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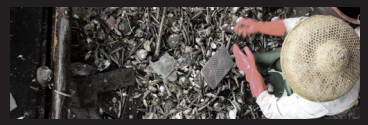






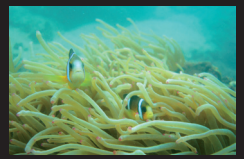
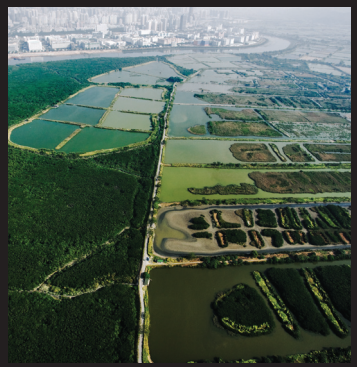

Hong Kong Ecological Footprint Report 2008

Living Beyond Our Means

Global Footprint Network

CONTENTS

WWF is one of the world's largest and most experienced independent conservation organizations, with almost 5 million supporters and a global network active in over 100 countries. WWF's mission is to stop the degradation of the planet's natural environment and to build a future in which humans live in harmony with nature.

WWF Hong Kong has been working since 1981 to ensure a better environment for present and future generations in Hong Kong through the implementation of a wide range of focused conservation and environmental education programmes in Hong Kong and southern China. Programmes include Climate, Footprint, Terrestrial & Conservation Policy, Freshwater & Wetlands and Marine.

Global Footprint Network is committed to fostering a world in which all people have the opportunity to live satisfying lives within the means of one planet. Our mission is to advance the use of the Ecological Footprint, a science-based sustainability tool that measures how much of the Earth's living resources we use, how much we have and who uses what. Our work seeks to make the planet's ecological limits a central consideration at all levels of policy and decision making.

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FOREWORD

The recent downturn in the global economy is a stark reminder of the consequences of living beyond our means. But the possibility of economic recession pales in comparison to the looming ecological credit crunch.

We, the seven million people in Hong Kong, are somewhat distanced from the natural resources on which our livelihoods depend. Some 40 percent of Hong Kong's population live above the 14th floor; many of us have not experienced first hand the wonder and beauty of the natural world. However, everything we consume, and all our actions, as individuals and collectively as a city, have an impact on the state of our planet's natural resources.

Our livelihoods, and indeed our lives, depend on the services provided by the Earth's natural systems, which include supplying us with fresh air, water and food, fiber and timber, and recycling and absorbing our waste. The *Living Planet Report 2008* tells us that we are consuming the resources that underpin those services much too fast – faster than they can be replenished. And our demands on the planet are accelerating. It is now forecasted that we would need the resources of two Planet Earths by 2030.

Every prudent person knows that you must preserve capital and live on the interest. If you draw on capital, your capacity for generating interest will diminish. Ultimately, if you keep drawing on capital to fund an ever more excessive lifestyle, you will go broke. As with household economics, so with Earth's natural resources: It is an iron rule.

Hong Kong will always be an "ecological debtor", where we need more resources than our land and sea mass can sustain; we will always have an "Ecological Footprint" that extends beyond our territory. This puts us in a vulnerable position, since our food, fuel, water and other resources must be imported, sometimes from far afield. As resource demand around the world continues to grow and resources become scarce, our dependency on external biocapacity poses considerable risk. We can reduce these risks by reducing our Footprint: by increasing efficiency and reducing consumption.

Apart from actions we can take within our territory, Hong Kong can also affect change through our regional reach: for example through the way we operate our factories on the Mainland, or by insisting on environmental standards in the companies we invest in or lend to.

This *Hong Kong Ecological Footprint Report 2008* will provide the benchmark to track our shift in consumption and the size of our Ecological Footprint. WWF Hong Kong will produce this report every two years, from which trends can be identified and actions proposed.

We know where to start. The biggest contributor to Hong Kong's Footprint is the way in which we generate and use energy: climate-changing emissions now make up 80 per cent of our overall footprint. Thus by moving to a low carbon economy (as recommended by the HKSAR Chief Executive in his 2008-2009 Policy Address), by developing a comprehensive energy strategy both on the supply and demand side whilst also promoting efficient building design and energy use, Hong Kong can make significant strides towards reducing our overall Footprint.

