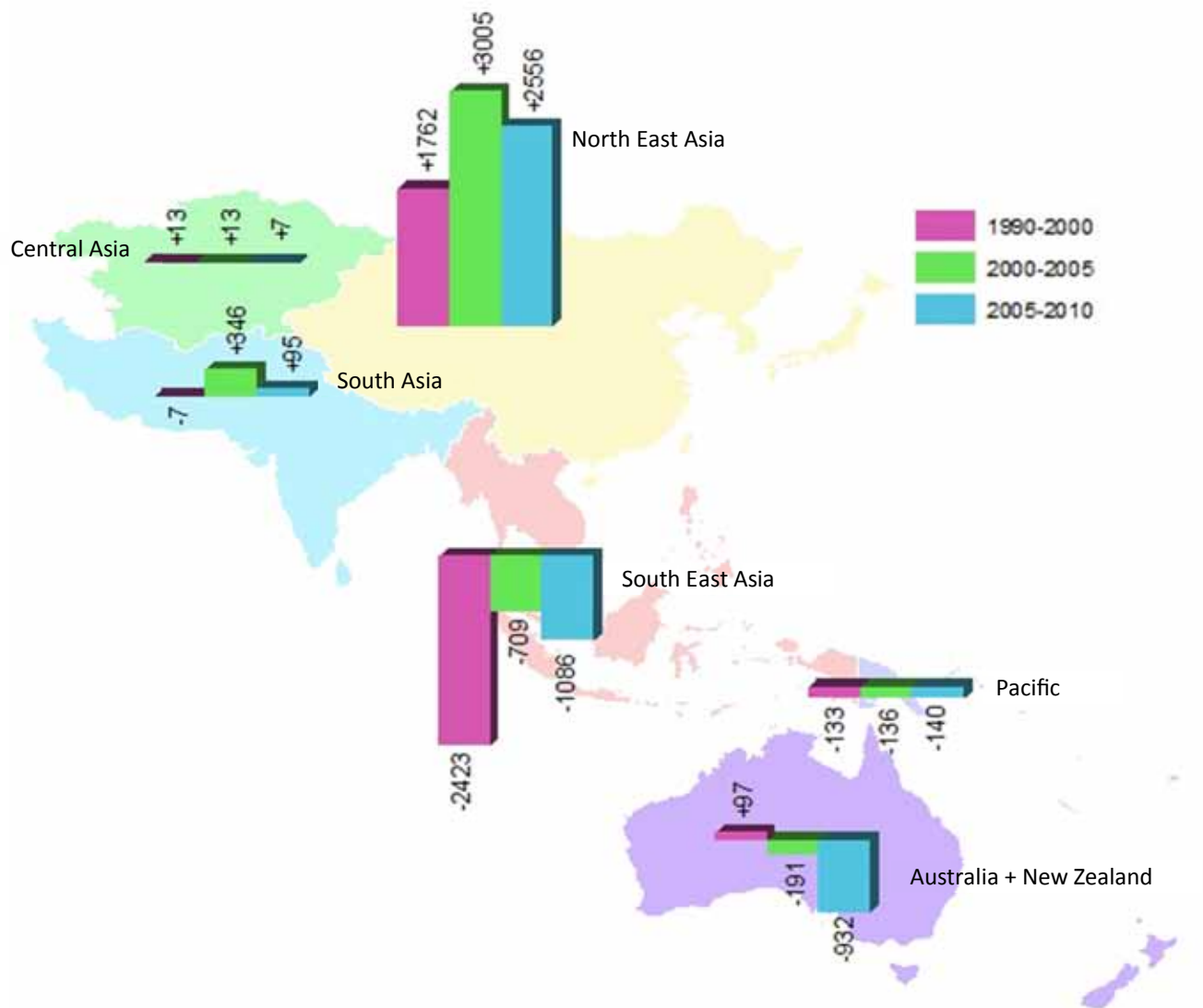


Million Hectares



Source: FAO 2010

Forest Average Annual Changes (Thousand hectares per year)

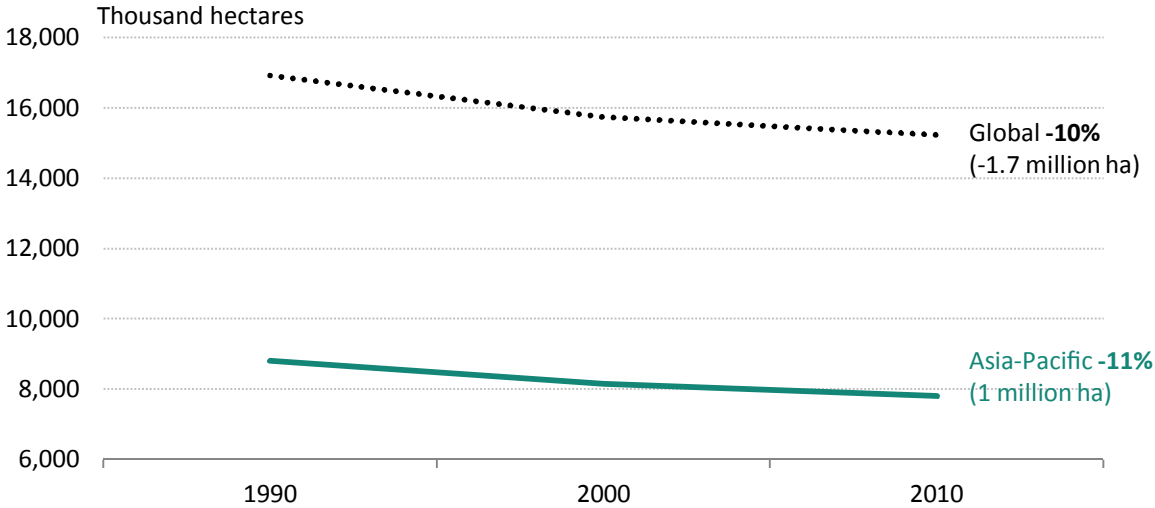


Source: UNEP Environmental Data Explorer, as compiled from FAO 2010



Mangrove forests continue to be lost in Asia and the Pacific

Mangrove Forest Extent



Source: FAO 2010

In 1990, the region was home to about 8.8 million hectares of mangrove forests, about half of all mangrove forests in the world. However, the world wide decline of mangrove forests over the past decades (-10% or -1.7 million ha between 1990 and 2005) is reflected in the region: between 1990 and 2010. 1.0 million hectares of mangrove forests were lost, more than -11% of the 1990 extent.

Of high concern is that high-resolution satellite imagery exposes that the extent of mangroves is even less than what country statistics show (UNEP 2011, as cited from Giri and others 2010).



March 17, 2000 (Source: NASA 2008)



June 7, 1989 (Source: NASA 2008)

Forest Change on New Ireland, Papua New Guinea 1989-2000

Widespread deforestation and degradation occurs in lowland rainforests in Papua New Guinea. Landsat imagery shows the impact of logging and forest fires on the island of New Ireland by comparing 2000 (top image) to 1989 (bottom image).

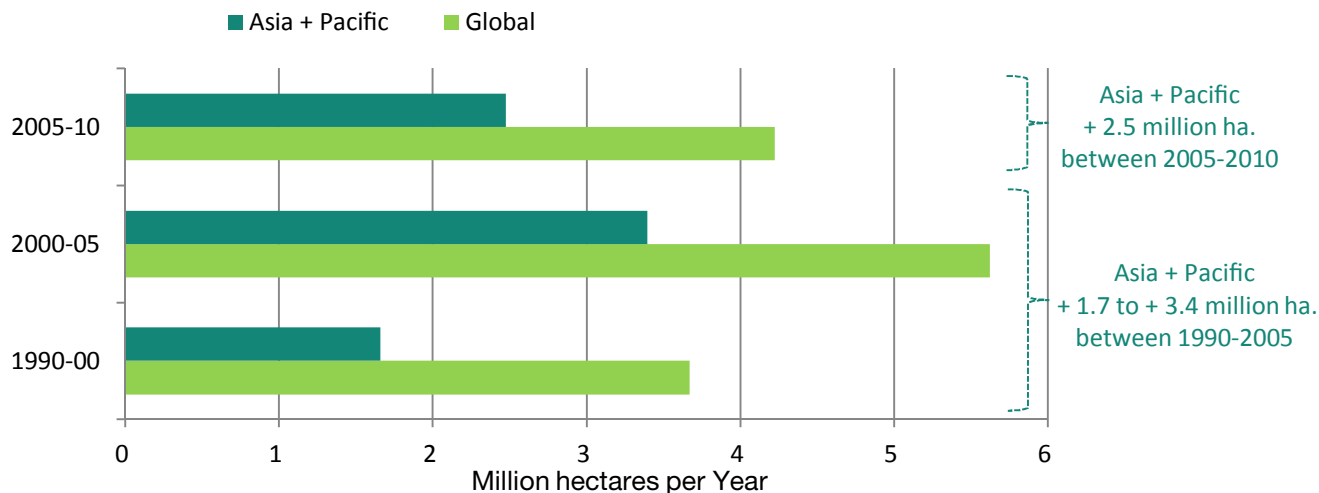
Transportation infrastructure, particularly logging roads and coastal shipping areas, makes forests more accessible for loggers. Nearly 60% of the forests are accessible to logging, and by 2002, 63% of the accessible forests had been deforested or degraded.

On the mainland, almost 30% of the logging-accessible areas have been deforested or degraded. The statistics may seem grim, but according to the Minister of Forests, the analysis provided good news too as over 70% of the country is still home to forest that can be preserved through more sustainable forestry and agricultural practices (NASA 2008).



Major changes to the extent of the region's forests have occurred as a result of forest plantations

Forest Plantation Annual Changes



(Source: UNEP Environmental Data Explorer, as compiled from FAO 2010)

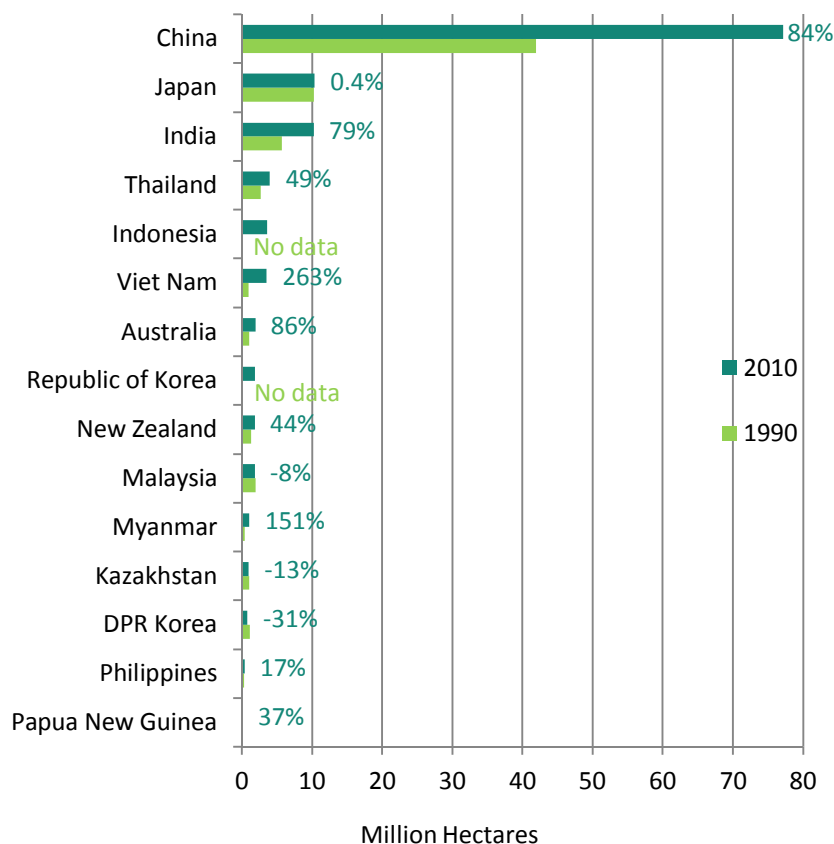
Forest plantations are generally intended for the production of timber, pulp and firewood, but along with other social and environmental benefits also protect against erosion by stabilizing the soil thus protecting the watershed (UNEP 2011).

Between 1990 and 2005, the yearly change in forest plantation extent across the region grew from about +1.7 to about +3.4 million hectares per year. Between 2005 and 2010, the increase in plantation forest was about +2.5 million hectares per year, each and every year. This contributed about 60% to the global extent of the yearly increase of +4.2 million ha.

Being production forests, they do not contribute to carbon sequestration and also do not necessarily enrich local biodiversity since they are mostly composed of a single and/or introduced species. However, they do contribute to important ecosystem services such as timber, carbon and water storage and soil stabilisation (UNEP 2011).

China showed the largest forest plantation extent, 84% increase between 1990 and 2010, a much larger extent compared with the rest of the region

Forest Plantation Extent by Countries in 2010 and 1990



(Source: UNEP Environmental Data Explorer, as compiled from FAO 2010)

China's contribution to the increase in the total forest plantation extent of the region is by far the largest: it went up by about 84% from just over 42 million hectares to 77 million hectares over the 1990-2010 period.

The second largest contribution to the regional extent is from Japan, followed closely by India.

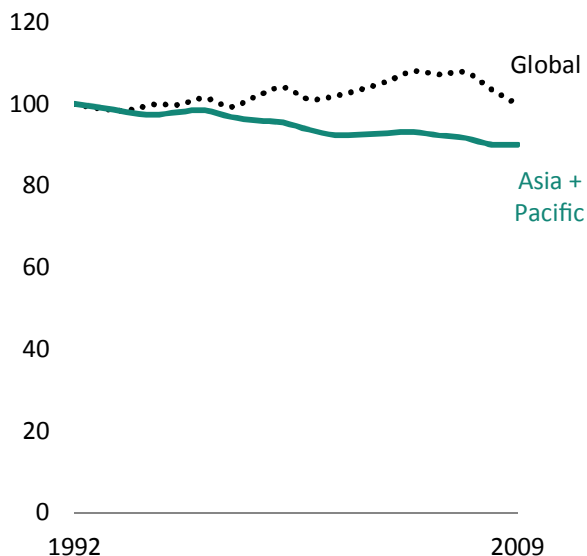
Focussing on relative changes, the following countries lead: Viet Nam (263%), Myanmar (151%), and Australia (86%).



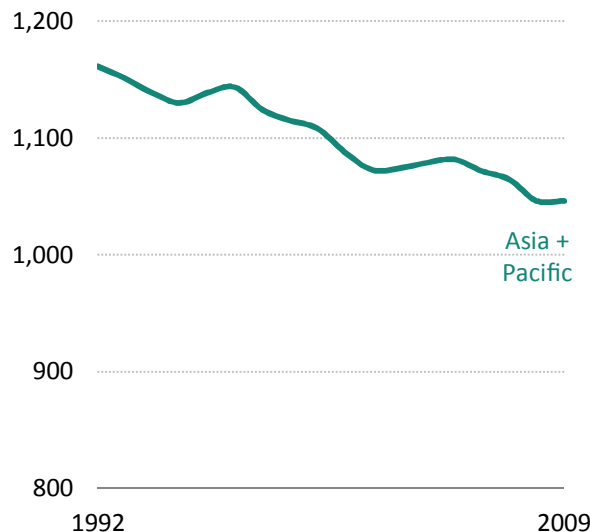
In contrast with the global trend, the region's roundwood production has been steadily declining over the past two decades

Roundwood Production

Index, 1992=100



Million Solid Volume (CUM)



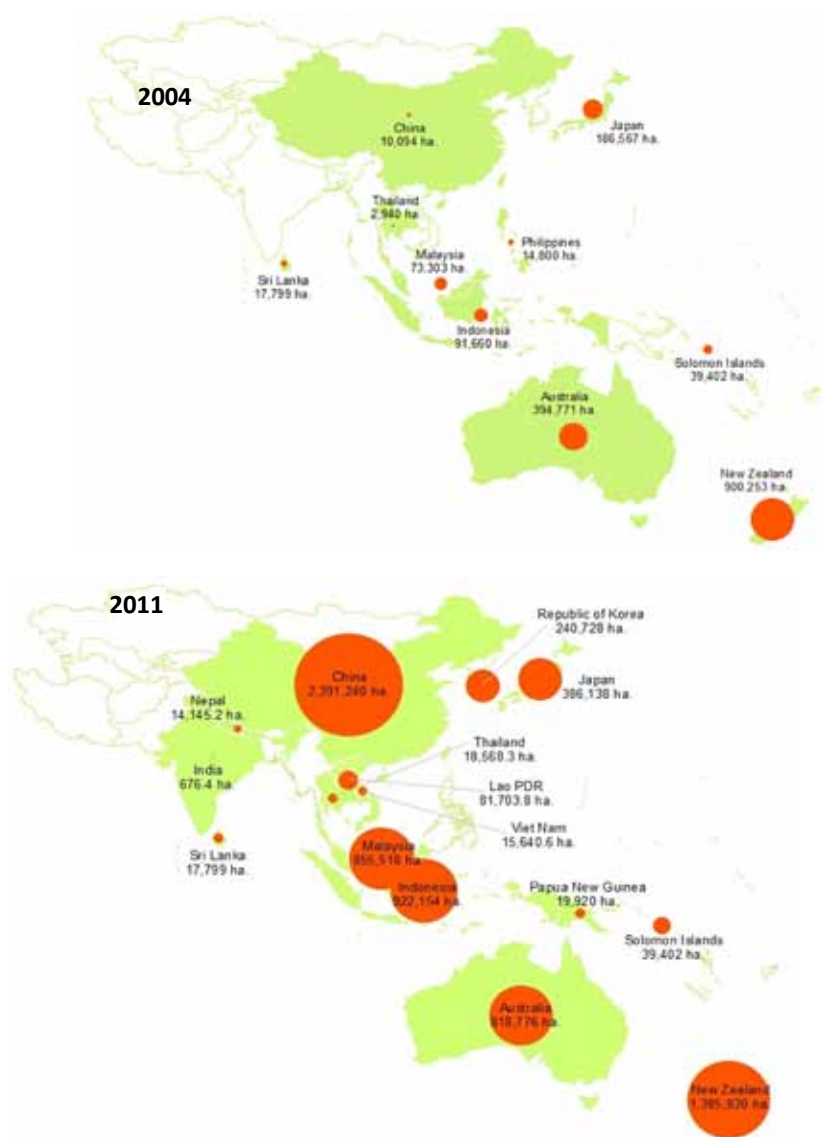
Source: UNEP Environmental Data Explorer, as compiled from FAO 2009

Roundwood production depends heavily on demand from the construction sector. Economic growth around the world stimulated global production, until the economic crisis in 2008, when new construction activities severely declined, impacting the demand for timber (UNEP 2011).

In contrast with the increasing trend of global roundwood production, roundwood production in Asia and the Pacific has steadily decreased. By 2008, roundwood production in the region had fallen by around 10% or 115 cubic meters (since 1992).

In 10 years, Asia and the Pacific's FSC certified forest area grew to over 7 million hectares, up from around 1 million hectares in 2002

Certified Forest Area by FSC (Hectares)



The Forest Stewardship Council (FSC) and the Programme for the Endorsement of Forest Certification (PEFC) are the two largest forest certification bodies worldwide to certify socially and environmentally responsible forestry, with slightly different approaches to management and certification (UNEP 2011, FSC 2012, and PEFC 2010).

Between 2002 and 2012, Asia and the Pacific's certified forest area by FSC grew from less than 1 million hectares to over 7 million hectares.

Source: UNEP Environmental Data Explorer, as compiled from FAO 2011

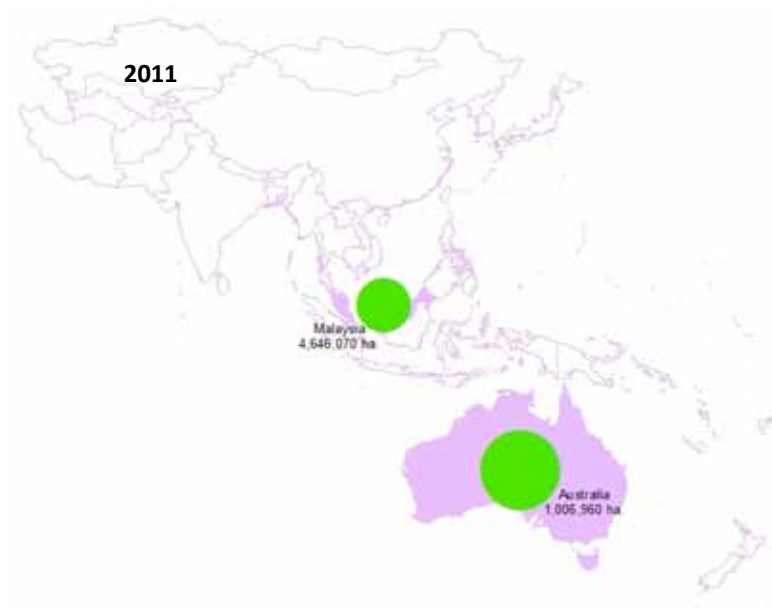


but fewer countries have expanded PEFC certified forests...



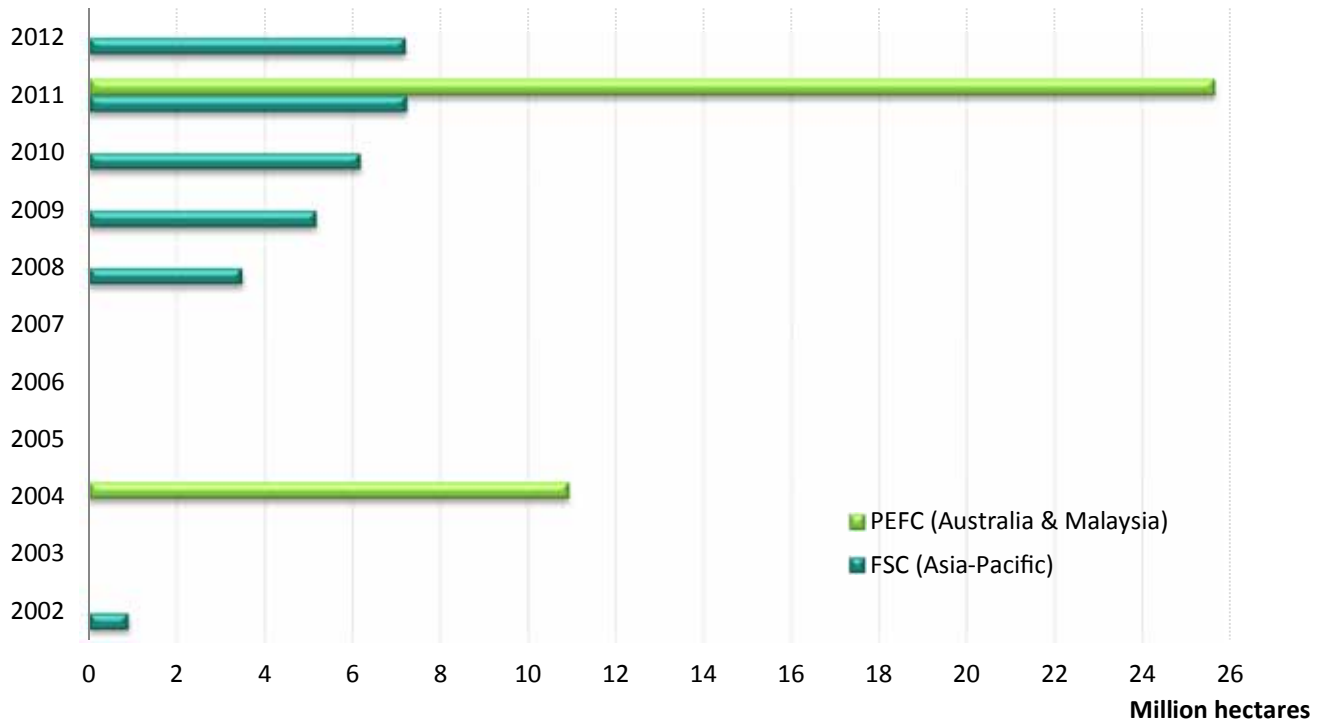
Certified Forest Area by PEFC (Hectares)

According to PEFC 2012 records, only Australia and Malaysia showed progress expanding their forest area managed under PEFC; while China and Japan have not expanded any forest area since 2004. Australia's forest area managed under PEFC accounted for over 10 million hectares in 2011, up from about 1 million hectares in 2004, over 820% increase. Over 4.6 million hectares of Malaysia's forest area is also managed under PEFC in 2011.



Source: UNEP Environmental Data Explorer, as compiled from PEFC 2011

FSC and PEFC Certified Forest Area (Asia-Pacific)



Source: FSC and PEFC 2012



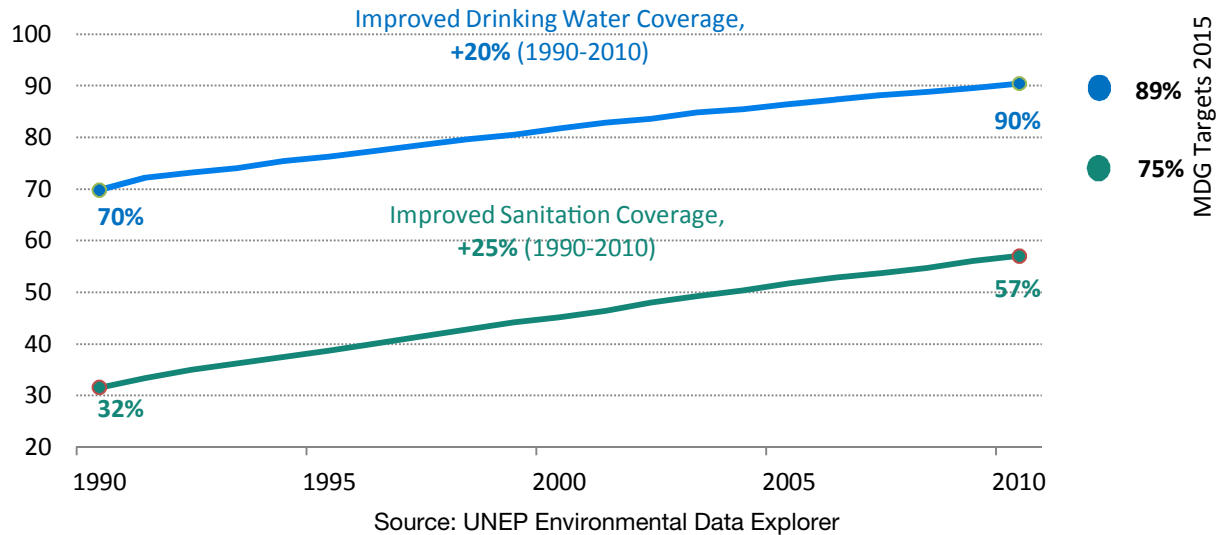
WATER



Water is supplied by the military in Old Dhaka.
UN Photo/Kibae Park (June 2010)

In Asia and the Pacific, improved drinking water coverage increased to 86%, but the region is far from meeting the sanitation target of 75%

Improved Sanitation and Drinking Water Coverage



In 2010, the region's improved drinking water coverage increased to 90% and surpassed the MDG drinking water target of 89% by 2015.