This Report also proposes solutions in the five main areas of Hong Kong's Ecological Footprint and biocapacity, suggesting paths for a sustainable future. WWF is working with the Hong Kong Government and leading Hong Kong companies to reduce Footprint, cut carbon emissions, and promote sustainability in other sectors, such as fisheries and forests.

Sustainable development combines moral obligation with economic imperative. The main message of this Report is that we are living beyond our means, and that the choices each of us makes today will shape the possibilities for the generations which follow us.

Markus Shaw
Chairman, WWF Hong Kong

EXECUTIVE SUMMARY

With growing global food shortages and price hikes, loss of cropland from salinization, depletion of overharvested fisheries, and the impact of climate change on agricultural productivity, it is clear that human wellbeing is not separable from ecological health. Human economies and endeavours, in order to make lasting progress, must take into account the reality of ecological constraints. This means knowing both human's demand for ecological resources, and the Earth's ability to meet this demand.

The Ecological Footprint is a resource accounting tool that makes this measurement possible. This report discusses Hong Kong SAR's current Ecological Footprint within both a global and regional context. It also builds on the CCICED–WWF Report on the Ecological Footprint in China that was released earlier in 2008. However, the Hong Kong results reported here are based on more recent data and reflect a number of improvements in the Ecological Footprint methodology (see Technical Notes).

As competition over limited ecosystem resources and services increases, how can Hong Kong maintain a robust economy and the well-being of its population?

This report finds that:

- The Asia-Pacific region is home to more than half of the world's population, who use more than 40 percent of the planet's available biological capacity.
- Focusing on individual lifestyle, Hong Kong's Ecological Footprint in 2005 was 4.4 global hectares per person. This is more than double the 2.1 global hectares of biocapacity available per person on the planet.
- Hong Kong's per capita Ecological Footprint in 2005 ranked as the 29th highest when compared to the Footprints of the 150 countries in the world with populations greater than one million. An average Hong Kong resident's Footprint was more than twice as large as the 2.1 global hectares average in the rest of China.
- Hong Kong's consumption requires more than 250 times the biological capacity of its land and sea area. More than three-quarters of Hong Kong's Footprint comes from carbon dioxide emissions from the use of fossil fuels.
- Hong Kong covers its significant ecological deficit in part by importing biological capacity, in the form of natural resources, from other nations. In 2005, Hong Kong's net Footprint of import was 17.6 million global hectares, 58 percent of its total Footprint. This is approximately equal to the biological capacity of Ireland. An additional 39 percent of Hong Kong's Footprint comes from carbon dioxide that is emitted to the atmosphere from within its own borders.
- Hong Kong's Ecological Footprint is connected through trade relations to many countries around the world. Hong Kong's primary trade partner is its home country of China. An analysis of selected traded products suggests that Hong Kong imports metals, minerals, food and plastic products from countries such as Japan, Korea and the United States and exports manufactured products, electrical machinery and metals.
- Three factors determine the size of Hong Kong's total Ecological Footprint: its population, consumption per person, and the resource- and waste-intensity of the goods and services consumed.
- Two complementary approaches for reducing Hong Kong's ecological deficit that can be pursued in parallel are (1) making changes that are relatively cheap, easy and fast, such as switching to energy efficient lighting, and (2) investing in infrastructure that will maximize well-being while minimizing future demand for resources.
- Government, companies and individuals all have important roles to play in Hong Kong's movement towards sustainability.
- Carbon emissions and overfishing contribute significantly to Hong Kong's unsustainable levels of consumption. These can be addressed in many ways, including regulations, efficient improvements and careful sourcing.

INTRODUCTION

In the last century, it was generally assumed that global economic growth is limited only by human innovation, with the finite nature of the planet's resources rarely considered. However, with a two-fold increase in world population and five-fold increase in energy consumption over the past 40 years, ecological limits have become more obvious as they increasingly determine which human endeavors will succeed. Many of the challenges the world is facing, from climate change and food shortages to large-scale ecosystem collapse, can only be addressed by making ecological limits a central consideration in the decisions society makes both individually and collectively.