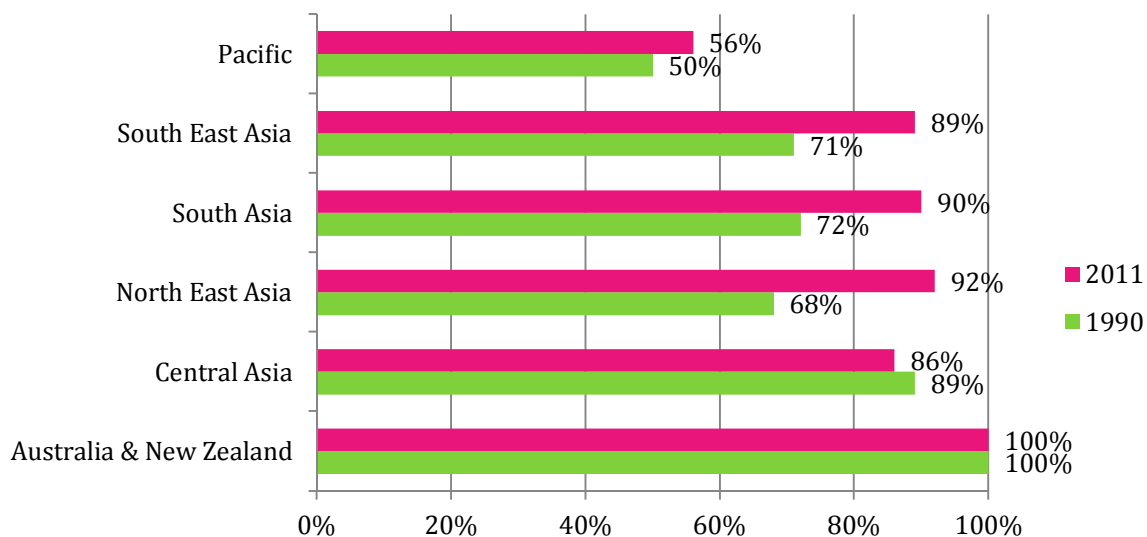
However, in 2010, the region's improved sanitation coverage was only about 57%, up from about 32% in 1990, representing more than 1.6 billion people still without access.

"Coverage in rural areas lags behind that of cities and towns. At the current rate of progress, the world will miss the MDG target of halving the proportion of people without access to improved sanitation by 2015." (UNEP 2011).

Improved drinking water coverage has actually declined in the Pacific region

Improved Drinking Water Coverage (1990 and 2011)

(Per cent of total population)



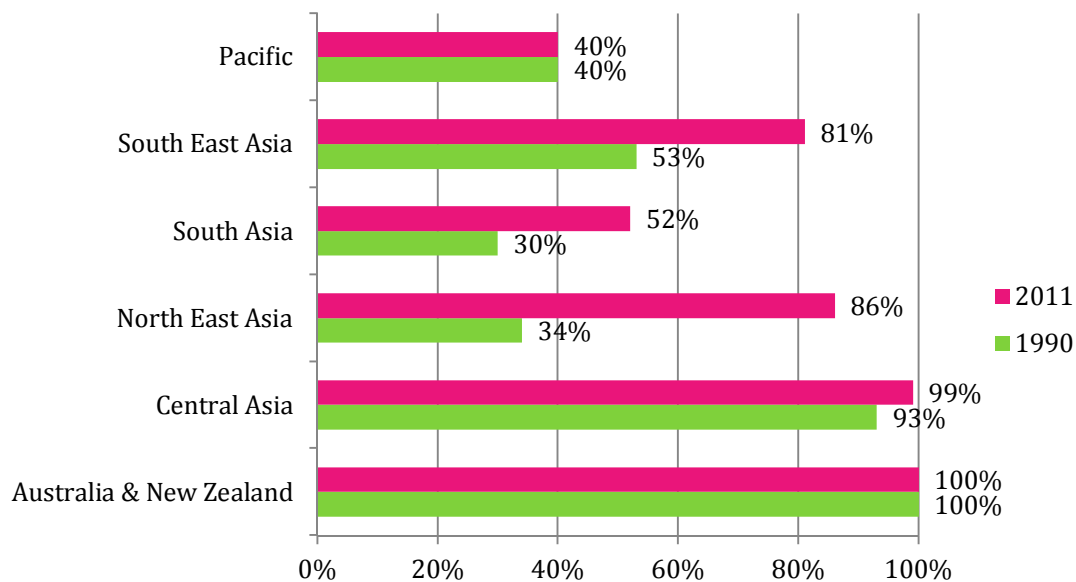
Source: UN 2013

Greatest progress has occurred in North East Asia, a 24% increase; while coverage has worsened in the Pacific, about 6% decrease while the coverage is already the lowest in the Asia and the Pacific region.

And the Pacific region has had no improvement in sanitation coverage, while other regions have made advances

Improved Sanitation Coverage (1990 and 2011)

(Per cent of total population)



Source: UN 2013

Overall, coverage of improved sanitation has increased across the region; except for the Pacific, which has no improvement over the past 20 years. Coverage in South Asia has increased, from 30% to 52%, but it remained the lowest in the region.

Greatest improvement has occurred North East Asia, increasing from 34% to about 86%. Coverage in Central Asia was at a remarkable rate of 99% in 2011.

Yellow River Delta, China

Low- and no-flow periods are a huge problem in the lower reaches of the river and the delta. These severely damage wetlands and aquaculture and worsen the river's already serious water pollution problems.



1995



2005

(Source: NASA 2009; UNEP 2012)

China's Yellow River is the most sediment-filled river on Earth. Soil from the upper reaches is easily eroded, and millions of tons are carried away every year. Several provinces share water from Northern China's Yellow River. Due to both reduced rainfall and explosive urban and agricultural demand for water upstream, the river began experiencing a partial failure to reach the sea from 1972, and a continuous cut-off was observed after 1987. The annual frequency of cut-off days reached its peak, 226 days, in 1997. The severe reduction of river flows impaired the ecosystem health of the Yellow (Huang) River basin (HRB) as well as its services to society.

Since the mid-19th century, the lower reaches of the river and the delta have been extensively engineered to control flooding and to protect coastal development. By 1995, the delta became longer and narrower. The new peninsula thickened, and aquaculture (dark-coloured rectangles) expanded significantly.

Water resource management policies (including "Annual Water Use Quotas and its Distribution Scheme for the Yellow River" and "Implementation Regulation for Water Resource Allocation among Provinces in HRB." were issued in 1998. By March 1999, the first water withdrawal quota directive was issued, and started the whole basin water withdrawal control plan. In 2006, the State Council issued "Water Withdrawal and Water Resource Fee Collection Rules" marking a new chapter in water resource management policy based on economic measures such as imposing water pricing and resource fees.

Implementation of these policies has ensured no more cut-offs since 2000, improved the water resource and ecological health of the HRB, and improved the biological diversity and stability of the Yellow River. Moreover, rare species have reappeared and a number of bird species increased in Shandong Yellow River Delta National Nature Reserve, and the population of rare and endangered plants and animals has doubled over five years in the Shell and Wetland System Nature Reserve.

The Xuan Thuy Wetland Reserve, at the Mouth of the Red River, Northern Viet Nam

The area occupies one of Viet Nam's two major agricultural regions. Natural and human forces continually reshape the area.



November 1989



September 2001
(Source: NASA 2008)

The Xuan Thuy Wetland Reserve sits along the coast of northern Viet Nam, at the mouth of the Red River, adjacent to the Tien Hai Nature Reserve. It occupies one of Viet Nam's two major agricultural regions (outlined in yellow). Red indicates shallow/sediment-laden water, and deep blue indicates deeper, clearer water.

Natural and human forces continually reshape the land in this area. The most obvious change over time is the disappearance of the barrier islands off the coast. The land loss results from the increase of aquaculture; soil is used to create dikes and fish ponds.

Furthermore, the barrier islands seem to support less vegetation in the past compared to the more recent image. The more abundant vegetation in 2001 was partly a result from seasonality and replanting efforts.



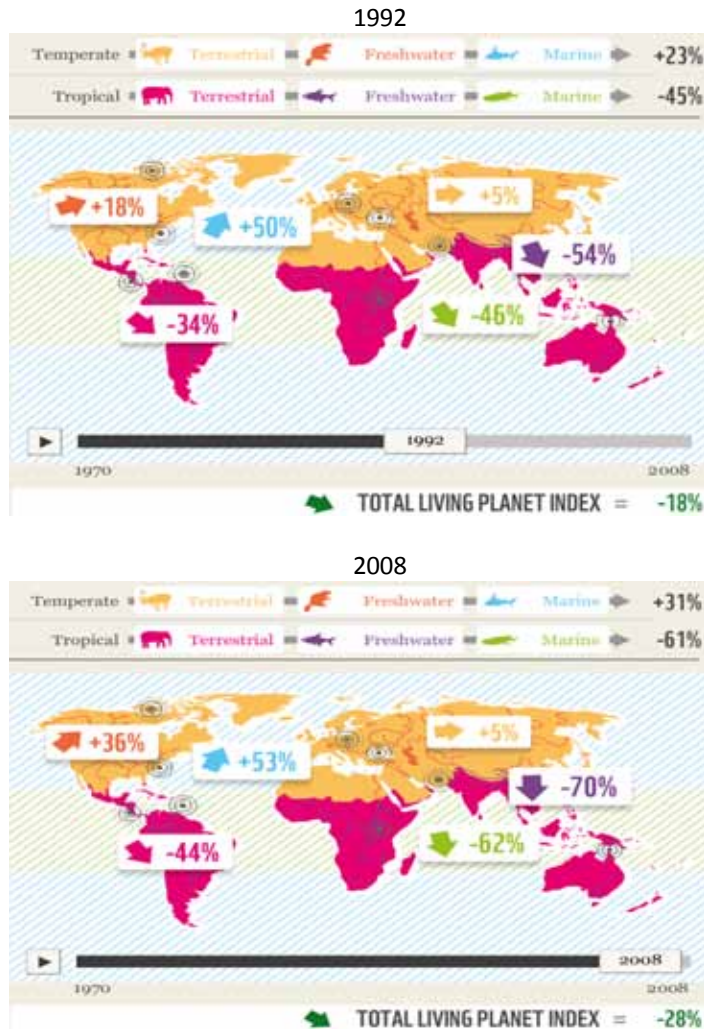
BIODIVERSITY



Tiger cubs in Mysore, India
UN Photo/John Isaac (April 1987)

Biodiversity continues to decline, especially in the tropical biome

Living Planet Index¹⁴



Source: WWF 2012

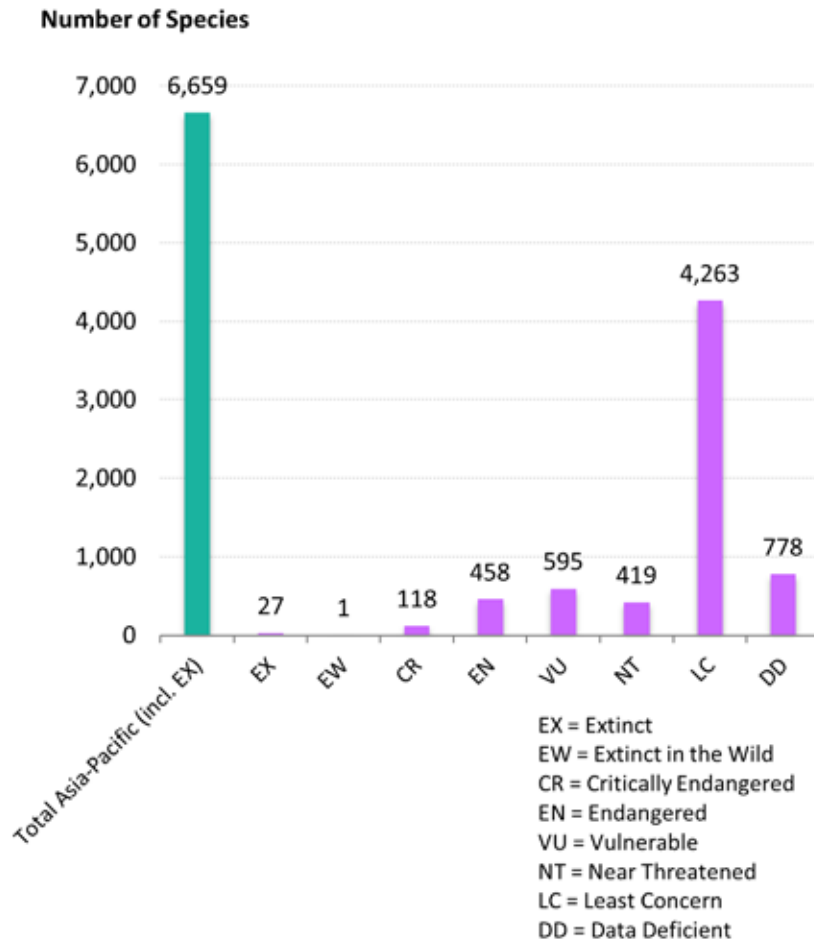
Between 1992 and 2008, the Living Planet Index (LPI) shows a 10% decline in biodiversity; and fell by about 28% between 1970 and 2008. Freshwater species populations showed the highest decline over the past decades (-54% between 1970 and 1992, -70% till 2008). The total tropical LPI declined by 61% between 1970 and 2008, while the total temperate LPI increased by 31% over the same period. In the Indo-Pacific region, the LPI shows an even greater decline of 64% in key populations of species over the same period (WWF and ADB 2012). In contrast to the temperate biome, which is somewhat stable (after hundreds of years of biodiversity losses), the tropical biome shows strong decline indicating a severe degradation due to high deforestation rates of primary forest and transformation into agricultural land and pasture (UNEP 2011).



¹⁴ The Living Planet Index (LPI) reflects changes in the state of the planet's biodiversity compared to 1970, using trends in the size of 9,014 populations of 2,688 mammals, bird, reptile, amphibian and fish species.

In Asia and the Pacific, mammal species have suffered a significant increase in extinction risk

Total Mammal Species and Extinction Risk in Asia-Pacific (2012)



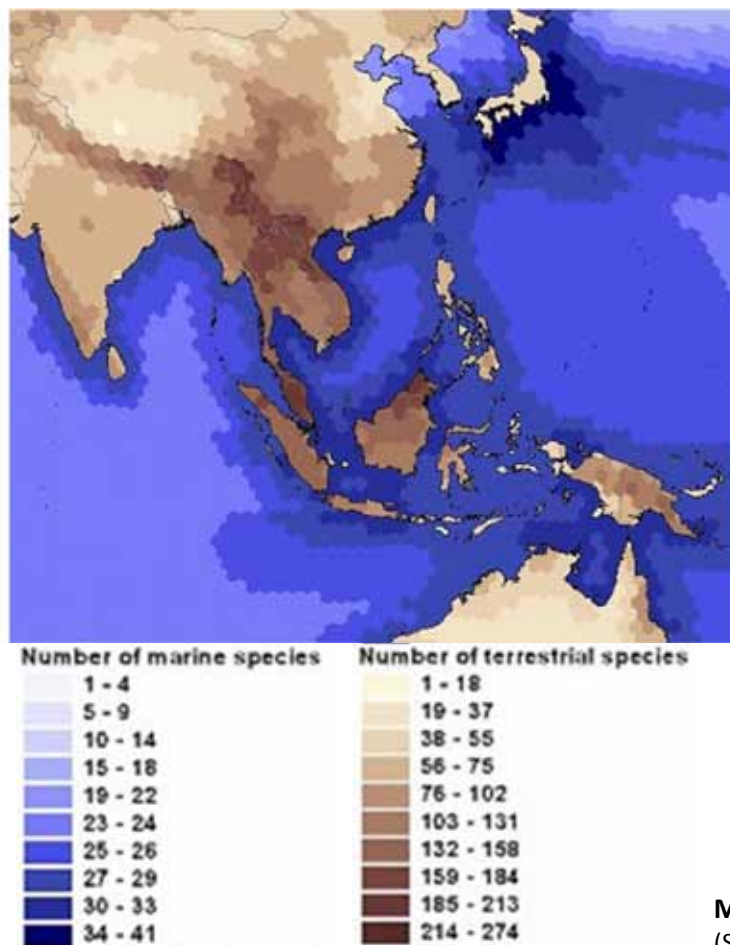
Source: IUCN 2012

In Asia and the Pacific, inland mammal species are mostly found in South Asia and South East Asia. These mammal species have suffered the steepest increase in extinction risk due to combined impact of hunting and loss of habitat (CBD 2010).

As of 2012, IUCN listed more than 6,600 species in Asia and the Pacific. Nearly 30 species (0.4%) have become extinct, nearly 120 species (2%) are critically endangered and more than 450 species (7%) already endangered. More than 1,000 species (15%) are vulnerable or near threatened.



Indonesia, China*, India, Australia, Malaysia and Thailand are amongst the 20 countries across the world with the highest number of threatened mammal species



Rank	Country	Total Species
1	Indonesia	670
2	Brazil	648
3	China*	551
4	Mexico	523
5	Peru	467
6	Colombia	442
7	USA	440
8	Congo, D.R.	430
9	India	412
10	Kenya	376
11	Argentina	374
12	Ecuador	372
13	Bolivia	363
13	Venezuela	363
15	Tanzania	359
16	Australia	349
17	Malaysia	336
18	Cameroon	335
19	Uganda	319
20	Thailand	311

**The numbers given here for China include Hong Kong and Macau, but do not include the province of Taiwan which is listed separately due to its geographic separation.*

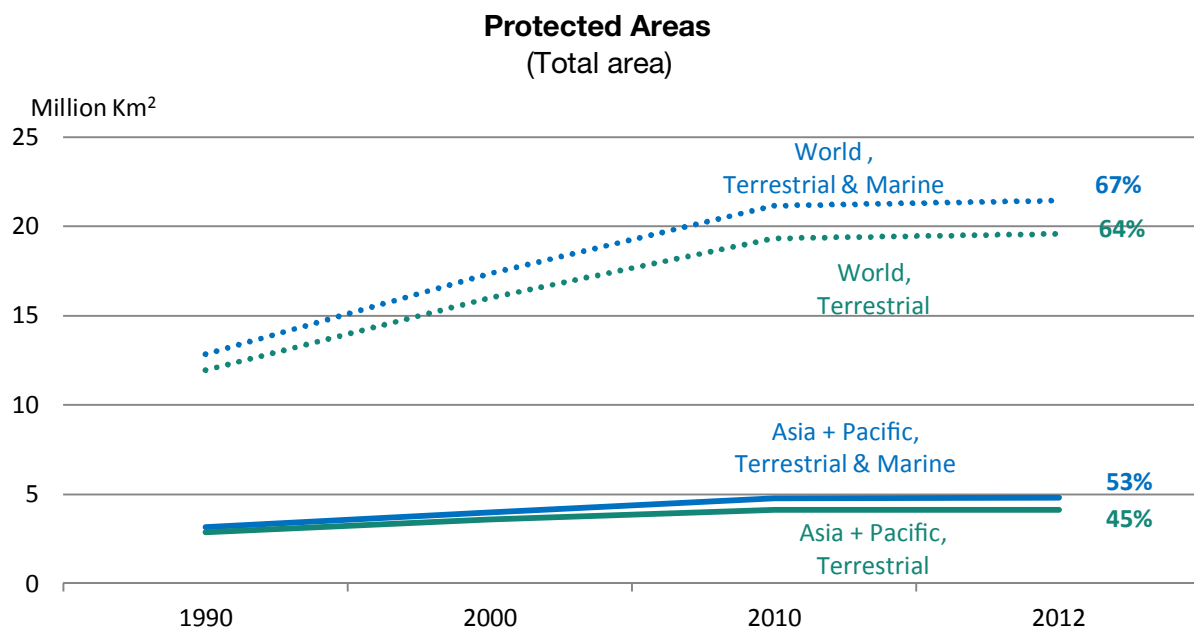
Mammal Species in South Asia and South East Asia

(Source: IUCN 2012)

According to the IUCN Red List 2012, six countries of Asia and the Pacific are among the world's 20 countries with the highest threatened number of mammal species. Indonesia has the highest number in the list, with 670 species, close behind with 551 species is China, India with 412 species, Australia with 349 species, Malaysia with 336 species, and Thailand with 311 species (IUCN 2012).



In 2012, Asia and the Pacific's terrestrial and marine protected area combined was 4.8 million km², an increase of nearly 55% since 1990

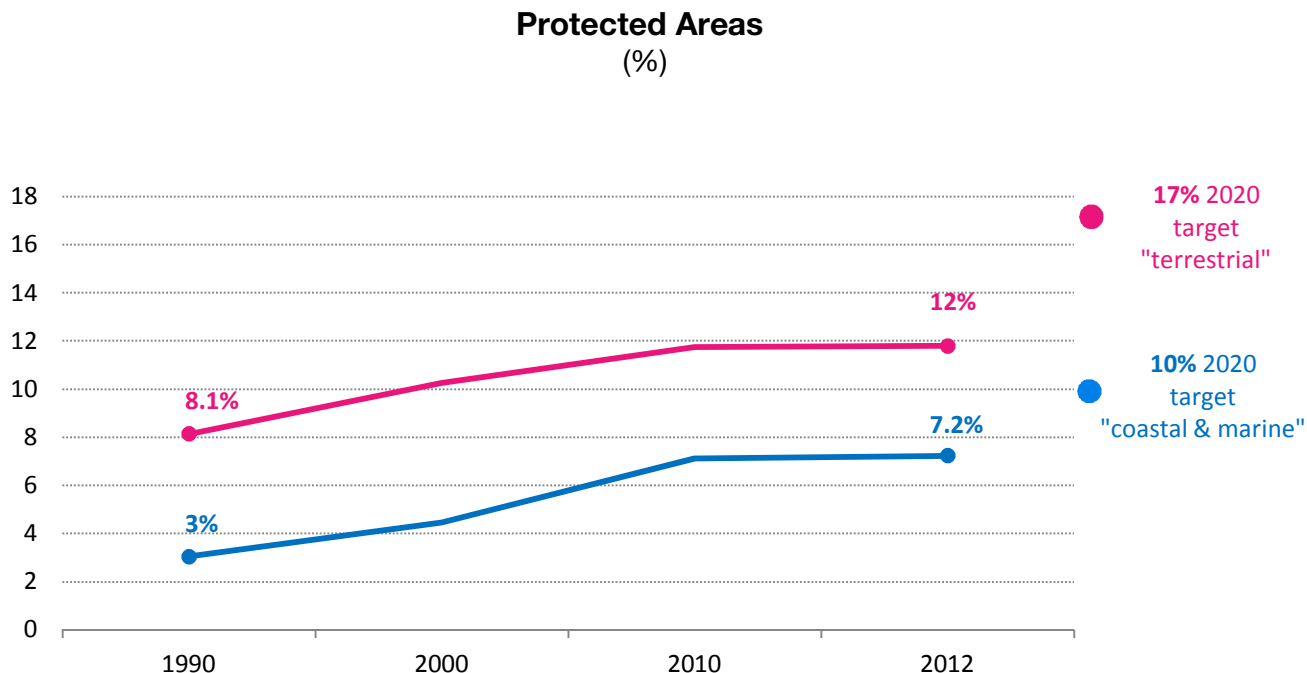


Source: UNEP Environmental Data Explorer

Between 1990 and 2012, Asia and the Pacific's protected areas have expanded although at a smaller rate compared to the world's total.

The region's terrestrial and marine protected area combined was about 4.8 million km² in 2012, representing an increase of nearly 55% since 1990. Terrestrial protected area alone was nearly 4.2 million km² in 2012, representing almost 45% increase since 1990.

In 2012, 7.2% of Asia and the Pacific's marine area was protected, up from about 3% in 1990



New targets for the extent of protected areas globally were set by governments in the Nagoya Protocol, negotiated in October 2010. Under a 20-point plan, commitments were made to protect 17% of terrestrial and inland waters, and 10% of coastal and marine areas, especially areas of particular importance for biodiversity and ecosystem services, by 2020 (UNEP 2011, CBD 2010a).

Asia and the Pacific's terrestrial protected area was 12% of the region's total terrestrial area in 2012, increasing from 8.1% in 1990. At the same time, marine protected area was 7.2% of the region's total marine area in 2012, increasing from over 3% in 1990.

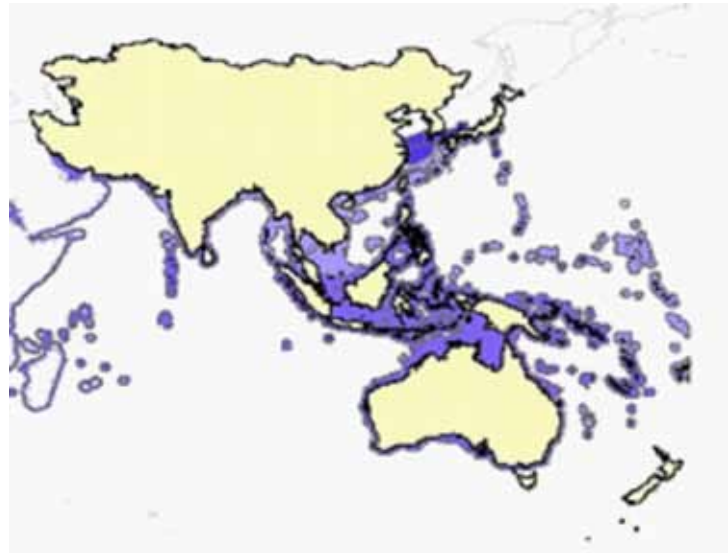


Two major threats to coral reefs from climate change: the increase in sea surface temperatures and ocean acidification

State of Coral Reefs in Asia and the Pacific (2010)



Source: IUCN Red List 2010



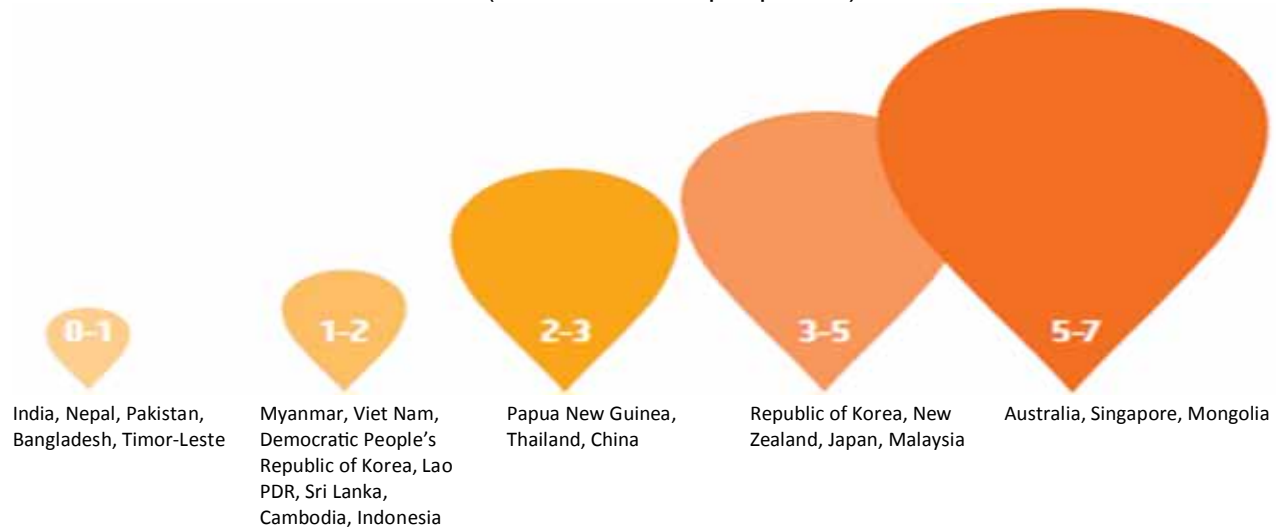
Asia and the Pacific has vast areas of coastal and marine ecosystems. Fisheries and aquaculture play an important role in providing food and income. Rapid economic growth, population growth and global demand for fish are threatening the region's marine resources.

Two major threats to coral reefs from climate change are the increase in sea surface temperatures (which increase the likelihood of coral bleaching) and ocean acidification (which disables the coral's ability to take calcium from the water to build its structure).

According to WWF and ADB 2012, about 50% of coral reefs in South East Asia are at risk; and in the Philippines this figure is as high as 70%. Unsustainable fishing practices are causing large declines in fish stocks in the region, in some cases as much as 40% in 5 years, especially in the Gulf of Thailand and the east coast of Malaysia. Shrimp aquaculture in particular has been responsible for much for the conversion of coastal ecosystems in the region (WWF and ADB 2012).

Ecological Footprint – Selected Countries

(Global hectares per person)



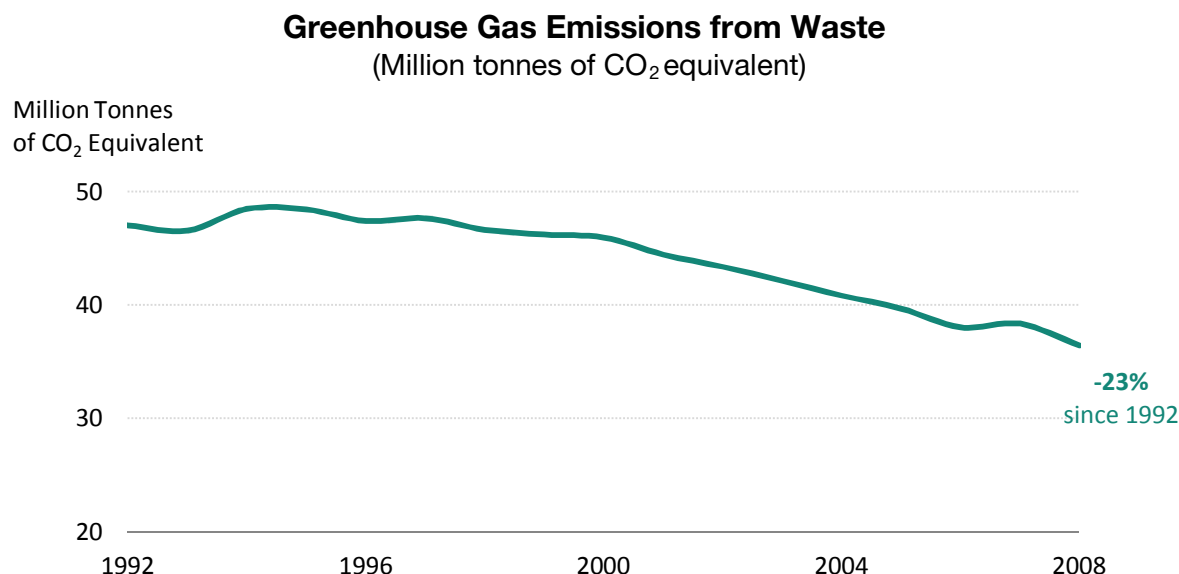
The ecological footprint of Asia and the Pacific is 1.6 global hectares (gha) per person, which is 60% below the global average of 2.7 global hectares per person. However, there is a wide disparity across the region. Australia's ecological footprint is highest in the region at 6.7 gha per person and 14 times larger than that of Timor-Leste (0.5 gha per person) (WWF and ADB 2012).

CHEMICALS & WASTE



Scavenger birds pick a dump site in Dhaka, Bangladesh.
UN Photo/Kibae Park (June 2010)

According to the UNFCCC National Reports, Asia and the Pacific's greenhouse gas emissions from waste decreased by 23% between 1992 and 2008



Source: UNEP Environmental Data Explorer, as compiled from UNFCCC National Reports 2008

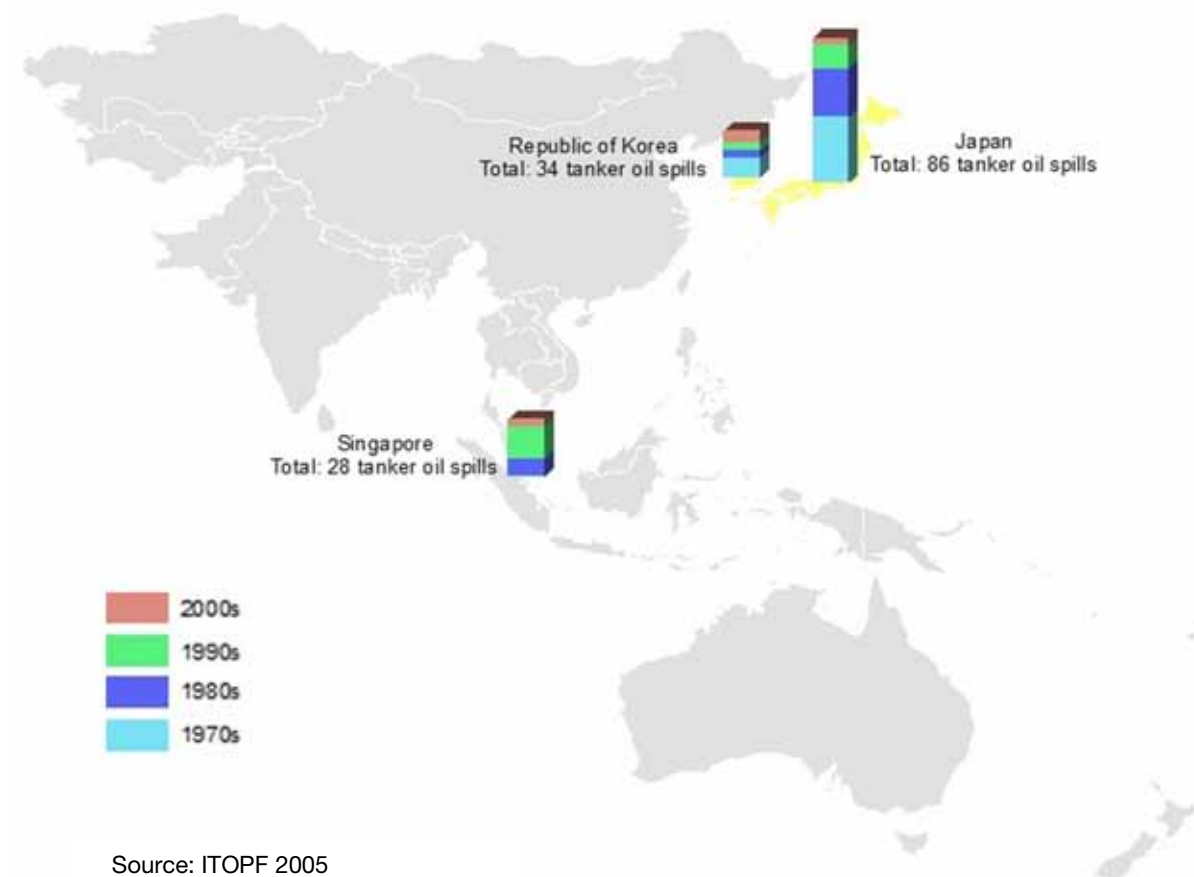
The rapid growth in economic activity experienced by many Asia and the Pacific countries since the 1970s has come at some cost, with an increased use of resources resulting in greater environmental degradation, greenhouse gas (GHG) emissions, and consumer waste. The region is in the midst of an industrial transformation that is going hand in hand with a large increase in natural resource use, waste and emissions, which will grow by a factor of three to five in coming decades (UNEP 2011d).

According to the UNFCCC National Reports, the region's greenhouse gas emissions from waste decreased by about 23% between 1992 and 2008, dropping from about 47,000 to 36,400 gigagrams (47 to 36.4 million tons) of CO₂ equivalent.



Increased intra-regional trade is leading to increased spills at sea

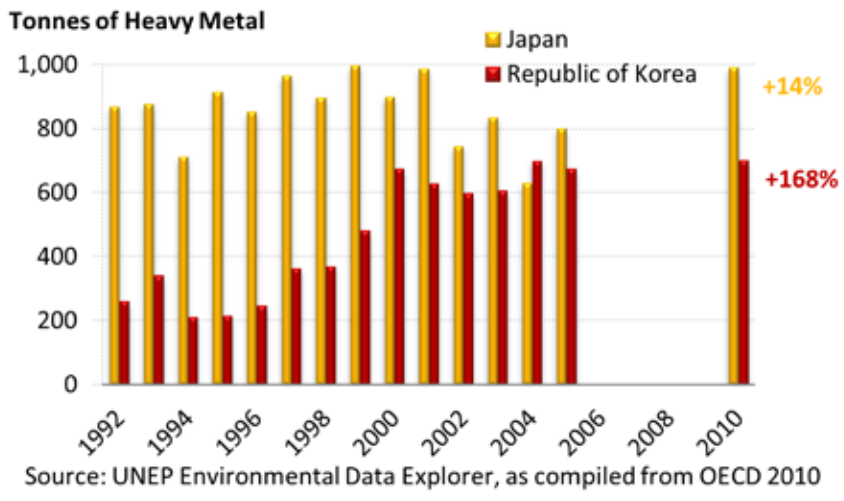
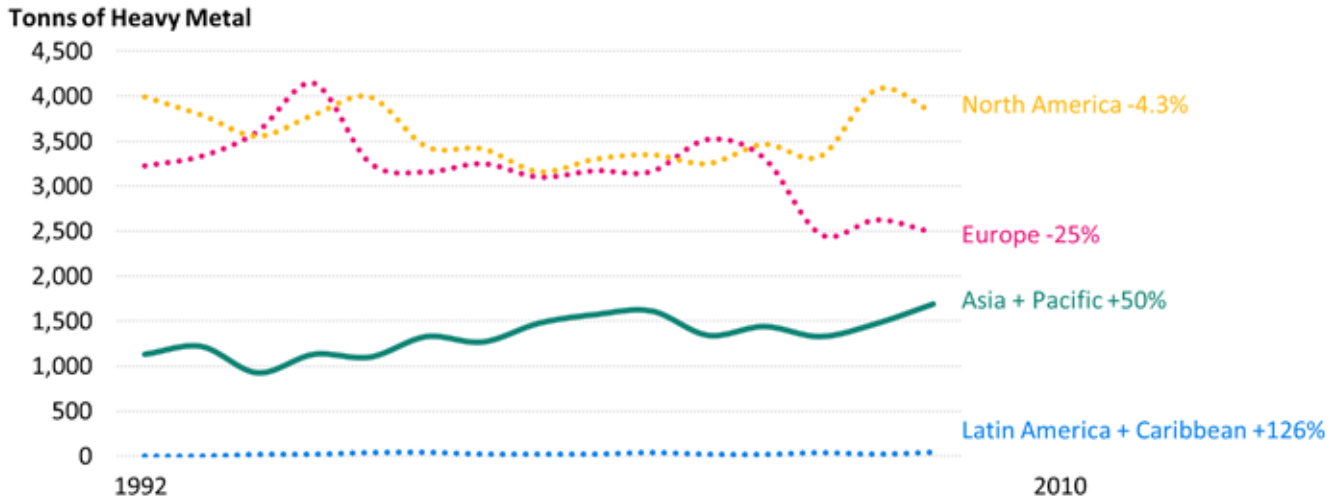
Number of Major Tanker Oil Spills per Decade (Japan, Republic of Korea and Singapore)



According to ITOPF 2005 report, major tanker oil spills recorded occurred in Japan, Republic of Korea and Singapore in the past 4 decades; 86 tanker oil spills in Japan, 34 in Republic of Korea and 28 in Singapore. Japan decreased its tanker oil spills significantly during the past 2 decades compared with the 1970s and 1980s.

Between 1992 and 2010, Asia and the Pacific's nuclear waste increased by more than 50% from about 1,100 tonnes in 1992 to nearly 1,700 tonnes in 2010

Nuclear Waste – Spent Fuel (Tonnes of heavy metal)



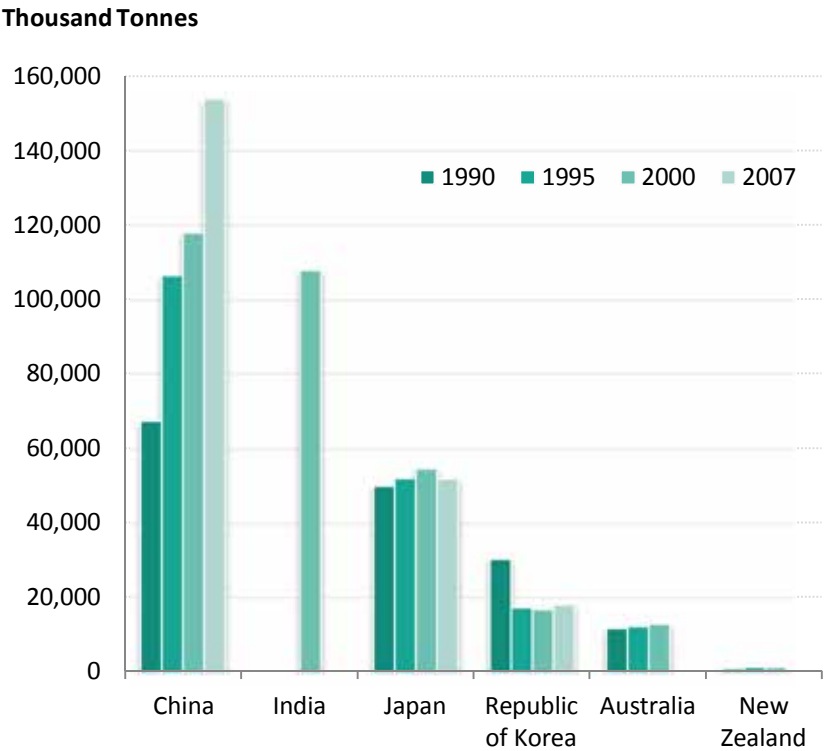
Between 1992 and 2010, Asia and the Pacific's nuclear waste increased by about 50%, increasing from about 1,130 to 1,690 tonnes.

Between 1992 and 2010, nuclear waste generation in Japan showed only annual variations; while in the Republic of Korea, nuclear waste generation showed an obvious increasing trend with about 168% increase.

The 2011 Fukushima nuclear accident in Japan has forced increased attention to potential accidental releases of harmful radioactivity.

The overall municipal waste generated in the region showed an upward trend in 1990-2007

Municipal Waste Generation (1990-2007)
(Total, selected countries)



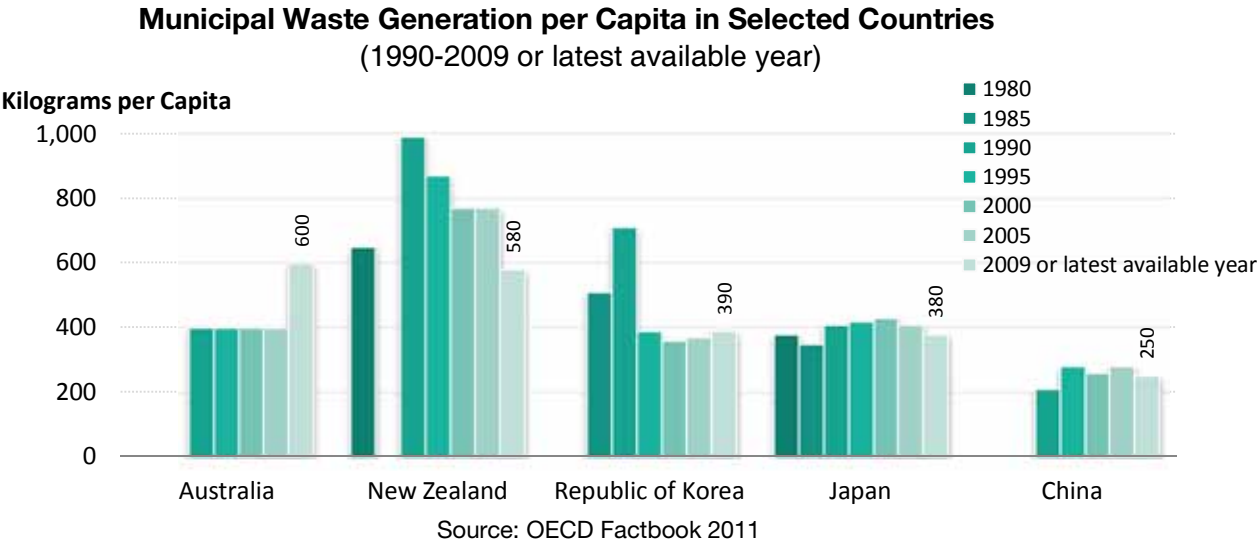
Between 1990 and 2007, the total amount of municipal waste generated yearly showed an upward trend due to rapid population growth and urban expansion across Asia and the Pacific.

The amount of municipal waste generation in Australia remained nearly the same, and Japan slightly increased. On the other hand, the amount of municipal waste generated in China increased at a faster rate compared to other countries.

In contrast, Republic of Korea had reduced its amount of municipal waste generation over the same period.

Source: OECD Economic, Environmental and Social Statistics 2010

However, municipal waste generated per capita shows a different picture



Municipal waste generated per capita shows a different trend. China showed the lowest municipal waste generated per capita among large economies such as Australia, Japan, Republic of Korea and New Zealand which showed the highest.

Asia and the Pacific has seen a very rapid growth in terms of waste generation during the last decade, especially in the wake of overall population growth, rapid urbanization and economic growth due to industrialization. However, large differences in terms of demographic and socio-economic characteristics exist in the region. In Asia and the Pacific, the World Bank estimates the waste generation in urban areas between 450,000 and 760,000 tonnes per day and by 2025, this would reach about 1.8 million tonnes per day (UNESCAP 2007).

Most cities throughout Asia and the Pacific are struggling to cope with overflowing landfills and rapidly increasing volumes of municipal and industrial waste as a result of increased economic production and consumption (ADB and IGES 2007).

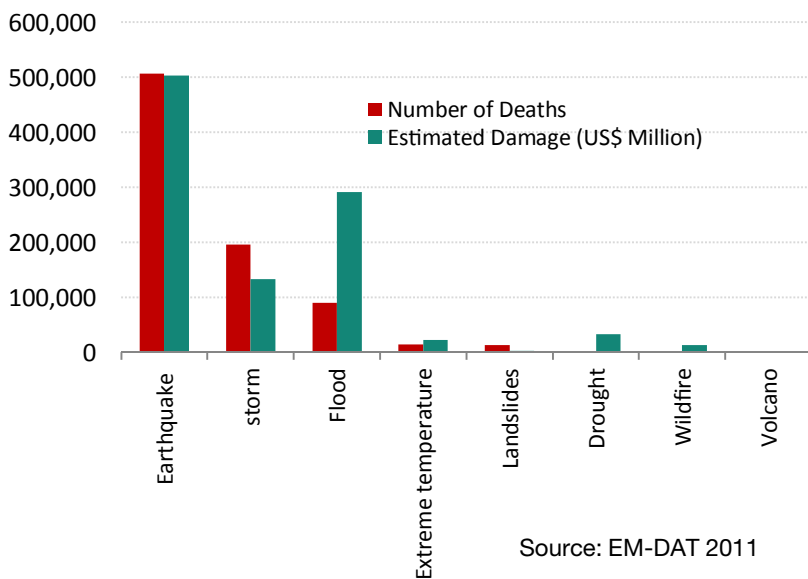
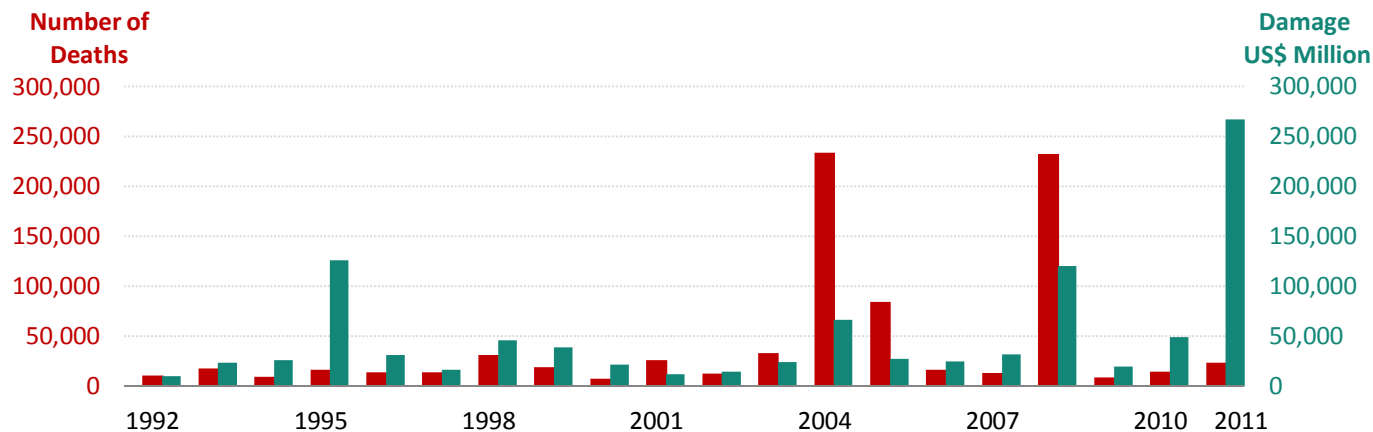
NATURAL HAZARDS



UN Photo/Evan Schneider (April 2010 - Multan, Pakistan)

In Asia and the Pacific, both human and economic losses from natural disasters showed an upward trend in the past two decades

Impacts of Major Natural Disasters (1992-2011)



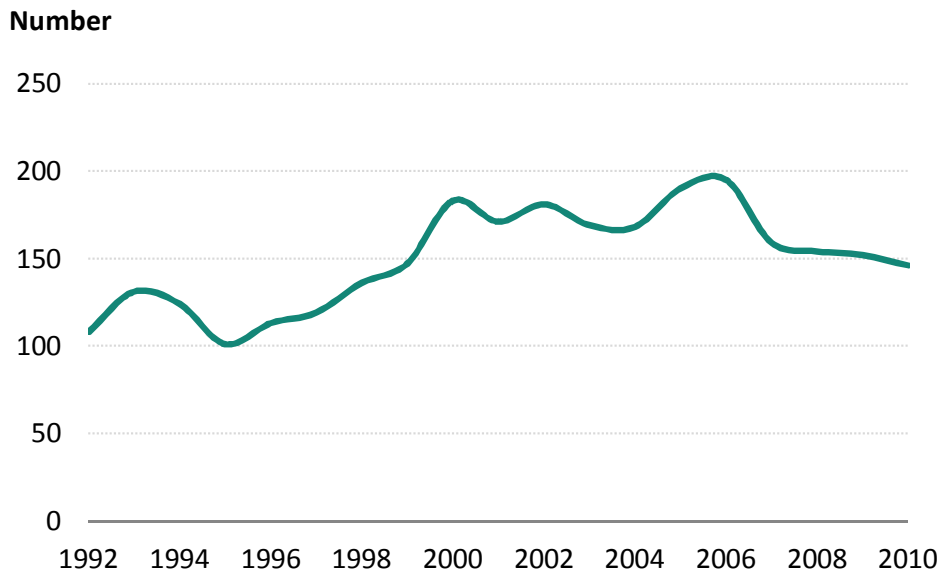
Between 1992 and 2011, both human losses and economic damage from natural disasters showed an upward trend in Asia and the Pacific.

According to reported human and economic losses from natural disasters in the region, earthquake events have caused the largest number of deaths and economic losses, followed by storms and floods. The other disaster types have a much lower impact. However, the aggregation over the sub-regions hides the large differences between them.



Increasing population numbers in hazard-prone areas lead to an increase in exposure

Reported Major Natural Disasters* in Asia-Pacific (1992-2011)



Source: EM-DAT 2011

**Flood - flash, storm, general*

Storm - tropical, local

Mass movement (dry/wet) – landslide, avalanche

Epidemic - viral, parasitic, bacterial

Extreme temperature - hot, cold

Wildfire - forest, scrub/grass

Although there is no clear indication that hazard occurrences have changed much in recent times, numbers of reported disasters has been increasing significantly (UNEP 2011e).

Indeed, around the world, “over the past two decades the number of reported natural disasters has doubled from around 200 to over 400 per year. In 2010, over 90 per cent of disaster displacement within countries was attributed to climate-related hazards.” (NRC 2011).

2011 was a year of record-breaking weather events, which caused a large number of deaths and economic losses across the world (UNEP 2012e), and a number of extreme weather and climate events occurred in Asia and the Pacific.

Major extreme weather and climate events in 2011

In 2011, a number of major extreme weather and climate events occurred in Asia and the Pacific (UNEP 2012c).

In Pakistan, between mid-August and mid-September, floods killed an estimated 247 people and destroyed almost a million homes. 1.7 million hectares of land was affected.

Extreme cold temperature in northern India in January. New Delhi's lowest ever maximum temperature was recorded.

Severe monsoon season flooding in several Indian states beginning in late August. Over 11 million people were affected, with more than 100 lives lost.

Floods triggered by monsoon rains affected over 2,500,000 people and killed more than 130 in India. West Bengal, Bihar was the worst affected.

Severe flashfloods in the southern Mindanao region of the Philippines as a result of Tropical Storm Washi in December. More than 1,200 people were killed and homes were washed away.

In July, Tropical Storm Nock-Ten made landfall three times, 72 deaths were reported in the Philippines, Viet Nam and China.

Heavy rains between July and October contributed the worst flooding in Thailand since 1942, killing nearly 800. Large number of people in Cambodia and Myanmar were also affected.

In China, mid-September rains have led to heavy flooding and at least 57 deaths in several provinces. More than 120,000 houses were destroyed and economic losses are initially estimated at US\$2.7 billion.

Drought beginning in April affected 3.29 million people and 950,000 livestock in China. This was the most serious drought ever known in five provinces.

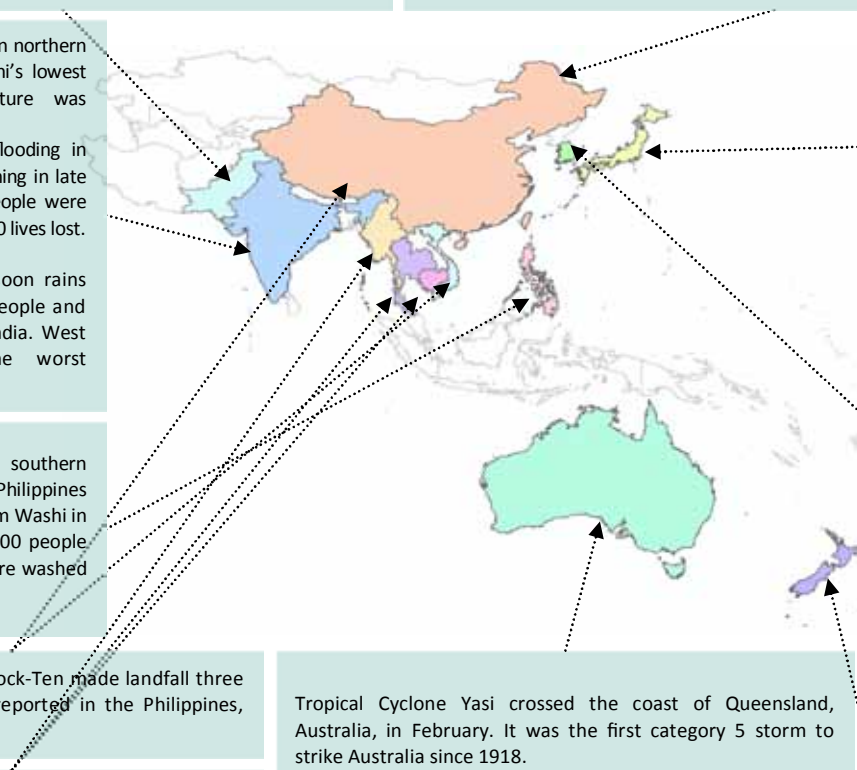
More than 12 million people affected by heavy rains beginning on 1 September in three Chinese provinces. Floods leave 57 people dead and 29 missing.

Typhoon Talas affects western and central Japan in September. The number dead and missing exceeds 100. Talas was the most destructive typhoon to hit Japan since 2004.

Heavy snow in parts of Republic of Korea on 11-14 February. At Samcheok the largest accumulation of snow was measured since record-keeping began in 1911.

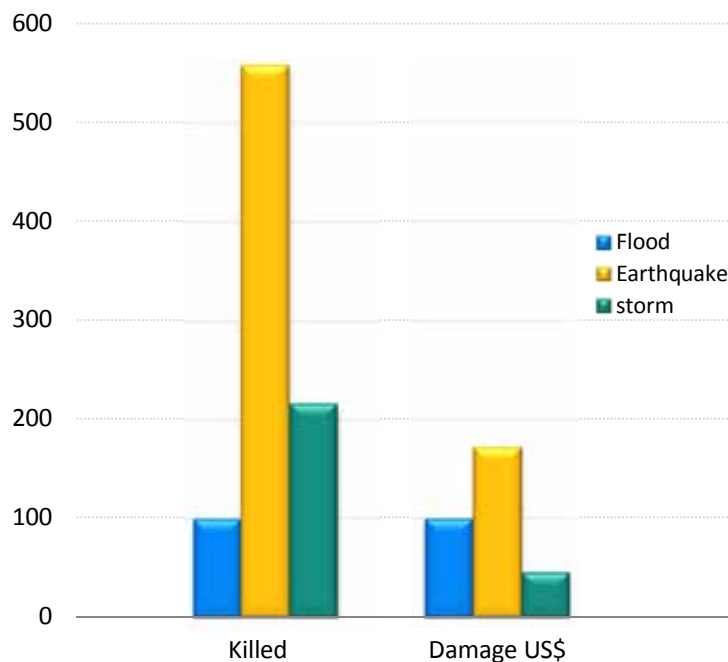
Warmest May in New Zealand since 1950. Parts of New Zealand experienced abnormally cold temperature on 14-16 August. First snowfall in Auckland since 1939.

Tropical Cyclone Yasi crossed the coast of Queensland, Australia, in February. It was the first category 5 storm to strike Australia since 1918. Floods affected much of Queensland in January, causing US\$7.3 billion in economic losses. Average precipitation in March was 117% above average, producing the wettest March since record-keeping began 112 years ago.



Human and Economic Losses from Earthquakes, Floods, and Tropical Cyclones in Asia-Pacific (1992- 2011)

Index, Flood=100



Source: EM-DAT 2011

In Asia and the Pacific, earthquake, flood and tropical cyclone mortality risk was high due to demographical factors such as population densities, with more people moving to hazard-prone areas.

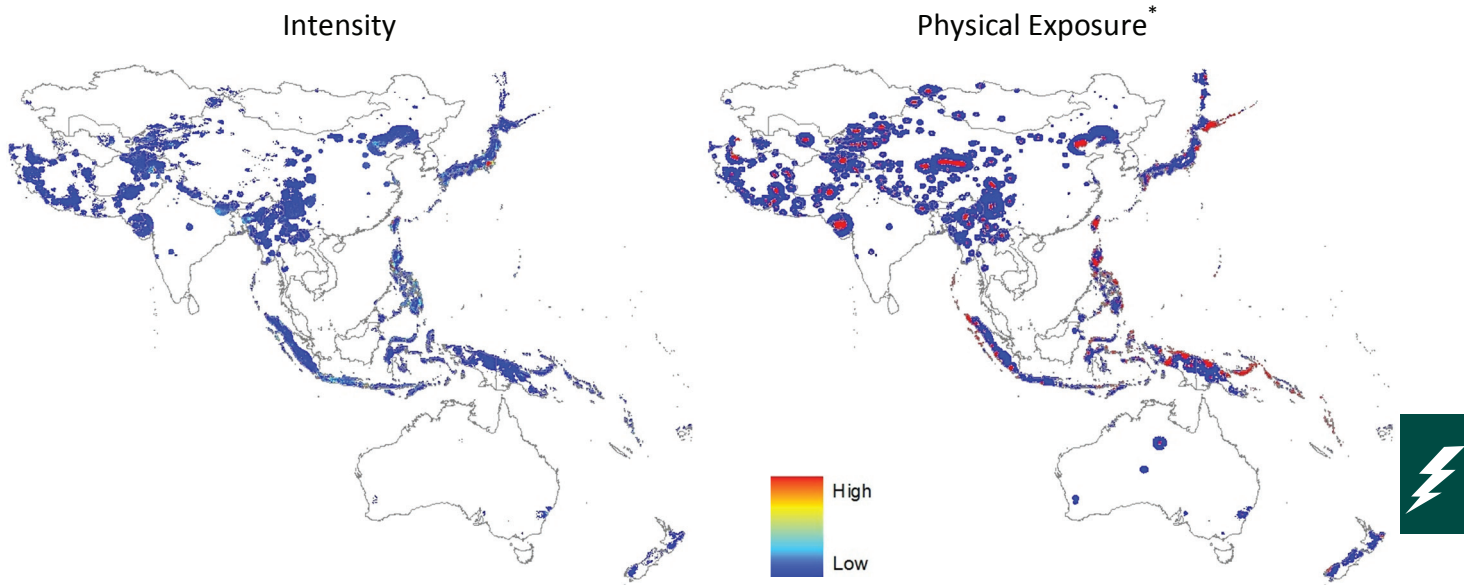
Many countries in the region are located along the Pacific Ring of Fire, which were hit by a number of massive earthquake events during the past two decades.

Relative risk, however, measured as a proportion of population or GDP, is stable, and in the case of mortality, may even be declining (UNEP 2011e).

At the same time, in many parts, vulnerability is decreasing as a result of improved governance and better urban and land planning. This trend compensates for the increase in exposure, thus stabilising or even decreasing risk (UNEP 2011).

Earthquake – Intensity and Physical Exposure

(Modelled using 1992-2011 data)



*Physical exposure – People and assets located in hazard-prone areas that are affected; according to its intensity, location and time period.

Source: UNISDR 2011

Credit: GIS processing UNEP/GRID Geneva 2011 with key support from USGS EROS Data Centre 2008

Earthquake intensity and physical exposure are concentrated in the same areas. Many Asia and the Pacific countries are located along the 40,000 km band of seismicity known as the “Pacific Ring of Fire”. Approximately 75% of the world’s seismic energy is released along the edges of the Pacific Ocean. “The Ring of Fire,” stretches up the west coasts of South and Central America and from the North American continent to the Aleutians, Japan, China (Southwest China), the Philippines, Indonesia, and Australasia (Pacific Disaster Center, accessed on 20 April 2012). Therefore, these countries are highly exposed to geophysical events (such as earthquakes) every year, including a number of deadly historical earthquakes in the past two decades.



1 January 2004 (Quickbird image)



26 December 2004 (Quickbird image)

2004 Tsunami

(Affected countries: India, Indonesia, Kenya, Malaysia, Maldives, Myanmar, Seychelles, Somalia, Sri Lanka and Thailand)

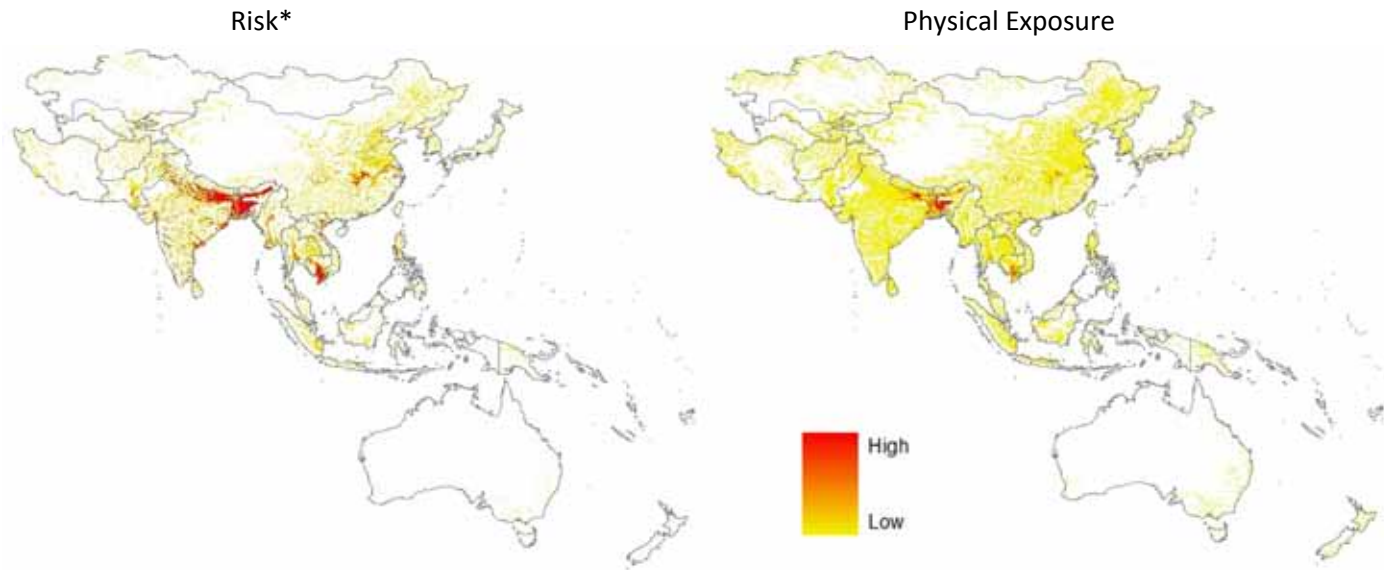
On 26 December 2004, tsunamis swept across the Indian Ocean, spawned by a magnitude 9.0 earthquake off the coast of Sumatra. Aside from Indonesia, Sri Lanka likely suffered the most casualties, with the death toll reported at 21,715 on 29 December 2004. The image above of Kalutara shows the normal condition, while in the image below it is hit by a series of waves. Water is flowing out of the inundated area and back into the sea, creating turbulence offshore.

Source: NASA 2004 and OCHA 2004

Many countries in Asia and the Pacific have a high risk of flooding, with associated high human and economic losses

Floods – Risk and Physical Exposure

(Modelled using 1992-2011 data)



**Risk – Probability of losses (mortality and economic losses) from a specific hazard, according to its intensity, location and time period.*

Source: UNISDR 2011;

Credit: GIS processing UNEP/GRID Geneva 2011 with key support from USGS EROS Data Center 2008

Between 1992 and 2011, South Asia, Eastern China and South East Asia were particularly affected by major floods with high human and economic losses in populated areas.

Floods Swamp Historic City - Ayutthaya, Thailand

showing an unusual large expanse of flood water in a monsoon season

The Chao Phraya River in Central Thailand forms at the confluence of smaller rivers and flows southward to the Gulf of Thailand. En route to the sea, the river passes through Ayutthaya, north of Thailand's capital city of Bangkok. Ayutthaya is a United Nations Educational, Scientific and Cultural Organization (UNESCO) World Heritage site.

The Chao Phraya River curves through the southwestern part of the city. In October 2011, the river overflowed onto nearby floodplains. Fields, roads, and buildings were all submerged by sediment-clogged flood water. The large expanse of flood water was unusual even in a monsoon season. Flooding forced the closure of manufacturing plants in Ayutthaya. On October 12, UNESCO Bangkok announced an assessment of the flood damage to Ayutthaya, requested by the Government of Thailand.

Source: NASA 2011



23 October 2011 (NASA EO-1 Satellite Imagery)



11 July 2011 (NASA EO-1 Satellite Imagery)

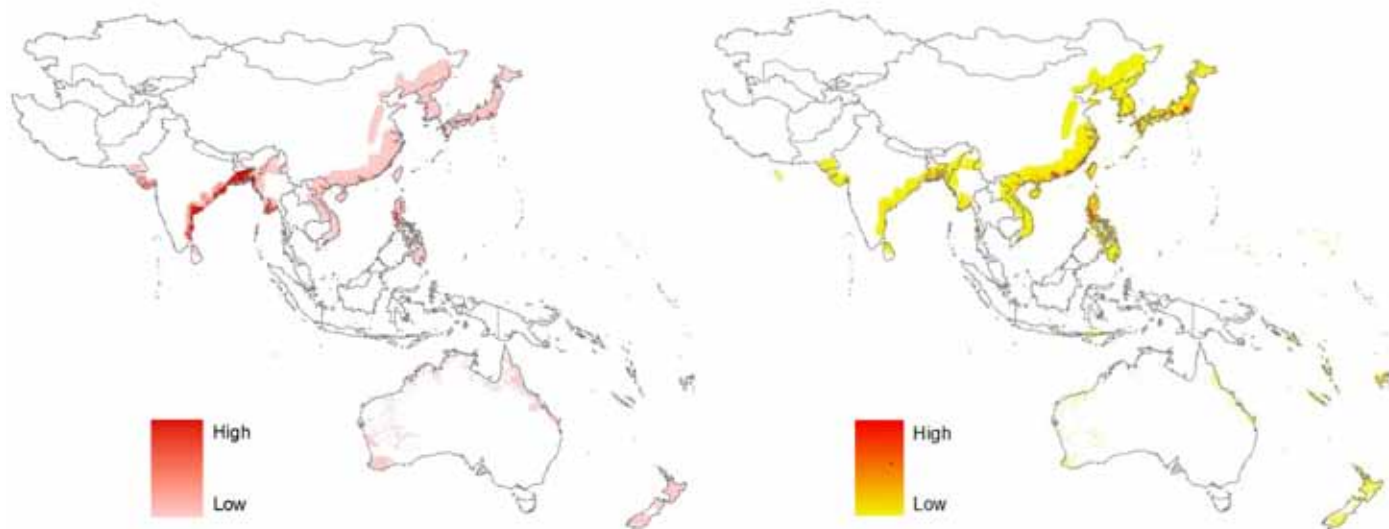
Coastal areas in Asia and the Pacific are also affected by tropical cyclones

Tropical Cyclones – Risk and Physical Exposure

(Modelled using 1992-2011 data)

Risk

Physical Exposure



Source: UNISDR 2011

Credit: GIS processing UNEP/GRID Europe 2011 with key support from USGS EROS Data Center 2008

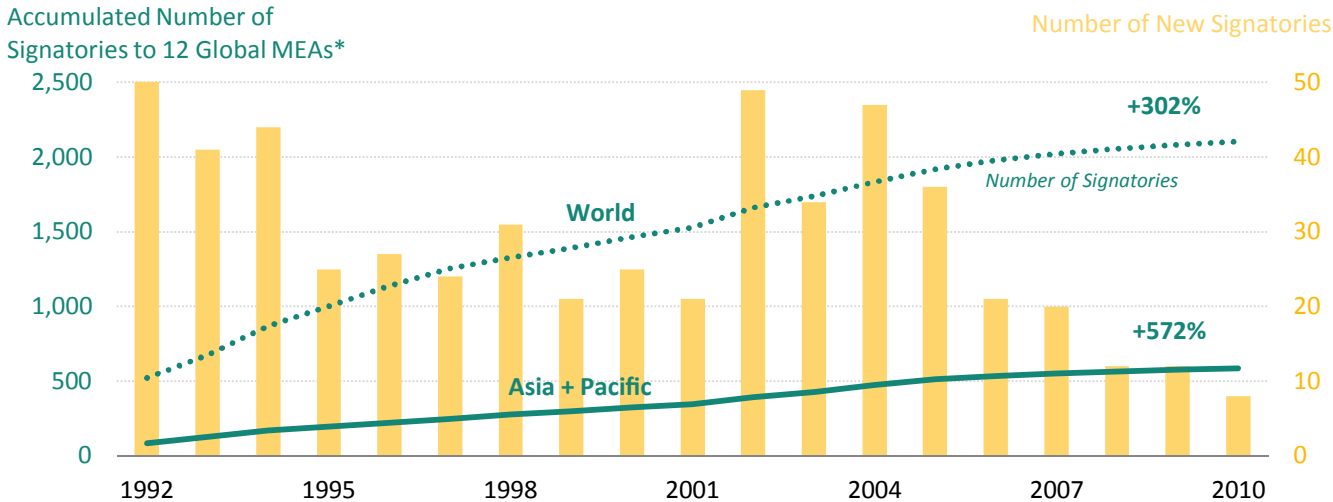
Tropical cyclones occurred in the same locations throughout 1992 and 2011: populations living on the coastline facing the Indian Ocean and the Pacific Ocean, including east coast of South Asia, east coast of South East Asia and North East Asia, were hit particularly by a number of severe storms causing heavy rains and flooding.

GOVERNANCE



More countries in the region ratified international agreements since 1992

Multilateral Environmental Agreements (Number of Parties to 12 Global MEAs*)



*MEAs include: Basel, CBD, CITES, Kyoto, Ramsar, Rotterdam, Stockholm, Montreal,

Source: UNEP Environmental Data Explorer, as compiled from various MEA secretariats

The steady increase of countries ratifying Multilateral Environmental Agreements (MEAs) such as the Convention of Biological Diversity, the Ramsar Convention and the Kyoto Protocol signifies rising political recognition of environmental issues. Asia and the Pacific's number of parties to 12 global MEAs has increased almost six-fold since 1992.

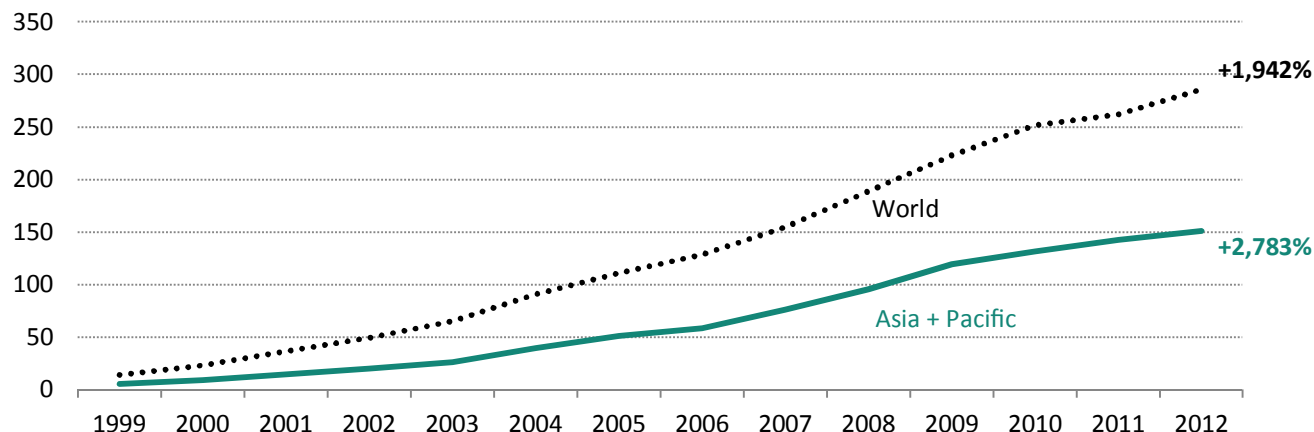
Altogether, the number of newly established global and regional MEAs is steadily decreasing, demonstrating that legal frameworks are now in place to address many important issues. Either establishing or signing an agreement or convention, however, does not mean that the related environmental problems have been solved (UNEP 2011).



The private sector is increasingly adopting environmental management standards. Compared to the world, Asia and the Pacific shows a faster growth rate

ISO 14001 Certifications

Number of Certificates
(Thousand)



Source: UNEP Environmental Data Explorer, as compiled from ISO 2012

The International Organization for Standardization (ISO) has developed over 18,500 international standards on a variety of issues (UNEP 2011). The ISO 14001 standard is primarily concerned with “environmental management”. It codifies what practices and standards companies should follow to minimize harmful impacts on the environment caused by their activities and to achieve continual improvement of their environmental performance. With 285,000 certificates granted in 2012 worldwide, this development demonstrates the commitment of a growing number of companies to adopting environmental management systems.

In Asia and the Pacific, the number of ISO 14001 certificates has grown from only 5,000 certificates in 1999 to 151,000 certificates in 2012, representing a more than 2,783% increase. This trend shows that the countries of the region have made some progress to improve their environmental performance.



Source: UN Photo/Kibae Park

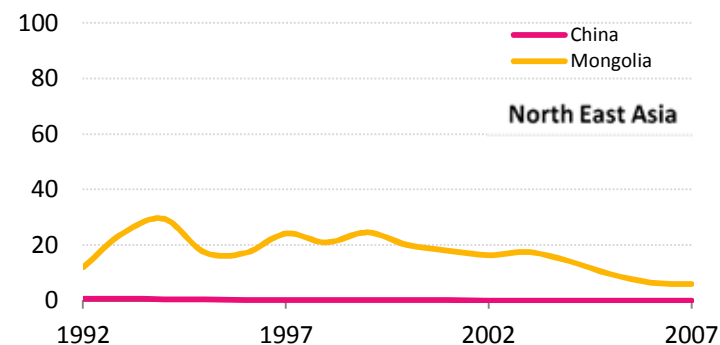
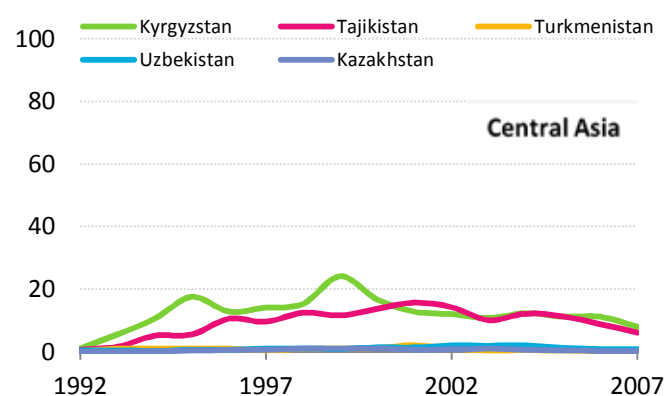
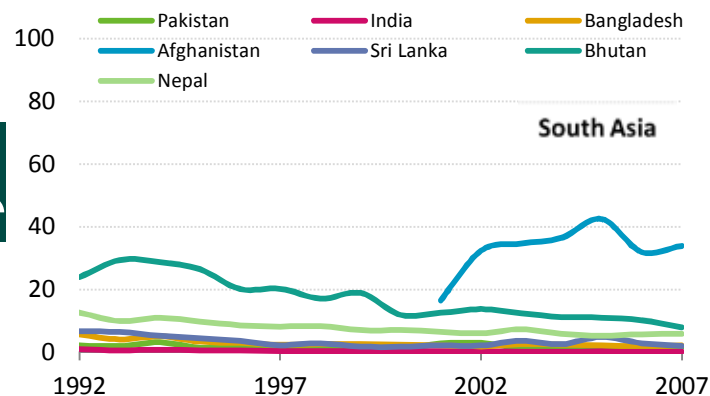
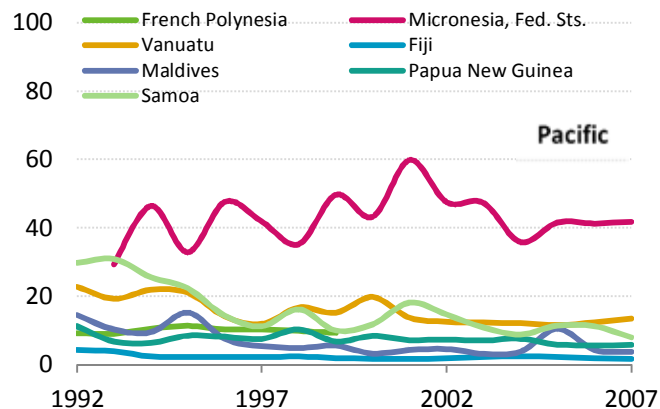
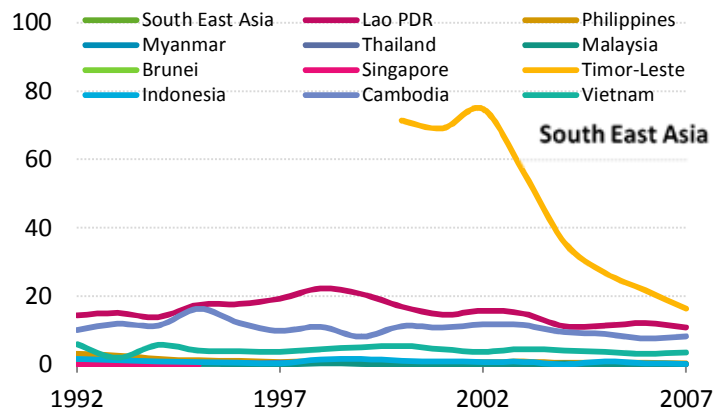
Carbon Market

All the data show that the carbon market is becoming a powerful financial force supporting clean development (World Bank 2012a). Up to the end of September 2012, Asian countries accounted for 84% of total volumes in the CDM market, China continues to dominate the project-based market with 60% of the volume of projects transacted (down from 73% in 2005) with India next with a 15% share of the market volume (up from 3% in 2005) (World Bank 2012).



Since the 2008-2009 financial crisis, 2011 emerged as yet another turbulent year for capital markets. Volatility increased for energy-related commodities, including carbon, with the onset of the Arab Spring, the shutdown of nuclear power stations in Japan and Germany in the wake of the Fukushima disaster, and the downgrade of the United States' AAA credit rating. Equally relevant was the crisis of confidence that ensued as the Greek debt crisis intensified, spurred by fears that it would spread to other European Union (EU) economies and lead to a double-dip recession (World Bank 2012).

Total Foreign Aid Received (% of national GNI)



Source: GapMinder 2012

Foreign aid received (% of national GNI) in Asia and the Pacific countries showed annual variations. Majority of the countries showed a downward trend since 2002.

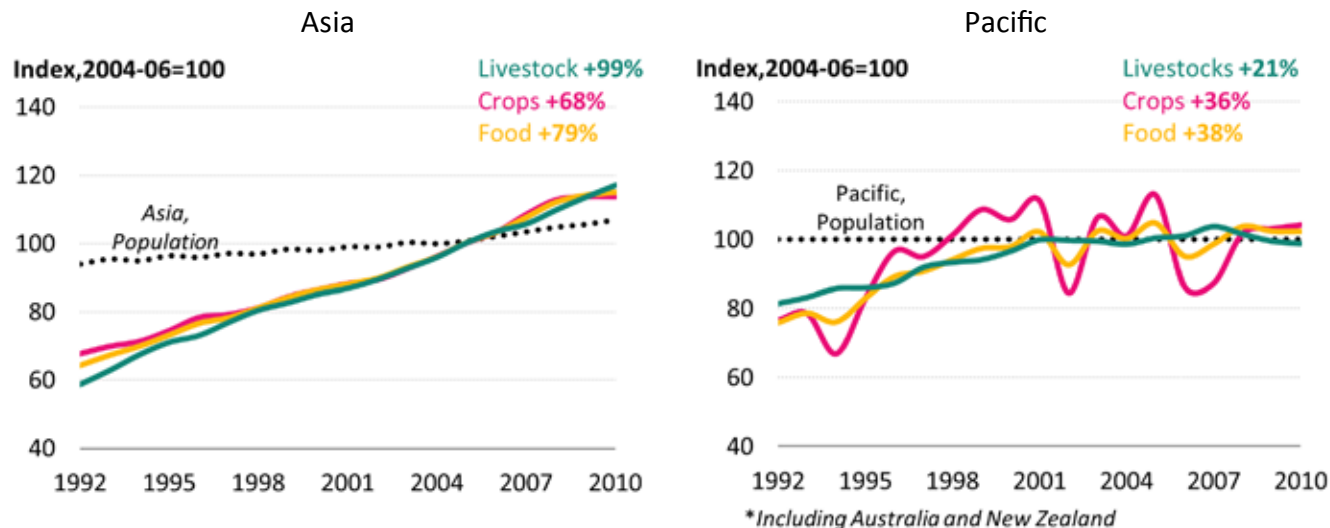
AGRICULTURE



UN Photo/John Isaac (Sichuan, China)

Food production has continued to rise steadily at a pace exceeding population growth

Food Production Index



Source: FAO 2010

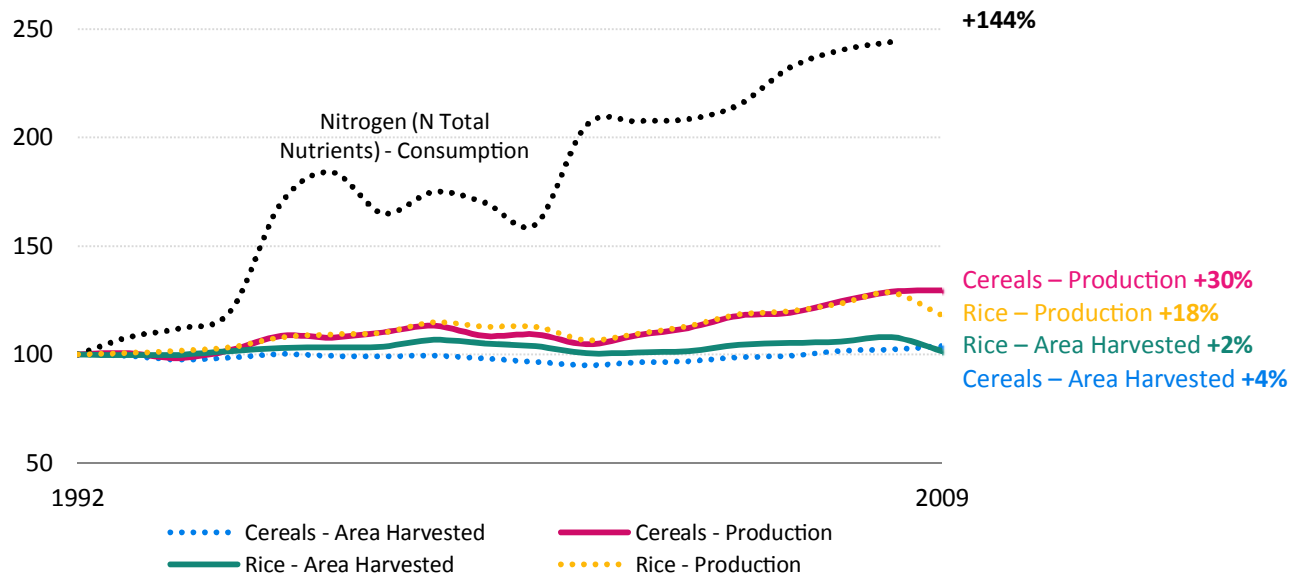
Global food production has exceeded population growth over the past two decades. Gains in production have come primarily from improved yields and to a lesser extent from new agricultural land. However, despite solid gains made in food security, millions in developing countries still face chronic hunger and malnutrition (UNEP 2011). More significant gains in agricultural production will be necessary to meet continued global population growth. These will require expanding farmland and using more intensive production techniques. Such practices have known negative impacts on the environment, including loss of biodiversity and pollution from nitrogenous fertilizers and other agricultural chemicals (UNEP 2011).

The past two decades show regional variation in food production in Asia and the Pacific. In Asia, food production has continued to increase to keep pace with and even exceed population growth. On the other hand, the Pacific (including Australia and New Zealand) shows strong annual variations. Overall, food production increased significantly by nearly 80% in Asia and by nearly 40% in the Pacific. Livestock production almost doubled in Asia and increased over 20% in the Pacific. Crop production increased by nearly 70% in Asia and over 35% in the Pacific.

Higher agricultural yields depend heavily on the use of fertilizers

Asia-Pacific Rice and Cereal Production, Area Harvested and Fertilizer Usage

Index, 1992=100



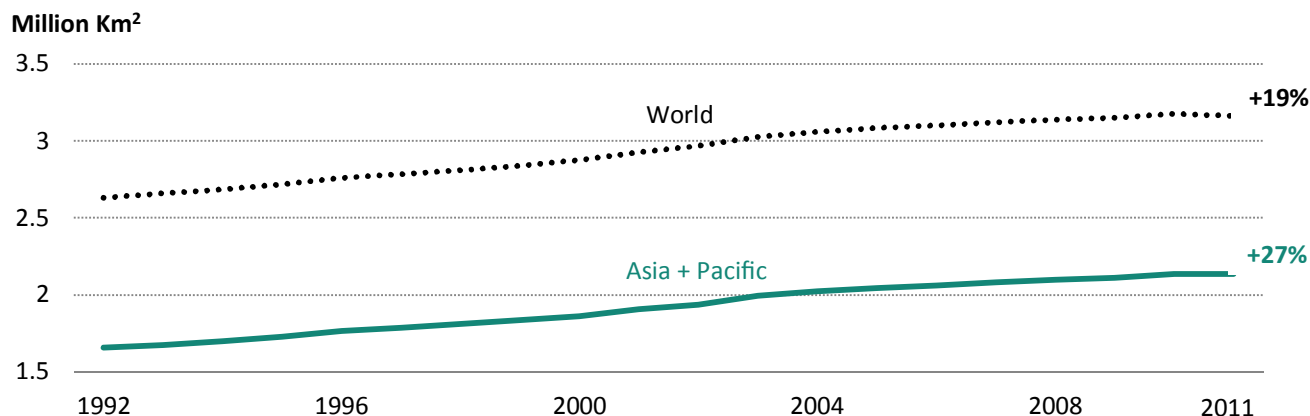
Source: UNEP Environmental Data Explorer, as compiled from FAO 2009

In Asia and the Pacific, cereal production increased during the early 1990s, dropping slightly between 2000 and 2004, increasing since to 30%. The region experienced record rice production in 2008 but rice production declined in 2009, from a drop in harvested area, related to natural disasters, particularly from the Asian monsoon (FAO 2009). Overall, rice production has increased by 18% since 1992.

The increase is almost exclusively dependent on intensification, where the use of fertilizers plays a major role (UNEP 2011a). The heavy dependence on machines and materials increases energy usage (UNEP 2011).

While increasing irrigation infrastructure can raise crop yields, it puts further pressure on freshwater resources

Total Area Equipped for Irrigation



Source: UNEP Environmental Data Explorer, as compiled from FAO 2012

In Asia and the Pacific, the areas equipped for irrigation have expanded steadily, representing a 27% increase between 1992 and 2011.

By 2011, Irrigation accounted for about 70% of total freshwater withdrawals worldwide, and it is seen as one of the principal factors in an increasing state of water scarcity (UNESCO 2011, as cited in UNEP 2011). According to the FAO statistics¹⁵, between 2008 and 2012, Asia and the Pacific's water withdrawal for irrigation accounted for more than 90% of the world's total withdrawal, increasing from 80% in the early 1990s.

Irrigation expansion into sensitive ecosystems leads to significant losses of natural habitat. Conversely, increasing production through intensification of agriculture irrigation can reduce the agricultural land use, sparing valuable natural areas. There is a strong need in general to increase water use efficiency under irrigated agriculture regimes (UNEP 2011).

¹⁵ No data for all countries. Total figures for withdrawals worldwide and Asia-Pacific were based on a sum of available data.

The Aral Sea in Uzbekistan and Kazakhstan

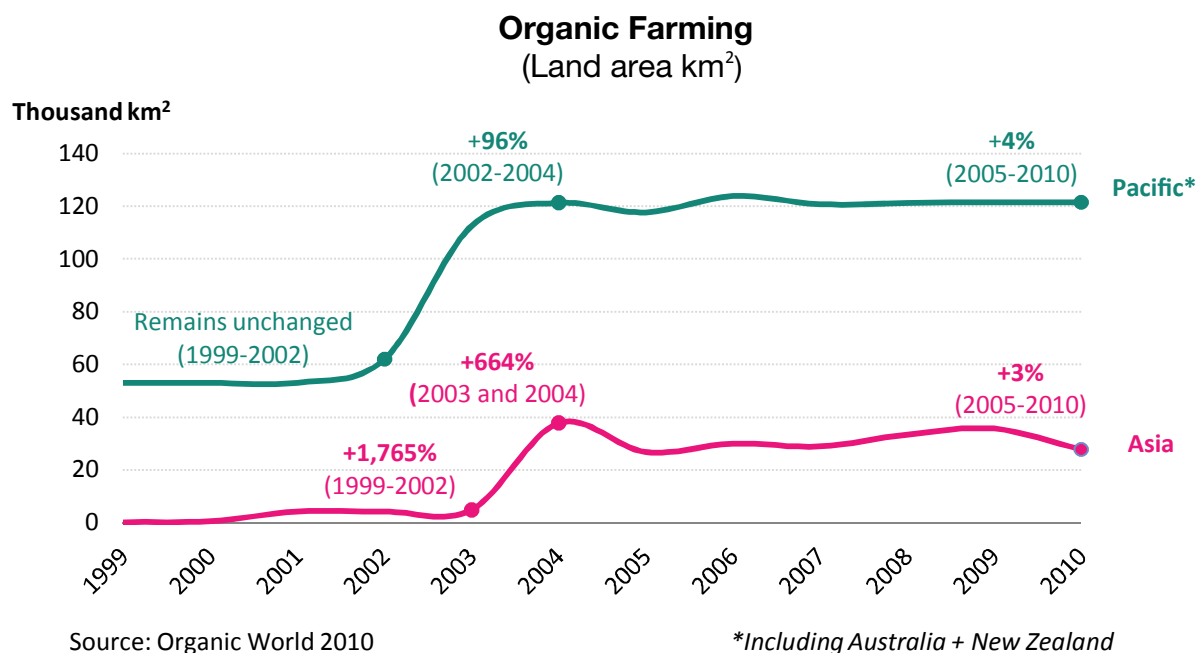


Source: USGS Landsat. Science Photo Library/Rex Features.

<http://www.dailymail.co.uk/sciencetech/article-2177202/The-changing-face-Earth-Dramatic-high-resolution-satellite-images-world-changed-decades.html> Accessed on 18 October 2012

These Landsat satellite photos are of the Aral Sea, found between Uzbekistan (west) and Kazakhstan (east). It used to be the fourth largest lake in the world. Since the 1960s it has lost more than half of its volume and these images show how its size has decreased in the past two decades. The first image was taken in 1999, the second image in 2004 and the third image in 2009. The shrinkage is due to overuse of feeder rivers (the Syr Darya and Amu Darya) for the irrigation of cotton and paddy fields. Since 2009, partial recovery of the lake has commenced.

In Asia and the Pacific, land area used for organic farming has grown rapidly between 2002 and 2004 and shown slight annual variations since 2005



Organic farming is a form of agriculture that excludes or strictly limits the use of chemical fertilizers and pesticides, and builds on integrating crops and livestock, diversifying species and recycling nutrients on the farm, among other practices that favour natural processes (UN 2010, as cited in UNEP 2011).

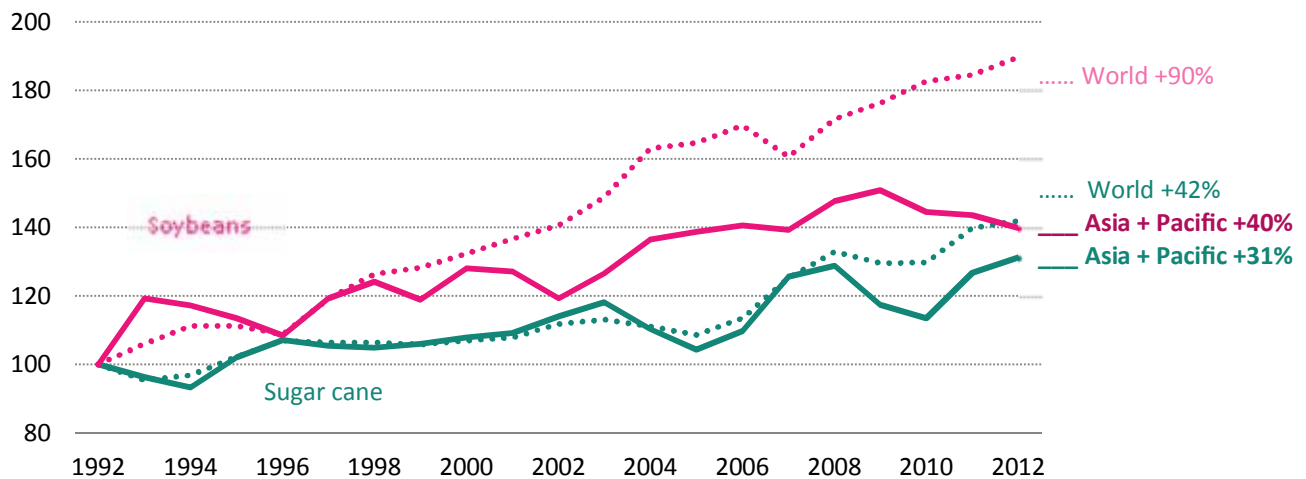
In the Pacific, organic farming expanded rapidly between 2002 and 2004, increasing from 62,000 square kilometers to more than 121,000 square kilometers, representing a 96% increase within a period of three years. The same trend occurred in Asia between 2003 and 2004, increasing from 4,900 square kilometers in 2003 to 38,000 square kilometers in 2004 representing more than 660% increase. The sudden strong and short increase is most likely due to either a change in the definition of “Organic Farming” or a change in the reporting source as both regions show the same trend.

Sugar cane, soybeans and palm oil have expanded dramatically in the tropics, often replacing primary forests

Selected Crops in Humid Tropical Countries

Sugar Cane and Soybean (Area harvested change)

Index, 1992-2012



Source: FAO 2013

Sugar cane, soybeans, and oil palm are cultivated on a massive scale in the tropics (UNEP 2011).

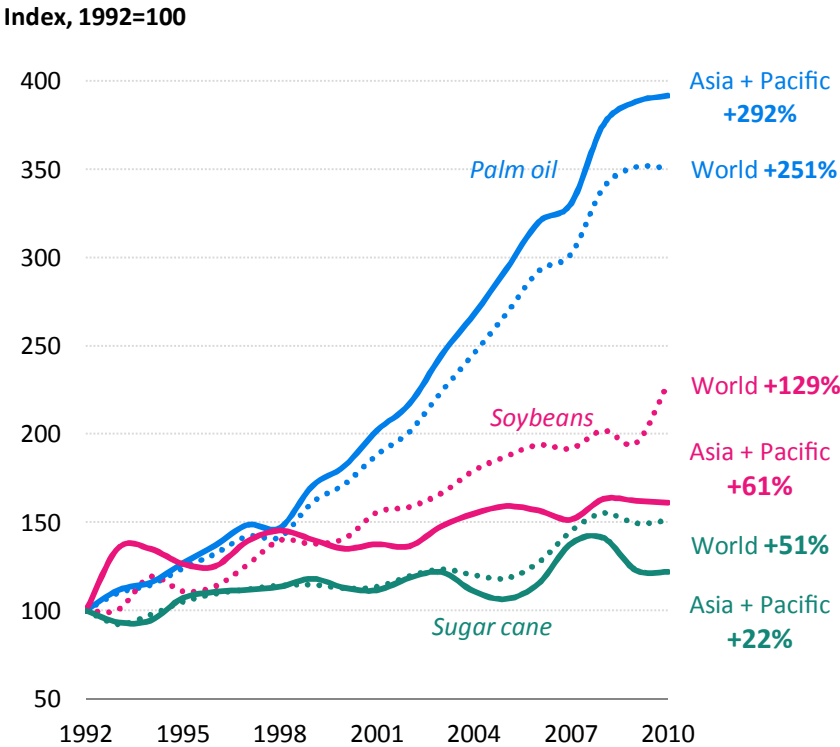
Between 1992 and 2012, the areas harvested for soybeans and sugar cane grew by over 40% and 31%, respectively.



Palm oil has seen some of the most drastic increase in production, mainly in South East Asia

Selected Crops in Humid Tropical Countries

Selected Crops Production
(Palm Oil, Soybeans and Sugar Cane)



Source: FAO 2010

The region's palm oil production has increased significantly in the past two decades, mainly in South East Asia, representing over 290% increase since 1992. Soybeans and sugar cane production has increased by over 60% and 20% respectively.

Since the early 1990s, the increase in the region's palm oil production has been stronger than the world's average production, in contrast to soybeans and sugarcane which growth dropped back from global increases in 1999 and 2003 respectively.

Oil palm plantation area and palm oil export in 2010

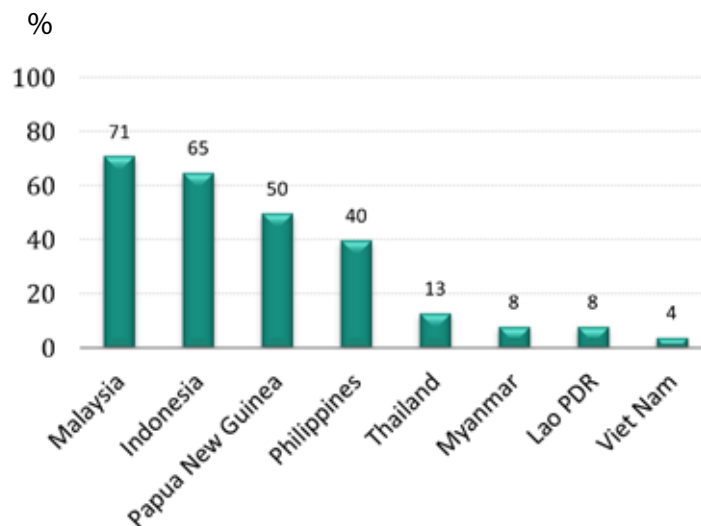
	Mature Area (in M ha)	Export (in '000 tonnes)
Indonesia	5.74	16,450
Malaysia	4.13	16,664
World Total	12.82	36,539

Source: UNCTAD 2013

Oil Palm Distribution:

Oil palms are restricted in the tropics and have mainly been cultivated in Indonesia and Malaysia. Global demand for palm oil is expected to double by 2020. (FAO 2009, as cited in UNEP 2011). New plantations continue to be established and existing ones are being expanded (WWF 2011, as cited in UNEP 2011).

Forests Suitable for Oil Palms (2010) (% of Total Forests)



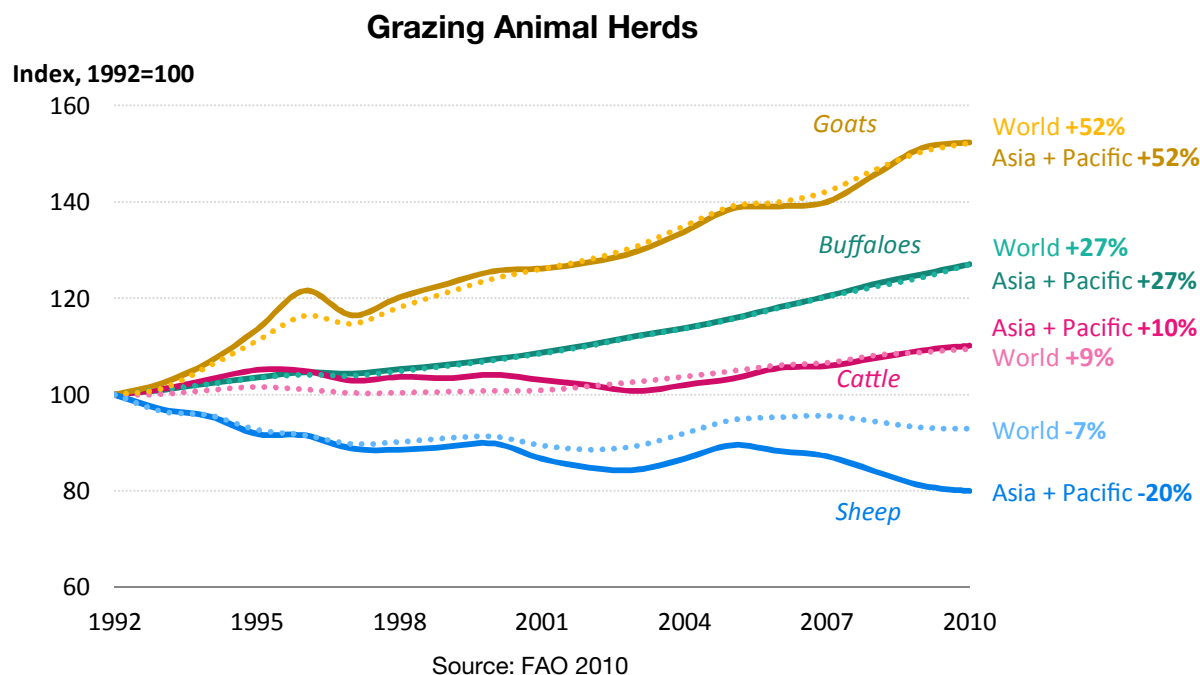
Source: Forest suitable for oil palms (Sickler and others 2007); Total forest (FAO 2010)

It was estimated that between 1990 and 2005, 55-60% of oil palm expansion in Malaysia and Indonesia occurred at the expense of virgin tropical forests (Koh and Wilcome 2008; WWF 2011, as cited in UNEP 2011). By the end 2000s, about 4 million ha of closed canopy oil-palm plantations were established in peninsular Malaysia (Gilbert 2012).

Accordingly to UN reports, the establishment of oil palm plantations caused widespread forest destruction in Indonesia and Malaysia, where 85% of global production has taken place (UNEP 2011c, UNCTAD 2013).

In 2010, it was estimated that about 40-70% of total forests in Malaysia, Indonesia, Papua New Guinea and Philippines were suitable for oil palm plantation, followed by Thailand, Myanmar, Lao PDR and Viet Nam (between 4-13% of total forests).

Livestock numbers in Asia and the Pacific have tended to match global growth trends, with the exception of sheep



The numbers of most grazing animals have increased worldwide over the last two decades. In Asia and the Pacific, the number of cattle and buffaloes has increased by 10% and nearly 30% respectively, and goats by more than 50%, while the number of sheep decreased by 20%.

By 2010, the region's buffaloes (which is largely distributed in Asia), represented more than 97% of the world's total, goats and sheep each accounted for more than 60%, and cattle accounted for nearly 40%.

These increases in grazing animal herds are significant, due to the impacts they have on the landscape, particularly fragile grasslands (UNEP 2011). Their hooves pulverize the soil, breaking up the thin crust formed by rainfall and allowing valuable topsoil to be more easily eroded by wind (Brown 2011, as cited in UNEP 2011).

FISHERIES

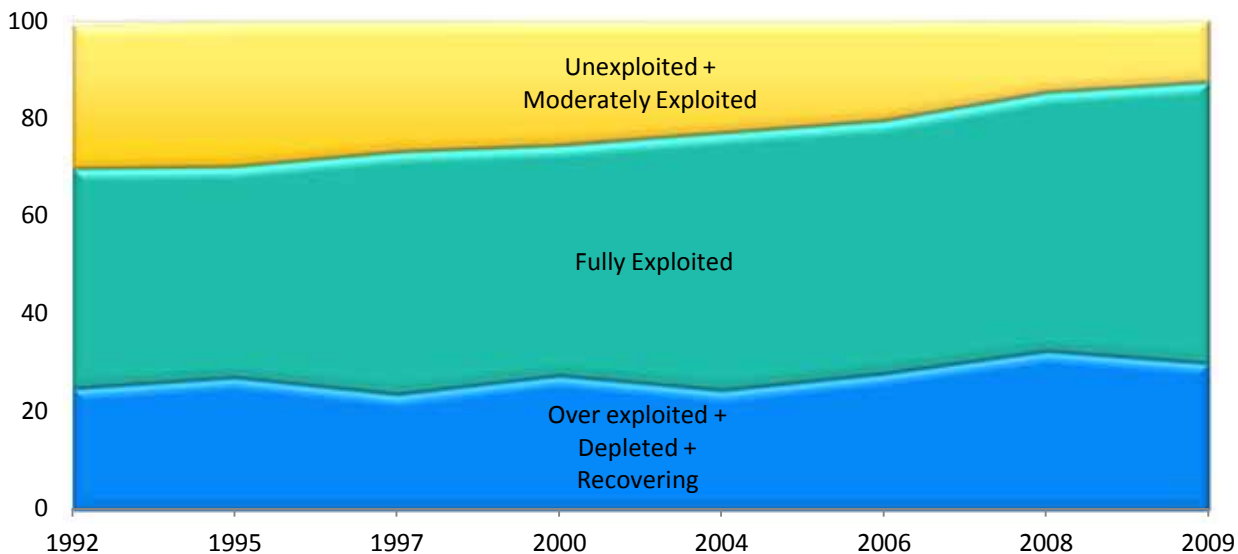


UN Photo (Cochin, India)

The depletion of fish stocks is one of the most pressing environmental issues

Global Trends in World Stocks State of Exploitation (1992-2008) (% of all fish stocks)

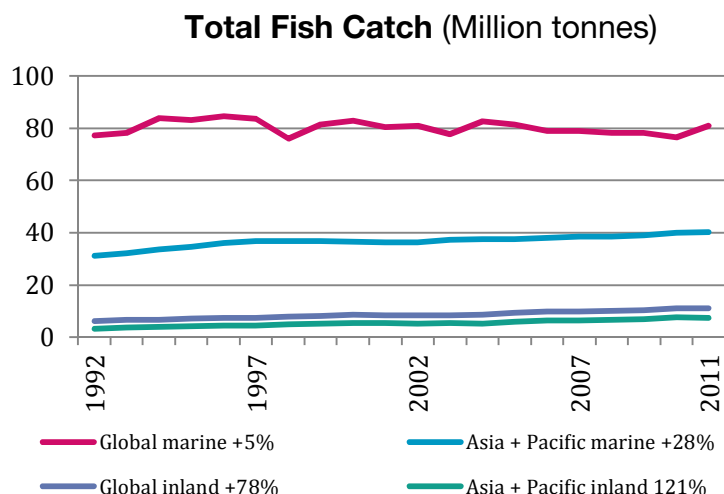
% of all fish stocks



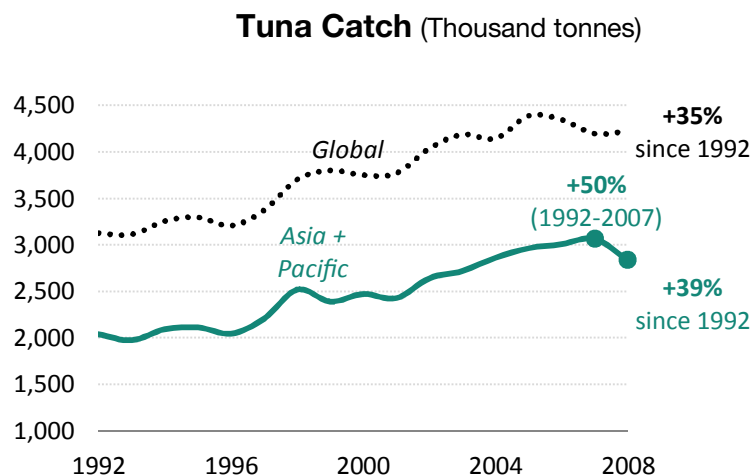
Source: UNEP Environmental Data Explorer, as compiled from FAO 2013

According to a FAO report (FAO 2011b), 87% of all people involved globally in fisheries and aquaculture live in Asia. World aquaculture is heavily dominated by the Asia and the Pacific region, which accounts for nearly 90% of production. This dominance is mainly because of China's enormous production (62% of global production). In 2008, two-thirds of the world's inland catch was in Asia (a slow but steadily rising trend since 1950). The effect of climate change (i.e. increasing ocean acidification, shifting food distributions and more frequent cyclones) may increase the negative impacts on capture fisheries already suffering from over-exploitation, coastal degradation and pollution. In the Eastern Central and Southeast Pacific, there have been no major changes in the state of the stock exploitation. However, there have also been some improvements regarding the assessment and management of some key fish stocks (i.e. Australia).

Asia and the Pacific's marine fish catch has increased slightly, although tuna catches have risen steeply



Source: UNEP Environmental Data Explorer, as compiled from FAO 2013



Source: FAO 2008

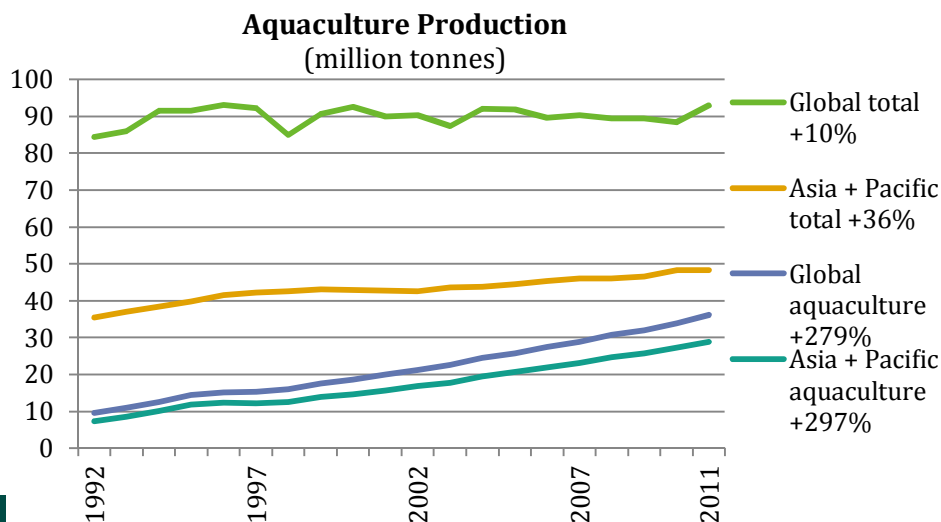
Asia and the Pacific's marine fish catch data show annual variations, with an overall trend suggesting an increase (reversing the global trend) over the past two decades. The region's marine fish catch has grown 28% from 31 million tonnes in 1992 to 40 million tonnes in 2011. By 2011 the catch accounted for 50% of the world's catch. At the same time, the region's inland fish catch showed a steady growth of 95%, increasing from three million tonnes to seven million tonnes between 1992 and 2011 reaching 67% of the world's total inland fish catch.

Tuna is an economically important, globally-traded fish that is increasingly in demand by consumers (UNEP 2011). In Asia and the Pacific, tuna catches increased dramatically, from about 2 million tonnes in 1992, to more than 3 million tonnes in 2007, representing a 50% increase. By 2007, the region's tuna catches accounted for more than 70% of the world's catch. Between 2007 and 2008, the catch has dropped by 7.4% closely related to the 2008 financial crisis (FAO 2011).



80% of global aquaculture was practiced in Asia in 2011

Fish Catch and Aquaculture Production



Aquaculture in Asia and the Pacific increased by nearly 300% between 1992 and 2011. The region showed the highest growth in the world, hosting 80% of the world's aquaculture in 2011. Aquaculture production in Asia and the Pacific has grown from seven million tonnes in 1992 to nearly 30 million tonnes in 2011, equal to nearly 30% of the world's total fish catch in 2011.

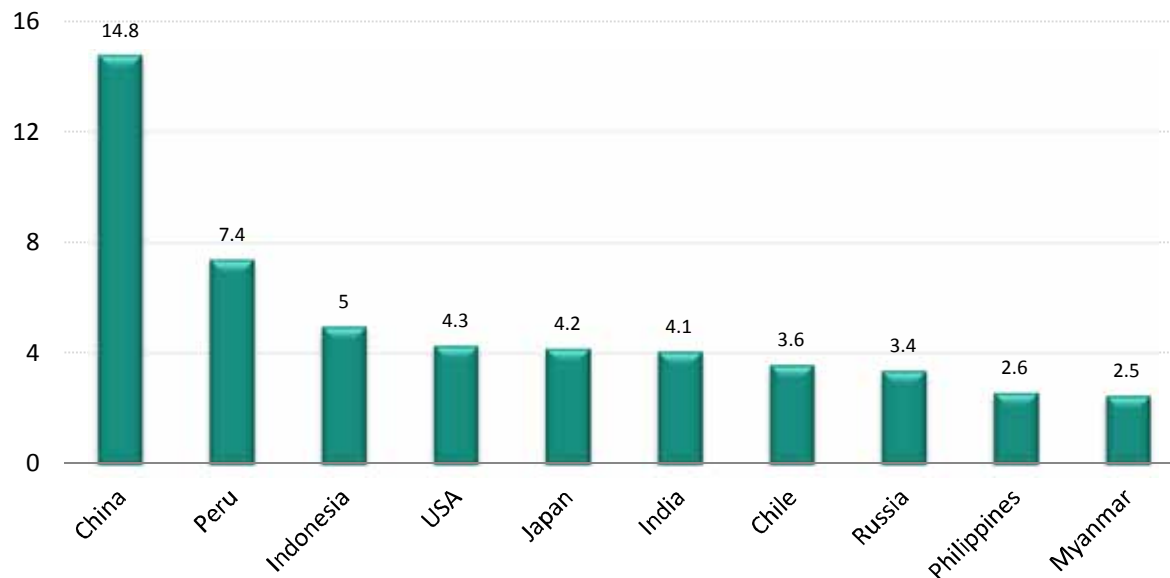
Source: UNEP Environmental Data Explorer, as compiled from FAO 2013

The growth of aquaculture has created jobs and important economic benefits, but the environment has suffered from a loss of mangroves, poor fish-waste management, an influx of antibiotics, impacts of producing or catching large quantities of small fish for feed, and competition between escaped farm fish and neighbouring wild fish (UNEP 2011, as cited from FAO 2011).

Major Asian fishing countries include China, Indonesia, Japan, India, the Philippines and Myanmar

Major Fishing Countries

Million Tonnes in 2008



Source: FAO 2011b

The most significant change in the ranking of the top ten producers was the gaining of a position by two countries (Indonesia and India), which surpassed two American countries (USA and Chile) whose total capture production decreased by 10% and 15% respectively, in comparison with 2008. Other major Asian fishing countries (i.e. Bangladesh, Myanmar, the Philippines and Viet Nam) are reporting increasing capture statistics in the past decade (FAO 2011b) despite well-known cases of local overfishing and natural disasters, including the 2004 tsunami and cyclones that occurred in recent years.

Aquaculture and salt production in Bo Hai, China

The last decades of the 20th century brought rapid development to eastern China's Bo Hai coast, where the sea supports both salt production and aquaculture. Developed areas are visible in the images as the grids of straight lines and sharp angles. In 2000, developed areas occupied most of the coastline.

Aquaculture provides both employment and food security, but poorly planned operations can damage or destroy habitats, and produce waste products that infiltrate local sediments. Runoff can transport those sediments to other areas than those originally used for aquaculture.

According to UNEP, the Bo Hai Sea ranks as one of the world's most intensely exploited aquaculture regions.

Source: NASA 2009



27 May 1979



2 May 2000

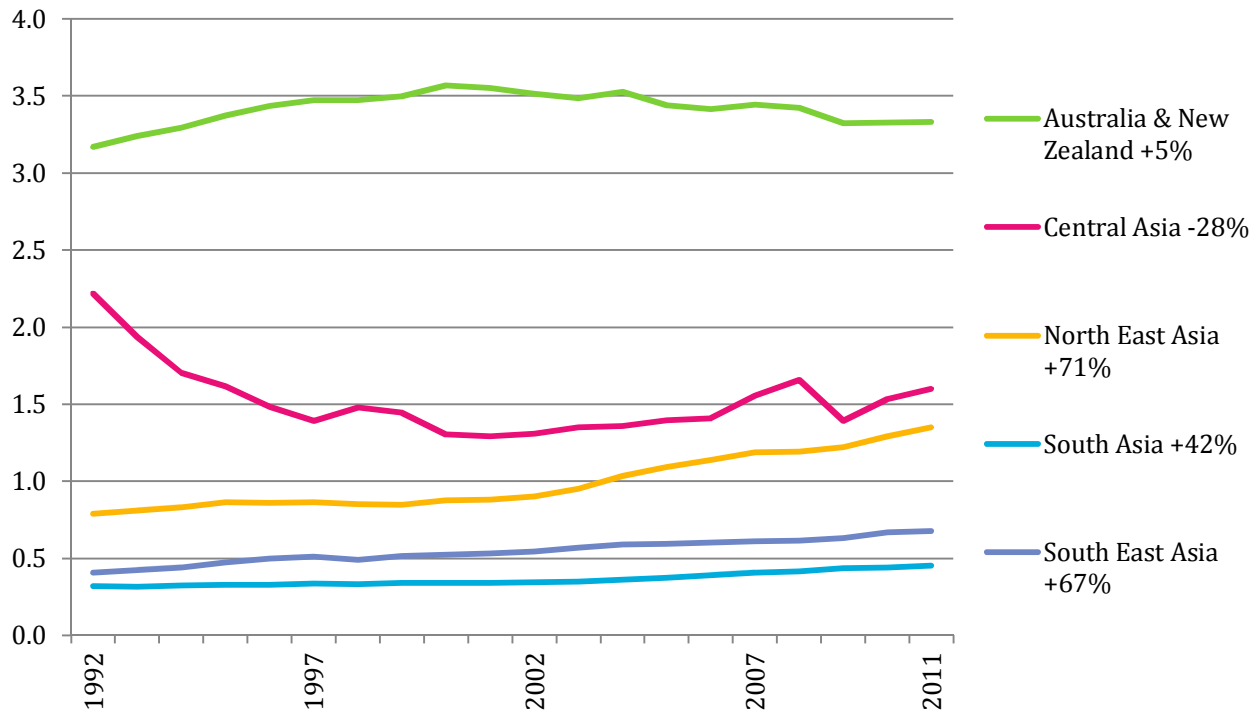
ENERGY



UN Photo/Ariane Rummery (Fakaofu, Tokelau, October 2007)

Australia & New Zealand has the highest energy consumption per capita in the region

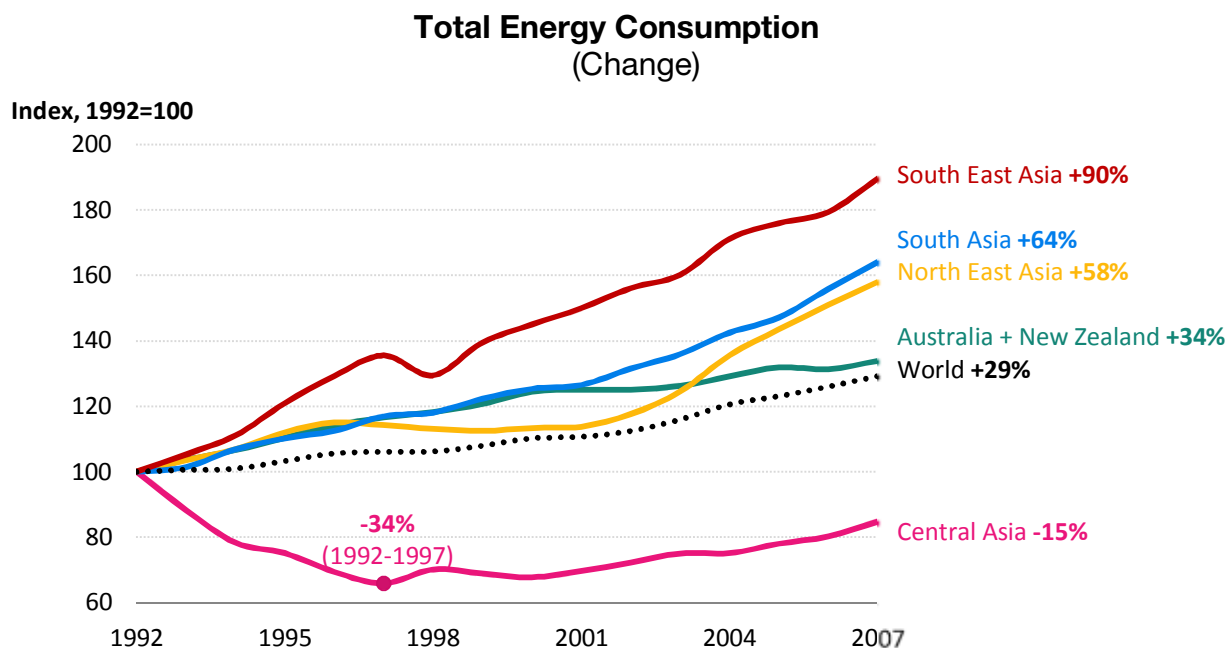
Total Energy Consumption in Asia and the Pacific
(Tonnes oil equivalent per capita)



Source: UNEP Environmental Data Explorer, as compiled from IEA 2012

Asia and the Pacific experienced a rapid economic growth in the past two decades while most sub-regions also show an increase in the per capacity energy consumption. Australia and New Zealand has the highest energy consumption per capita, while North East Asia has shown a steady increase since 1992, at a higher rate than other sub-regions.

Since 1992, energy consumption in South East Asia showed the highest increase (90%), while Central Asia showed a decline (-15%)



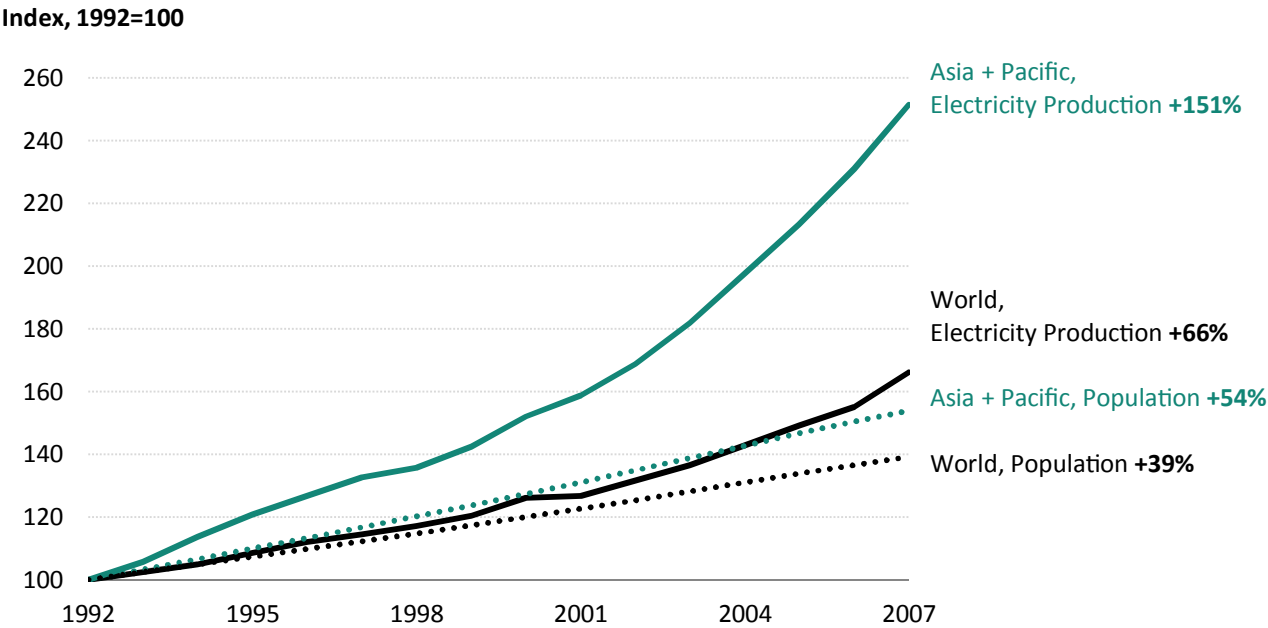
Source: UNEP Environmental Data Explorer, as compiled from IEA 2010

As a growing population aspires to higher material living standards, there is an ever-greater need for goods and services and the energy required to provide these (e.g. housing, consumer products, transport and travel) further compounding the increase in total energy consumption (UNEP 2011). Over the past two decades, the increase was Asia and the Pacific wide, except for Central Asia where total energy consumption decreased between 1992 and 1997 (-34%) as a result of economic decline following the break-up of the Soviet Union and a range of other economic indicators.

South East Asia showed the greatest increase in total energy consumption representing a 90% increase, followed by South Asia (64%), North East Asia (59%), and Australia and New Zealand (34%). Central Asia's total energy consumption decreased compared to 1992 (-15%) but began to increase from 1998 (+21% between 1998 and 2007).

A steady rise in electricity production is primarily driven by the growth in industrial production, as well as improving living standards in many developing countries

Electricity Production
(World and Asia-Pacific)



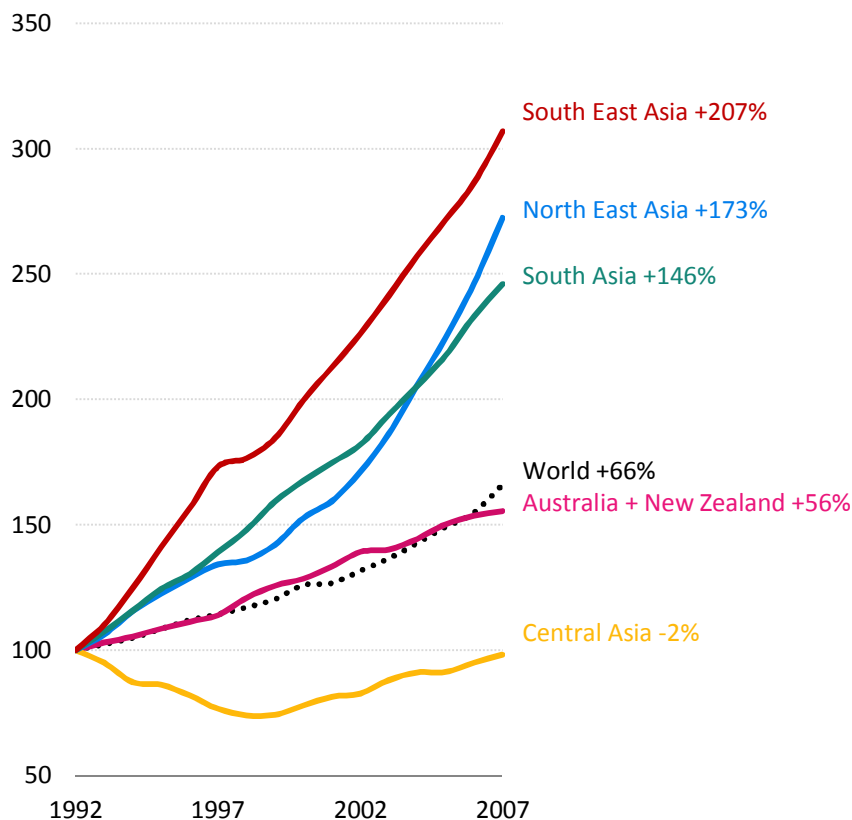
Source: UNEP Environmental Data Explorer, as compiled from IEA 2009

Electricity production in Asia and the Pacific increased by more than 150% since 1992. According to ESCAP 2011, the region, along with Africa, leads the world in growth of electricity production. From 2000 to 2008, the region experienced double the rate of the world's growth at 4%. The growth was particularly evident in less developed countries and lower-middle income countries.

Asia leads the world in increasing electricity production

Electricity Production (World and Asia-Pacific Sub-regions)

Index, 1992=100



Source: UNEP Environmental Data Explorer,
as compiled from IEA 2009

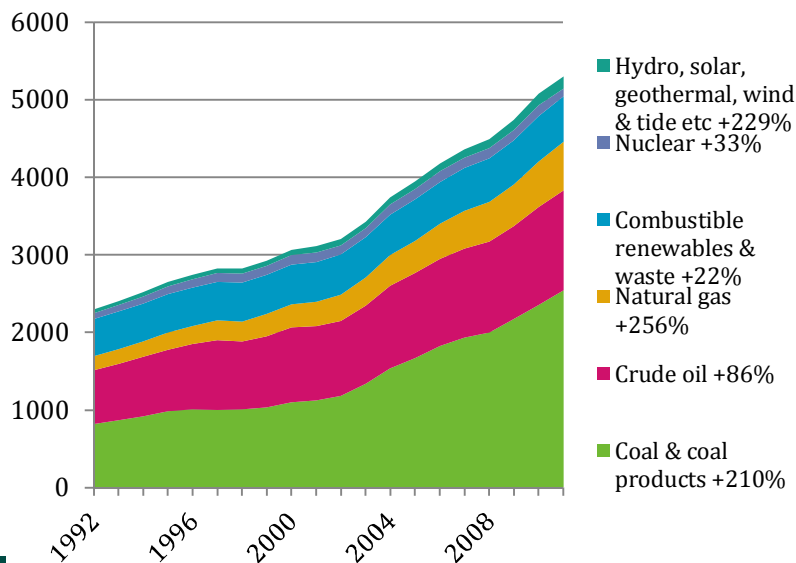
Electricity production in South East Asia, North East and South Asia increased rapidly, higher than the world's average. South Asia showed the highest increase, a 146% increase since 1992, followed by South East Asia (207%), North East Asia (173%), and Australia and New Zealand (56%, lower than the global average).

Central Asia showed variations in electricity production, representing a 2% decrease overall, since 1992. On a per capita basis, the largest growth in absolute numbers occurred in the developed countries (UNEP 2011).



In Asia and the Pacific, renewable energy sources accounted for only 3%, while coal accounted for about 48% of the region's energy supply in 2011

Total Primary Energy Supply in Asia and the Pacific (Million tonnes of oil equivalent)



Coal and oil dominated production of electricity and heating, transportation, industrial uses and other fuel combustion processes in Asia and the Pacific. The share of primary energy sources has been increasing, particularly rapidly in the early 2000s. Natural gas and coal have increased by 256%, and 210% respectively. Oil and nuclear supply increased by 86% and 33%, respectively. Combustible renewables and waste remained the fourth highest share (after coal, crude oil and natural gas) in the primary energy supply, but increased by only 22% since 1992.

Source: UNEP Environmental Data Explorer, as compiled from IEA 2012

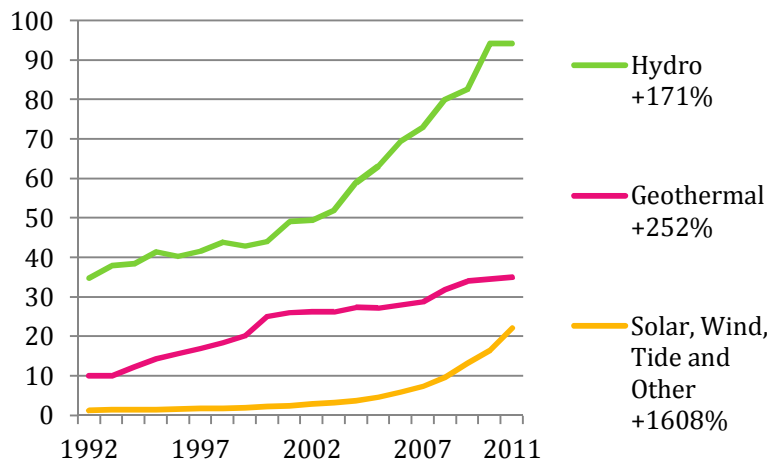
The share of renewable energy has increased from 2% in 1992 to 3% in 2011 but remains modest compared to that of fossil fuels. However, renewable energy has increased by 229% since 1992, and the region's investment in renewable energy was more than US\$102 billion in 2012, and surpassed that of Europe (US\$80 billion) (UNEP 2013a).

In 2007, ASEAN-6 (Indonesia, Malaysia, the Philippines, Singapore, Thailand, and Viet Nam) was responsible for more than 95% of the energy demand in South East Asia. Given their large population and robust projected economic growth, these countries are projected to account for more than 80% of the energy demand growth by 2030 (IEA/OECD 2010).

Asia is the world's most active region for hydropower development

Renewable Energy Supply (Total)

Million tonnes of oil equivalent



Source: UNEP ENvironmental Data Explorer, as compiled from IEA 2013

Renewable energy sources have grown to supply an estimated 16.7% of the global final energy consumption in 2010 (REN21 2012).

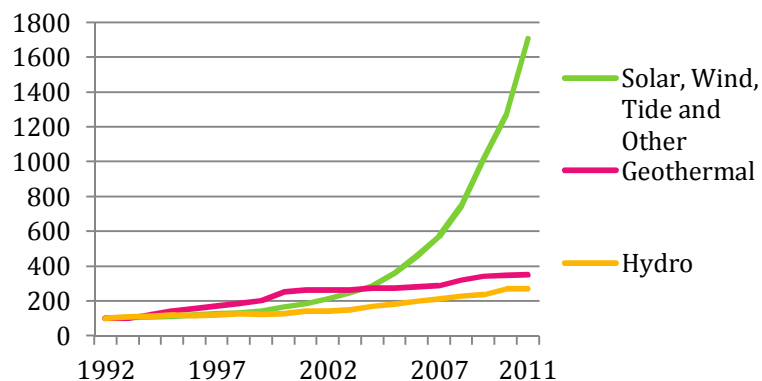
Renewable energy markets show significant gaps across Asia and the Pacific, but Asia is the most active region for new hydro projects.

In 2012, Asia and the Pacific's investment in renewable energy reached US\$102 billion from less than US\$12 billion in 2004 (UNEP 2013a).

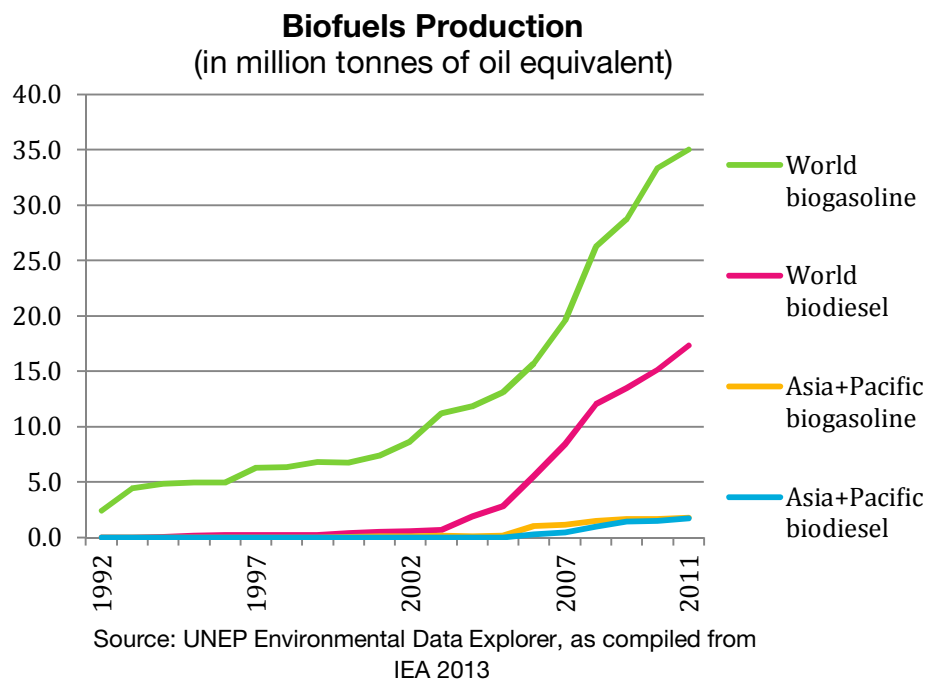
China and India have made significant investments in renewable energy capacity, mainly wind and solar (REN21 2012). Moreover, China is the biggest producer of solar panels and the main actor in driving down the price of these panels.

Renewable Energy Supply (Change)

Index, 1992=100



Biofuels production has grown rapidly since 2004 in the region,



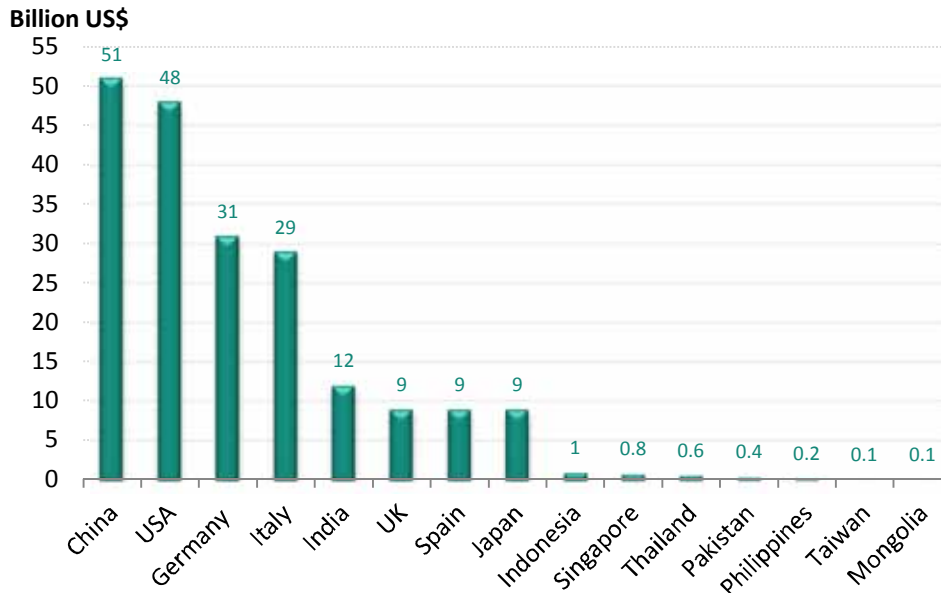
Biofuels production (biogasoline and biodiesel) in the region has grown steadily since 2005. By 2011, the region's biogasoline production accounted for about 5% and biodiesel for 10% of the global production.

ASEAN-6 (excluding Viet Nam) produces first-generation ethanol and biodiesel. The production is highest in Thailand, followed by the Philippines and Indonesia. Favorable conditions for biomass cultivation, coupled with related economic and social factors, are expected to boost biofuels production in these countries (IEA/OECD 2010).

A major concern is the trend of numerous wealthy countries to buy or contract land in other, typically developing and sometimes semi-arid countries, in order to produce food or biofuels. This trend may have potentially serious impacts on forests, fossil and renewable water resources, as well as local food security (UNEP 2009).

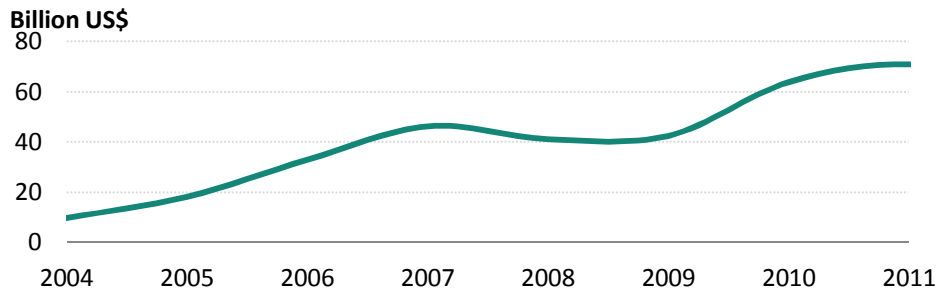
The expansion of investments in renewable energy shows hope that we will reach sufficient levels to start to reduce carbon emissions before 2020

Investment in Renewable Energy by Country and Asset Class (2011)



Source: Bloomberg New Energy Finance 2012

Global New Investment in Clean Energy



Source: Bloomberg New Energy Finance 2012

According to Bloomberg New Energy Finance 2012, global investments in renewable power and fuels increased 17% to a new record of \$257 billion in 2011. This is the first time these investments surpassed the investments in traditional energy sources. Developing economies made up 35% of the total investment, compared to 65% for developed economies. The US and China are the lead investors in renewable energy, while India showed the fastest expansion rate for investment of any large renewable market in the world in 2011. This shows hope that investments in clean energy will reach sufficient levels to start to reduce global carbon emissions before 2020.

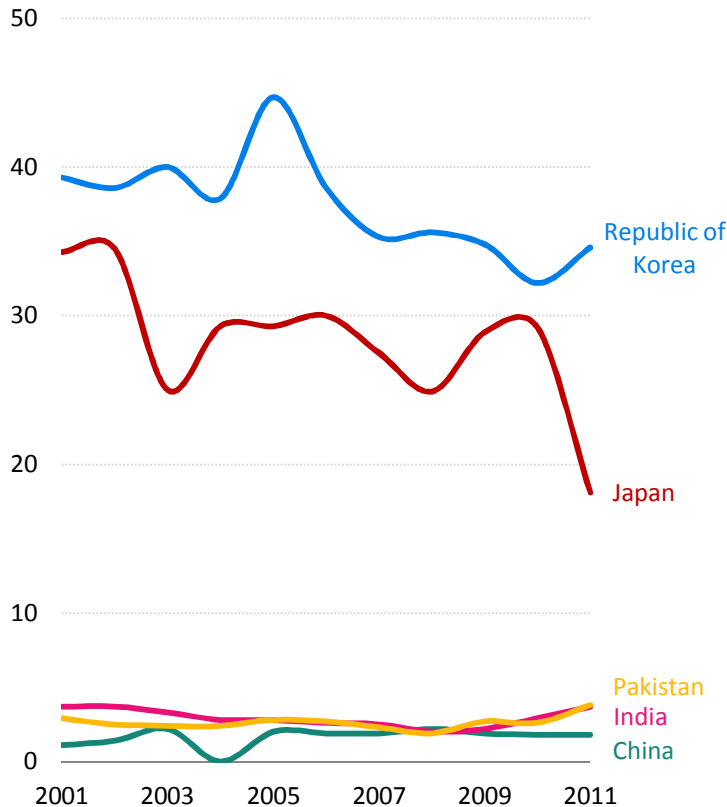
In 2011, China, India, and Japan were among the top 8 clean energy investors together with the US, Germany, Italy, UK and Spain.



There are now over 430 commercial nuclear power reactors operating in 31 countries across the world including Asia and the Pacific countries: Japan, Republic of Korea, China, India and Pakistan

Nuclear Share (2001-2011) (Selected countries)

Per Cent



Source: World Nuclear Association 2012, IAEA

According to the World Nuclear Association 2012 (WNA 2012), China has 14 nuclear reactors in operation, more than 25 under construction, and more about to start construction soon. Additional reactors are planned, including the world's most advanced, to give a five- or six-fold increase in nuclear capacity to at least 60 GWe by 2020, then 200 GWe by 2030, and 400 GWe by 2050.

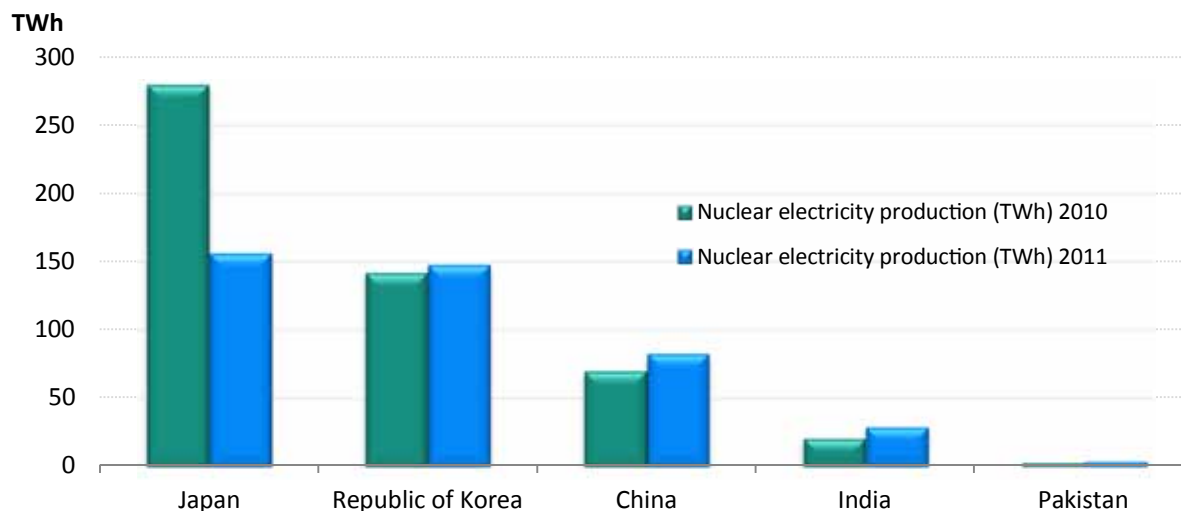
Japan's first commercial nuclear power reactor began operating in mid-1966, and nuclear energy has been a national strategic priority since 1973, but this is now under review following the 2011 Fukushima accident. Japan's 50 main reactors have provided about 30% of the country's electricity and this was expected to increase to at least 40% by 2017 before the Fukushima accident.

Republic of Korea is set to become a major world nuclear energy country, exporting technology. Presently, 23 reactors provide one third of the country's electricity. Nuclear energy remains a strategic priority for the country, and capacity is planned to increase by 56% to 27.3 GWe by 2020, and then to 43 GWe by 2030.



India and Pakistan are increasing their nuclear energy capacity

Nuclear Electricity Production (2010-2011)
(TWh)



Source: World Nuclear Association 2012, IAEA

India has a flourishing and largely indigenous nuclear power programme and expects to have 14,600 MWe nuclear capacity by 2020. It aims to supply 25% of electricity from nuclear power by 2050. India has a vision of becoming a world leader in nuclear technology due to its expertise in fast reactors and thorium fuel cycle.

Pakistan has a small nuclear power programme, with 725 MWe capacity, but plans to increase this substantially. The country's nuclear weapons capabilities have arisen independently of the civil nuclear fuel cycle, using indigenous uranium. Nuclear power makes a small contribution to total energy production and requirements, supplying only 2.34% of the country's electricity.

Impacts of Fukushima:

In March 2012 almost 80% of the public supported the phase-out of nuclear power and renewable energy is now widely viewed as a critical energy source for the future (REN21 2012).

INDUSTRY, TRANSPORT & TOURISM



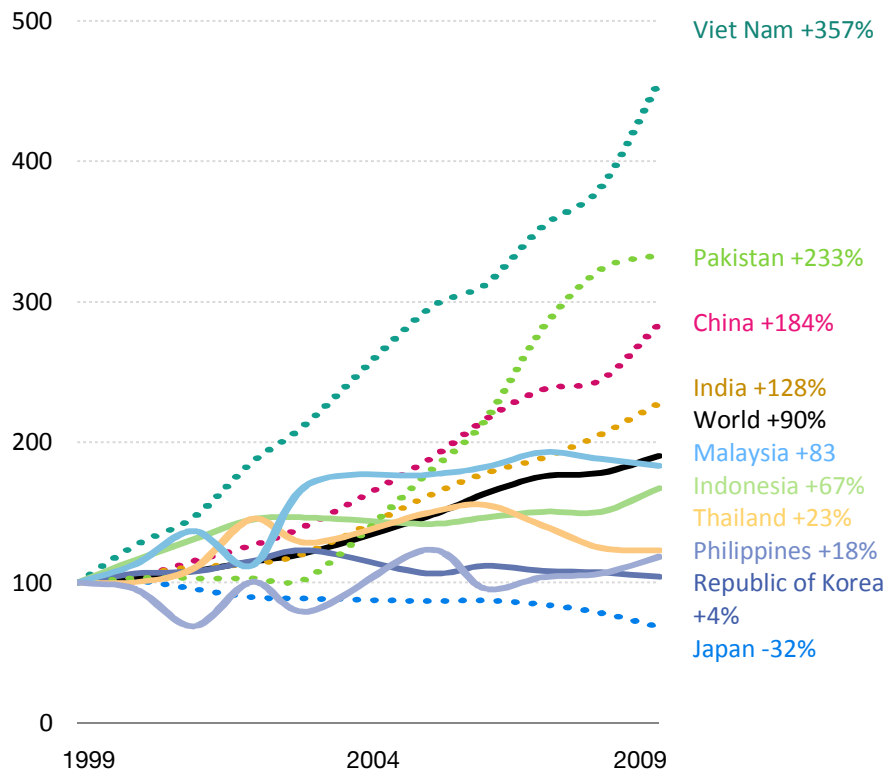
UN Photo/Kibae Park (June 2010)

Basic construction materials, such as steel and cement, serve an ever increasing demand from the building sector

Cement Production (2009)

(Countries with a cement production of more than 10,000,000 metric tonnes)

Index, 1999=100



Source: USGS 2012

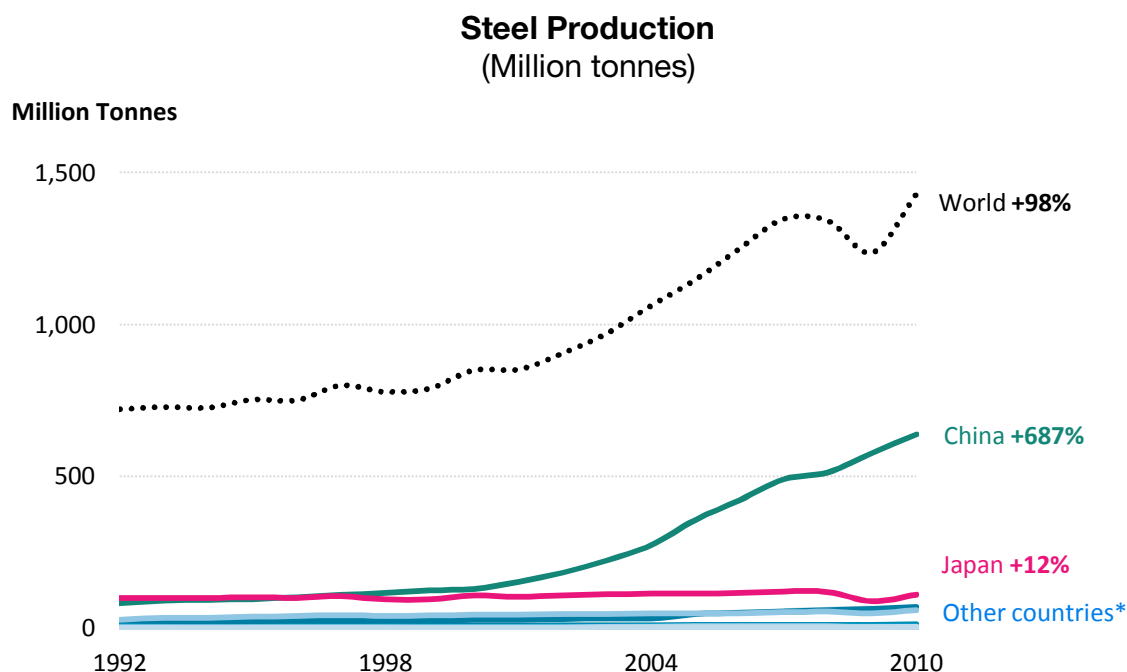
A growing population and rapidly advancing economies need construction materials to build housing, major roads and other infrastructure (UNEP 2011).

The demand for cement and steel has risen steeply since the late 1990s. As of 2009, there were ten Asia and the Pacific countries that produced more than 10 million metric tonnes of cement. Between 1999 and 2009, Viet Nam's cement production increased significantly with more than 350%; next are Pakistan, China and India with 233%, 184% and 128% increase respectively. Japan's constant decrease in cement production was joined by Thailand and Republic of Korea from 2006.



The Japanese cement industry has faced a prolonged downward trend in demand. Following the bursting of the bubble economy Japan experienced in the 1980s, public and private investment in construction, decreased substantially since the 1990s (Nishiwaki 2010). According to the USGS statistics (2012) Japan's cement production decreased by 32% between 1999 and 2009 as the construction investment shrank.

China's steel production began to increase significantly from 2001. By 2010, it contributed nearly 45% of the world's steel production

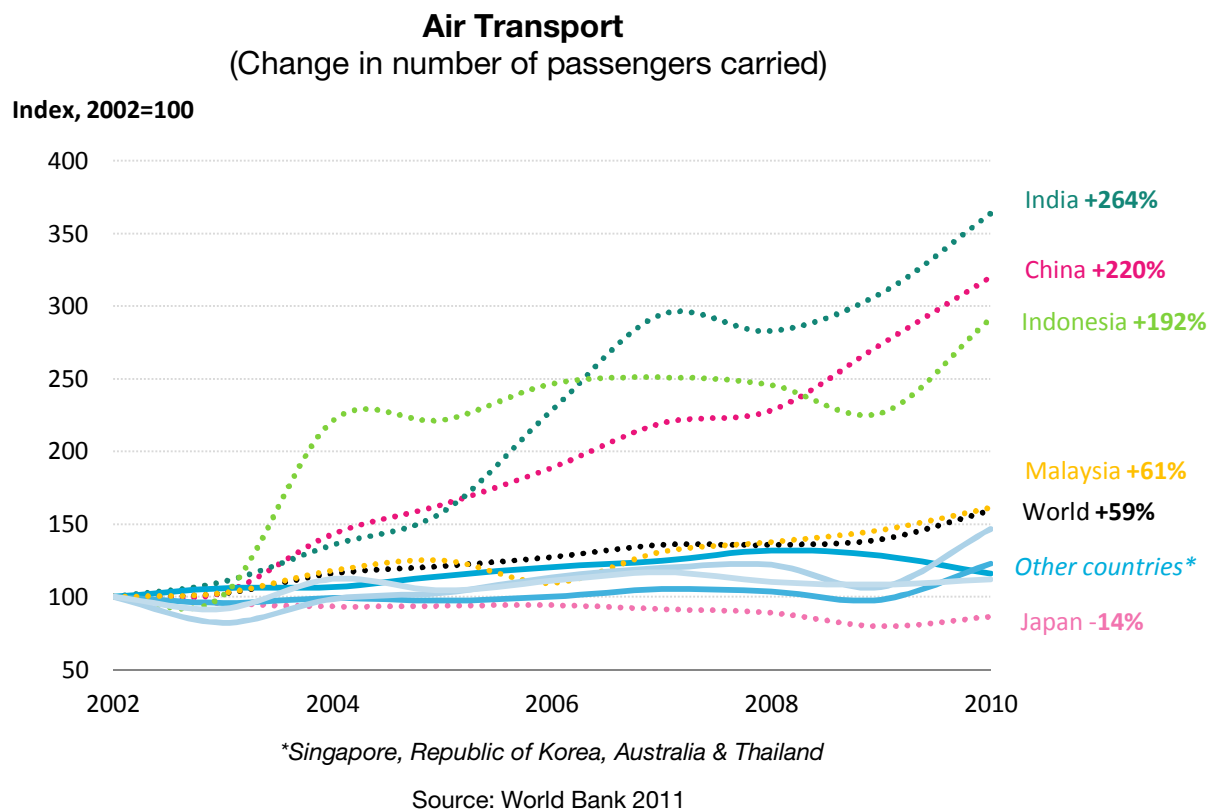


*Australia, India, Indonesia, Iran, Japan, Kazakhstan, Malaysia, Myanmar, New Zealand, DPRK, Pakistan, Philippines, Singapore, Republic of Korea, Sri Lanka, Thailand, Uzbekistan, Viet Nam

Source: World Steel Association 2010

In 2008, nearly 60% of the world's steel production was used in Asia (UNEP 2011). China's steel production began to increase significantly from 2001, being solely responsible for the global growth. Overall, China's steel production has increased significantly over the past two decades, representing nearly 690% increase. Japan had been fairly stable with only about 12% increase overall. By 2010, China's steel production accounted for nearly 45% and Japan's accounted for more than 8% of the world's total steel production.

The number of passenger trips by airplane has increased significantly within Asia and the Pacific, particularly in China, India and Republic of Korea

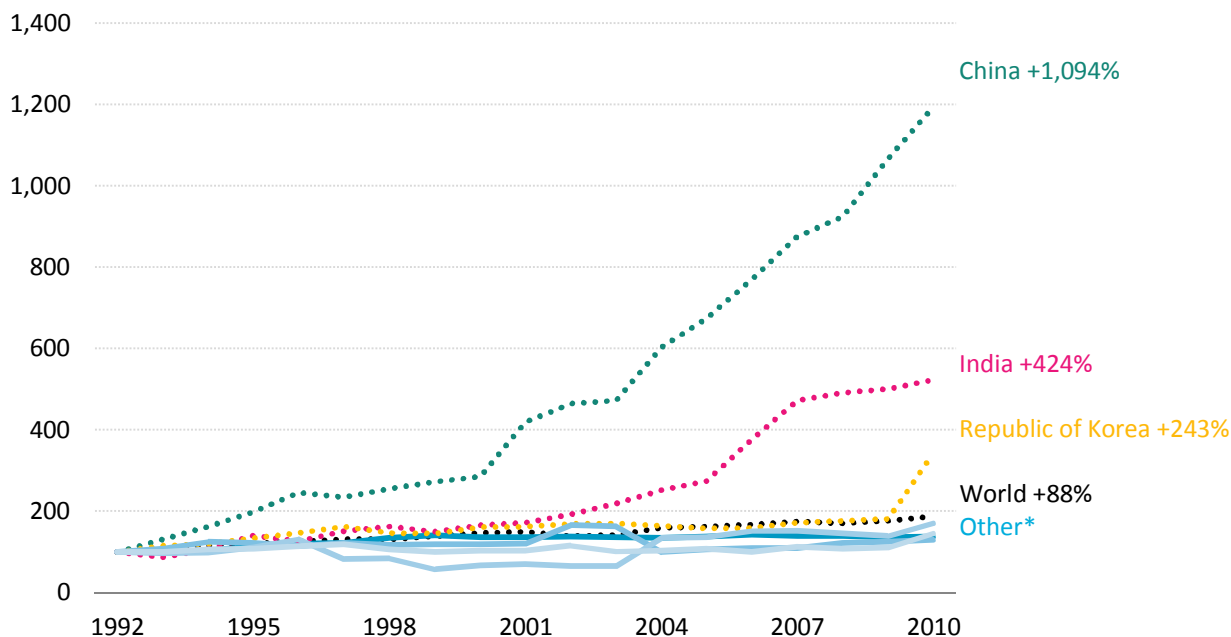


Since 2002, there has been a steady increase in the number of passengers transported by air across Asia and the Pacific with the exception of Japan. The number of passengers has increased by about 260%, 220%, 190% and 60% in India, China, Indonesia and Malaysia, respectively, above the world's average.

Freight transport by air has increased rapidly, especially in China and India

Air Transport (Air transport, registered carrier departures)

Index, 1992=100



Source: World Bank 2011

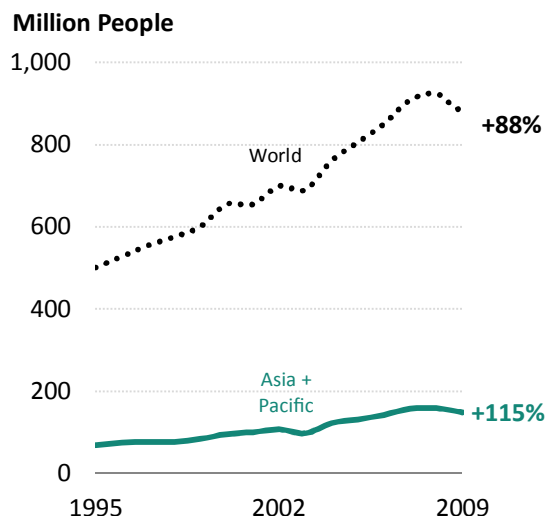
*Japan, Australia, Indonesia, Malaysia, New Zealand, Philippines, Iran, Thailand, Viet Nam, Singapore

Between 1992 and 2010, freight transport has increased very strongly in China and India, with over 1,000% and 420% increase respectively. Republic of Korea has increased strongly in 2010, resulting in an overall change of more than 240%. The regional average is similar or slightly below the world's average.

The huge increase in air travel and shipping of goods is one of the most notable characteristics of an ever-more “globalised” world (UNEP 2011). The downside of increased air travel and goods transport is the additional emissions of CO₂, as well as particles, nitrogen oxides and water vapour, which can have more than twice the warming effect of CO₂ alone (UNEP 2011).

Increasing globalisation and high incomes are driving an increase in international tourism in Asia and the Pacific

International Tourism, Arrivals (World and Asia-Pacific)

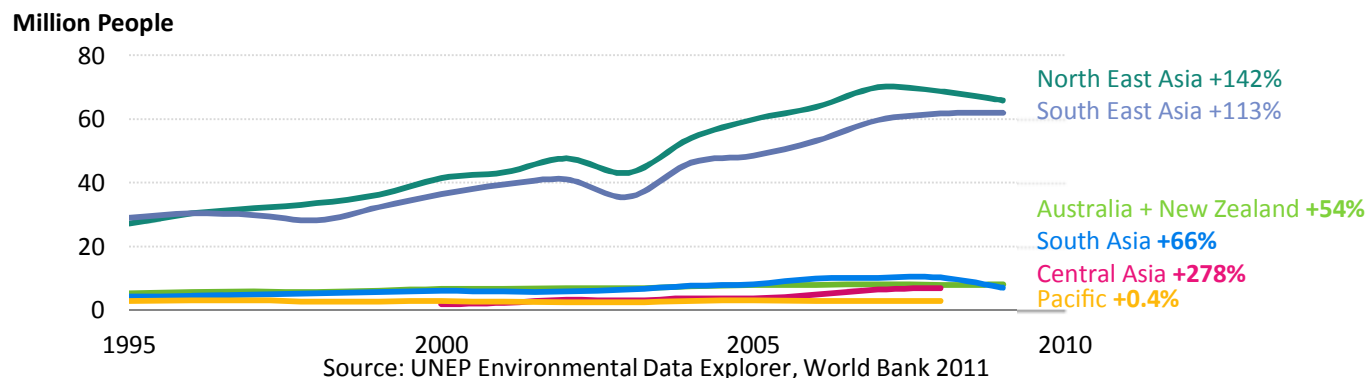


Source: UNEP Environmental Data Explorer, as compiled from World Bank 2011

Travel and tourism is the single largest business sector in the world (UNEP 2011). International tourist arrivals grew by over 4% in 2011 to 980 million, increasing from 939 million in 2010 (UNWTO 2012). Between 1995 and 2009, the number of tourist arrivals in Asia and the Pacific showed an upward trend, increasing from 69 million to about 150 million (over 115% increase). Significant upward trends occurred in North East Asia and South East Asia, representing over 142% and 113% increase respectively, with a temporary drop in 2003 due to the SARS outbreak.

The region was up 11 million arrivals in 2011, reaching a total 161 million international tourists. South Asia and South East Asia benefited from strong intraregional travel, while growth was weaker in North East Asia and the Pacific, partly due to the temporary decline in the Japanese outbound market (UNWTO 2012). Momentary drops in the number of tourist arrivals between 1992 and 2010 were due to the Asia financial crisis in 1997, the SARS outbreak in 2003, the Christmas 2004 tsunami in the Indian Ocean and the global financial crisis in 2008. However, by the last quarter of 2009, the region's tourism began to recover (UNWT 2010).

(Asia-Pacific Sub-Regions)



Source: UNEP Environmental Data Explorer, World Bank 2011



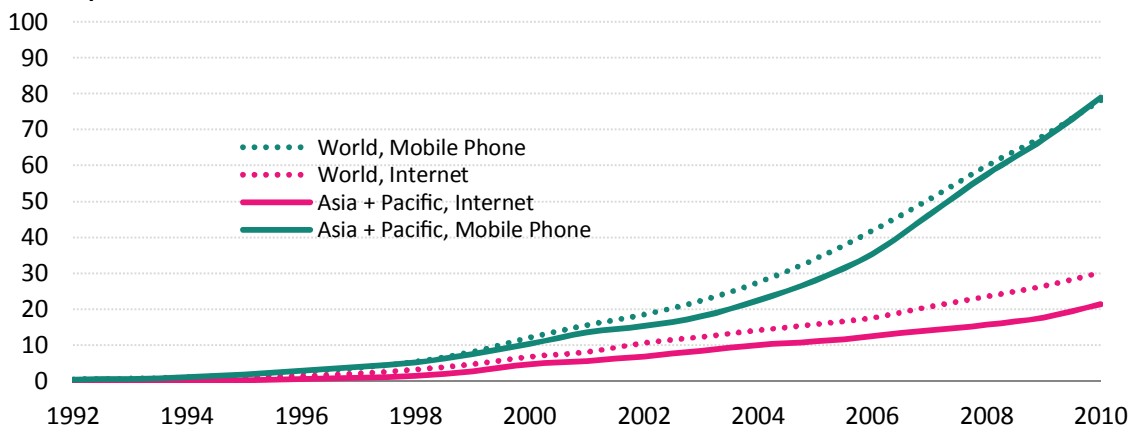
TECHNOLOGY



The “global village” has developed rapidly on the basis of new technology

Internet Users and Mobile Phone Subscriptions

Number of Users
Per 100 People



Source: World Bank 2011

Use of mobile phones in Asia and the Pacific lagged slightly behind the global increase, but picked up in 2006 and is now the same as global: almost 80% in 2010. Use of the Internet also increased constantly since 1992 but lags behind the global average.

Use of the Internet and mobile phones revolutionizes global interconnectedness and opens up a true notion of “global commons” worldwide (UNEP 2011).

At the same time, a growing obsolescence of communication and computer devices and other hardware increases the amounts of electronic waste (e-waste) containing hazardous chemical compounds. E-waste causes significant environmental and human health impacts and poses enormous challenges for recycling (UNEP 2005 and UNEP 2011) and is the fastest growing waste stream (UNEP 2012).



DATA SOURCES

POPULATION & HUMAN DEVELOPMENT

- Total Population: UNEP Environmental Data Explorer, as compiled from UNPD (United Nations Population Division)
- Differences in Population Numbers Across the Region: UNEP Environmental Data Explorer, as compiled from UNPD (United Nations Population Division)
- Proportion of Asia-Pacific's to the World's Population: UNPD (United Nations Population Division)
- Populations in the Sub-regions of Asia and Pacific: 1992-2010: UNPD (United Nations Population Division)
- Population Growth Rate: UNPD (United Nations Population Division)
- Urban Population: UNEP Environmental Data Explorer, as compiled from UNPD (United Nations Population Division)
- Asian Megacities: State of the Asian Cities 2010/2011 (UN-HABITAT 2010)
- Population of China's Pearl River Delta has Tripled Since 1992: UNEP-GRID Sioux Falls 2010 and USGS
- People Living in Slums: UN-Habitat 2010
- Human Development Index: UNEP Environmental Data Explorer, as compiled from UNPD (United Nations Population Division)
- Proportion of Seats Held by Women in National Parliaments: World Bank, as compiled from UN Women
- Age Distribution: UNEP Environmental Data Explorer, as compiled from UNPD (United Nations Population Division)
- Life Expectancy: UNEP Environmental Data Explorer, as compiled from UNPD (United Nations Population Division)
- Crude Death Rate: UNEP Environmental Data Explorer, as compiled from UNPD (United Nations Population Division)
- Ratio of Female to Male Primary Enrolment: World Bank, as compiled from UNESCO (United Nations Educational, Scientific and Cultural Organization)
- Asia-Pacific Population Living Below US\$1.25 per Day Consumption: UNEP Environmental Data Explorer, as compiled from World Bank
- Gross National Income, Total: UNEP Environmental Data Explorer, as compiled from World Bank
- Gross National Income per Capita, PPP: World Bank
- Food Supply per Capita, Meat: UNEP Environmental Data Explorer, as compiled from FAO (Food and Agriculture of the United Nations)
- Food Supply: Fish & Seafood, Meat & Cereals: UNEP Environmental Data Explorer, as compiled from FAO (Food and Agriculture of the United Nations)
- Ecological Footprint: Global Footprint Network

ECONOMY

- GDP per Capita Total, Asia-Pacific Sub-regions: World Bank
- Asia-Pacific GDP per Capita 2010 (map): UNEP Environmental Data Explorer, as compiled from World Bank
- Asia& Pacific Trade: Import-Export of Goods & Services, Total & Per Cent of GDP: UNEP Environmental Data Explorer, as compiled from World Bank
- Domestic Material Consumption in Asia and the Pacific: CSIRO (Commonwealth Scientific and Industrial Research Organisation) -UNEP
- Resource Use Intensity in Asia and the Pacific: CSIRO (Commonwealth Scientific and Industrial Research Organisation)- UNEP
- Physical Trade Balance of Asia and the Pacific: CSIRO (Commonwealth Scientific and Industrial Research Organisation)- UNEP

- Relative Shares of Domestic Material Consumption in Asia and the Pacific for 1992 & 2008: CSIRO (Commonwealth Scientific and Industrial Research Organisation)-UNEP
- Ten Highest Domestic Material Consumers: CSIRO (Commonwealth Scientific and Industrial Research Organisation)-UNEP
- Domestic Materials Consumption per Capita for Asia-Pacific and its Sub-regions for 1992, 2002 & 2008: CSIRO (Commonwealth Scientific and Industrial Research Organisation)-UNEP
- Physical Trade Balance per Capita Asia-Pacific and its Sub-regions: CSIRO (Commonwealth Scientific and Industrial Research Organisation)-UNEP
- Material Intensity Asia-Pacific and its Sub-regions: CSIRO (Commonwealth Scientific and Industrial Research Organisation)-UNEP
- Drivers of Increased Materials Consumption in Asia and the Pacific: CSIRO (Commonwealth Scientific and Industrial Research Organisation)-UNEP

ENVIRONMENT TRENDS

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- Emissions of CO₂, Total: UNEP Environmental Data Explorer, as compiled from CDIAC (Carbon Dioxide Information Analysis Center)
- Emission growth in Asia-Pacific and the World: 1992-2008: UNEP Environmental Data Explorer, as compiled from CDIAC
- Emissions of CO₂, per Capita: World Bank
- Emissions of CO₂, from Cement Production & Fossil Fuels: UNEP Environmental Data Explorer, as compiled from CDIAC (Carbon Dioxide Information Analysis Center)
- Emissions of CO₂, Total & Change by Type: UNEP Environmental Data Explorer, as compiled from CDIAC (Carbon Dioxide Information Analysis Center)
- Emissions of CO₂ per GDP: UNEP Environmental Data Explorer, as compiled from CDIAC (Carbon Dioxide Information Analysis Center)
- Sectors Emit the Most Greenhouse Gases: EDGAR (The Emissions Database for Global Atmospheric Research)
- Consumption of Ozone-Depleting Substances: UNEP Environmental Data Explorer, as compiled from UNEP (United Nations Environment Programme)

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- Global Atmospheric CO₂ Concentration: UNEP Environmental Data Explorer, as compiled from NOAA (US National Oceanic and Atmospheric Administration)
- Temperature Anomaly: NASA (US National Aeronautics and Space Administration)
- Hottest Years in Record: NOAA (US National Oceanic and Atmospheric Administration)
- Global Change in Glacier Mass: UNEP Environmental Data Explorer, as compiled from WGMS (World Glacier Monitoring Service)
- Billion-Dollar Weather Disasters of 2011: EM-DAT 2010 & AON Benfield
- Estimated Displacement by Climate-Related and Extreme Weather Events in Asia: ADB 2012, as compiled from Internal Displacement Monitoring Center
- Forecasted Population at Risk from Sea Level Rise in 2050: ADB 2012, as compiled from Wheeler 2011
- Population within 100 Kilometers of the Coast: UNEP Environmental Data Explorer, as compiled from UNEP/DEWA/

GRID-Europe

- Impact of Climate Change on the Hindu Kush-Himalaya Mountains on Water Resources & Overall Economy of Pakistan: NASA (US National Aeronautics and Space Administration)
- Climate Change Vulnerability & Adaptation in the Livestock Sector in Mongolia: UNEP (United Nations Environment Programme)

FORESTS

- Forest Average Annual Changes: UNEP Environmental Data Explorer, FAO (Food and Agriculture Organization of the United Nations)
- Mangrove Forest Extent: FAO (Food and Agriculture Organization of the United Nations)
- Forest Change on New Ireland, Papua New Guinea: NASA (US National Aeronautics and Space Administration)
- Forest Plantation Annual Changes: FAO (Food and Agriculture Organization of the United Nations)
- Forest Plantation Extent by Countries in 1990 & 2010: FAO (Food and Agriculture Organization of the United Nations)
- Roundwood Production: UNEP Environmental Data Explorer, as compiled from FAO (Food and Agriculture Organization of the United Nations)
- FSC & PEFC Certified Forest Area: FSC (Forest Stewardship Council) & PEFC (forest certification system)

WATER

- Improved Sanitation & Drinking Water Coverage: UNEP Environmental Data Explorer, as compiled from WHO (World Health Organization)
- Improved Drinking Water Coverage 1992 & 2011: The Millennium Development Report 2013, United Nations
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- Yellow River Delta, China: NASA (US National Oceanic and Atmospheric Administration) & UNEP (United Nations Environment Programme)
- The Xuan Thuy Wetland Reserve, Northern Viet Nam: NASA (US National Aeronautics and Space Administration) & UNEP (United Nations Environment Programme)

BIODIVERSITY

- Living Planet Index: WWF (World Wildlife Fund)
- Total Mammals Species & Extinction Risk: IUCN Red List (International Union for Conservation of Nature)
- Threatened Mammal Species, Top 20 Countries: IUCN Red List (International Union for Conservation of Nature)
- Protected Areas: UNEP Environmental Data Explorer, as compiled from IUCN (International Union for Conservation of Nature) & UNEP-WCMC (World Conservation Monitoring Center)
- State of Coral Reefs 2010: IUCN Red List (International Union for Conservation of Nature)
- Ecological Footprint in Selected Countries: WWF (World Wildlife Fund)

CHEMICALS & WASTE

- Greenhouse Gas Emissions from Waste: UNEP Environmental Data Explorer, as compiled from UNFCCC National Reports
- Number of Major Tanker Oil Spills per Decade: ITOPIF (International Tanker Owners Pollution Federation Limited)
- Nuclear Waste – Spent Fuel: UNEP Environmental Data Explorer, as compiled from OECD (Organisation for Economic

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- Municipal Waste Generation 1990-2007, Total (selected countries): OECD Economic, Environmental and Social Statistics
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NATURAL HAZARDS

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- Tropical Cyclones - Risk & Physical Exposure: GIS processing UNEP/GRID Europe 2011 with key support from USGS EROS Data Center 2008

GOVERNANCE

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- ISO 14001 Certifications: UNEP Environmental Data Explorer, as compiled from ISO (International Organization for Standardization)
- Carbon Market: World Bank
- Total Foreign Aid Received: GapMinder 2012

AGRICULTURE

- Food Production Index: FAO (Food and Agriculture Organization of the United Nations)
- Asia-Pacific Rice & Cereal Production, Area Harvested & Fertilizer Usage: UNEP Environmental Data Explorer, as compiled from FAO (Food and Agriculture Organization of the United Nations)
- Total Area Equipped for Irrigation: UNEP Environmental Data Explorer, as compiled from FAO (Food and Agriculture Organization of the United Nations)
- The Aral Sea in Uzbekistan & Kazakhstan: USGS Landsat. Science Photo Library/Rex Features
- Organic Farming: Organic World
- Selected Crops in Humid Tropical Countries (Sugar Cane, Soybean & Palm Oil): FAO (Food and Agriculture Organization of the United Nations)
- Forests Suitable for Oil Palms (2010): Forest suitable for oil palms (Sickler and others 2007); Total forest (FAO 2010)
- Oil Palm Distribution: UNEP (United Nations Environment Programme)
- Grazing Animal Herds: FAO (Food and Agriculture Organization of the United Nations)

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- Fish Catch & Aquaculture Production: UNEP Environmental Data Explorer, as compiled from FAO (Food and Agriculture Organization of the United Nations)
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ENERGY

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- Renewable Energy Supply: UNEP Environmental Data Explorer, as compiled from IEA (International Energy Agency)
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- Investment in Renewable Energy by Country & Asset Class (2011): Bloomberg New Energy Finance
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ACRONYMS

ADB	Asian Development Bank
AIACC	Assessments of Impacts and Adaptations to Climate Change
CBD	Convention on Biological Diversity
CDIAC	Carbon Dioxide Information Analysis Center
CDM	Clean Development Mechanism
CITES	Convention on International Trade in Endangered Species of Wild Flora and Fauna
CRED	Center for Research on the Epidemiology of Disasters
CSIRO	Commonwealth Scientific and Industrial Research Organisation
DMC	Domestic Material Consumption
EDGAR	Emissions Database for Global Atmospheric Research
EF	Ecological Footprint
EM-DAT	International Disaster Database
EROS	Earth Resources Observation Systems
ESRI DCW	ESRI Digital Chart of the World
EU	European Union
FAO	Food and Agriculture Organization of the United Nations
GDP	Gross Domestic Product
GHG	Greenhouse Gas Emissions
GIS	Geographic Information Systems
GLIMS	Global Land Ice Measurements from Space
GNI	Gross National Income
GNP	Gross National Product
HDI	Human Development Index
HCFCs	Hydrochlorofluorocarbons
HFCs	Hydrofluorocarbons
IAEA	International Atomic Energy Agency
IEA	International Energy Agency
IGES	Institute for Global Environmental Strategies
ISO	International Organization for Standardization
IUCN	International Union for Conservation of Nature
MDGs	Millennium Development Goals
MEAs	Multilateral Environmental Agreements
NASA	National Aeronautics and Space Administration
NOAA	National Oceanic and Atmospheric Administration
NRC	Nuclear Regulatory Commission
NSIDC	National Snow and Ice Data Center
UNOCHA	United Nations Office for the Coordination of Humanitarian Affairs
OECD	Organisation for Economic Co-operation and Development
PPP	Purchasing Power Parity
ppm	Parts per million
REN21	Renewable Energy Policy Network for the 21st Century
UNCCD	United Nations Convention to Combat Desertification

UNCLOS	United Nations Convention on the Law of the Sea
UNCTAD	United Nations Conference on Trade and Development
UNEP	United Nations Environment Programme
UNEP-WCMC	UNEP World Conservation Monitoring Center
UNESCAP	United Nations Economic and Social Commission for Asia and the Pacific
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNFCCC	United Nations Framework Convention on Climate Change
UNFPA	United Nations Population Fund
UN-Habitat	United Nations Human Settlements Programme
UNISDR	United Nations Office for Disaster Reduction
UNPD	United Nations Population Division
UNWTO	United Nations World Tourism Organization
WGMS	World Glacier Monitoring Service
WHO	World Health Organization
WWF	World Wildlife Fund

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Keeping Track of Our Changing Environment in Asia and the Pacific uses the latest data and statistics to illustrate the major environmental, economic and social changes that have taken place in Asia and the Pacific since 1992, the year that countries around the world committed themselves to sustainable development. The numbers tell the story of the region's dramatic development over these twenty years, helping to bring millions out of poverty. But they also uncover the unfinished social and environmental agendas on which the future growth of the region depends.

The report has been produced within the framework of UNEP's fifth Global Environment Outlook report and as an input to UNEP Live and the ongoing work on development of the Sustainable Development Goals.

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