The Ecological Footprint is a resource accounting tool that can reveal these limits by comparing human demand on the Earth's regenerative capacity with the available supply. It does this by summing the area of cropland, grazing land, forest and fishing grounds required to produce the food, fibre and timber humanity consumes, to absorb the waste emitted when it uses energy, and to provide space for infrastructure. It allows decision makers at any scale to understand how much capacity they and others are using, where this capacity is located, and if it is sufficient to meet these demands.

By 2005, with the growth in world population and individual consumption, humanity was using resources 30 percent faster than the planet could regenerate them (Figure 1). This global overshoot means that humanity is depleting and degrading the biological capital on which its economy depends.

In responding to this new reality, what strategies will governments adopt when confronting ecological limits? How will global trends in resource availability shape markets and financial centers? What decisions will individuals make to ensure resources will be available for their children and grandchildren?

With more than 50 percent of the globe's population and approximately 20 percent of its biological capacity, what the Asia-Pacific region decides to do will play a crucial role in determining humanity's future. China's demand on the Earth's biological capacity is already on par with that of the United States. Hong Kong, a major Chinese city and financial capital with relatively little productive area, is currently using approximately 250 times its own biological capacity (Figure 2). Using the Ecological Footprint, this report analyzes Hong Kong's demand on natural capital, placing it in a regional and global context. It then looks at various strategies Hong Kong might consider to help reduce overshoot, while maintaining its future economic health and the well-being of its citizens.

Figure 1: Humanity's Ecological Footprint. Human consumption has grown over the last 40 years, with global demand for biological capacity exceeding supply by 30 percent.

Figure 2: Hong Kong's Ecological Footprint. The residents of Hong Kong use more than 250 times the biocapacity of Hong Kong's own ecosystems. In 2005, Hong Kong had a Footprint of 30.2 million global hectares and a biocapacity of only 117 thousand global hectares.

FIGURE 1: RATIO OF HUMANITY'S ECOLOGICAL FOOTPRINT TO GLOBAL BIOCAPACITY, 1961-2005

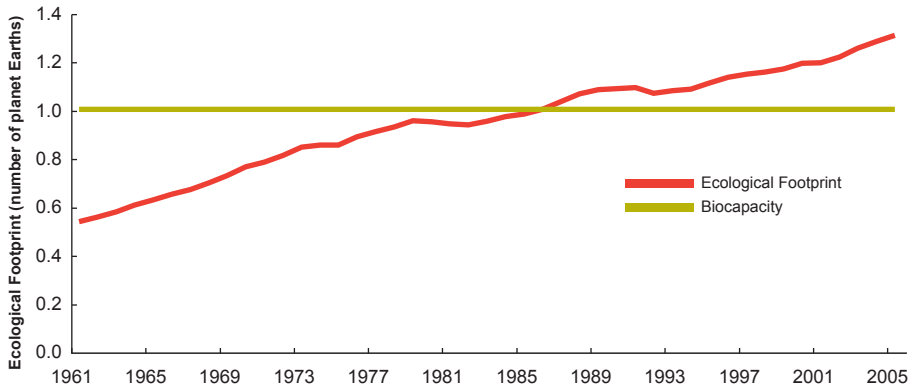
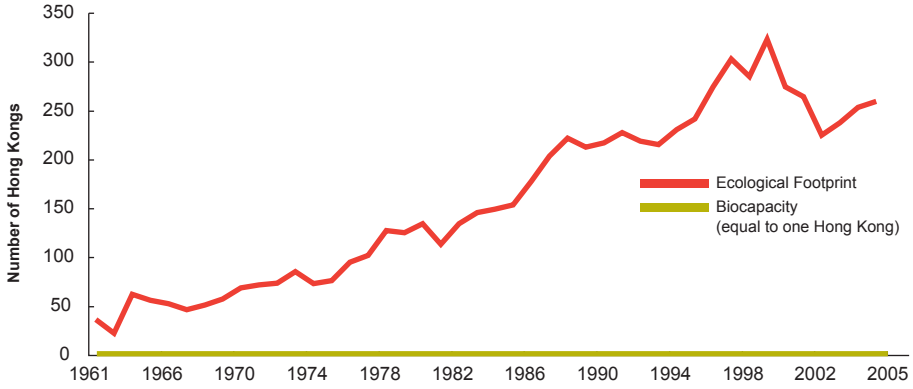
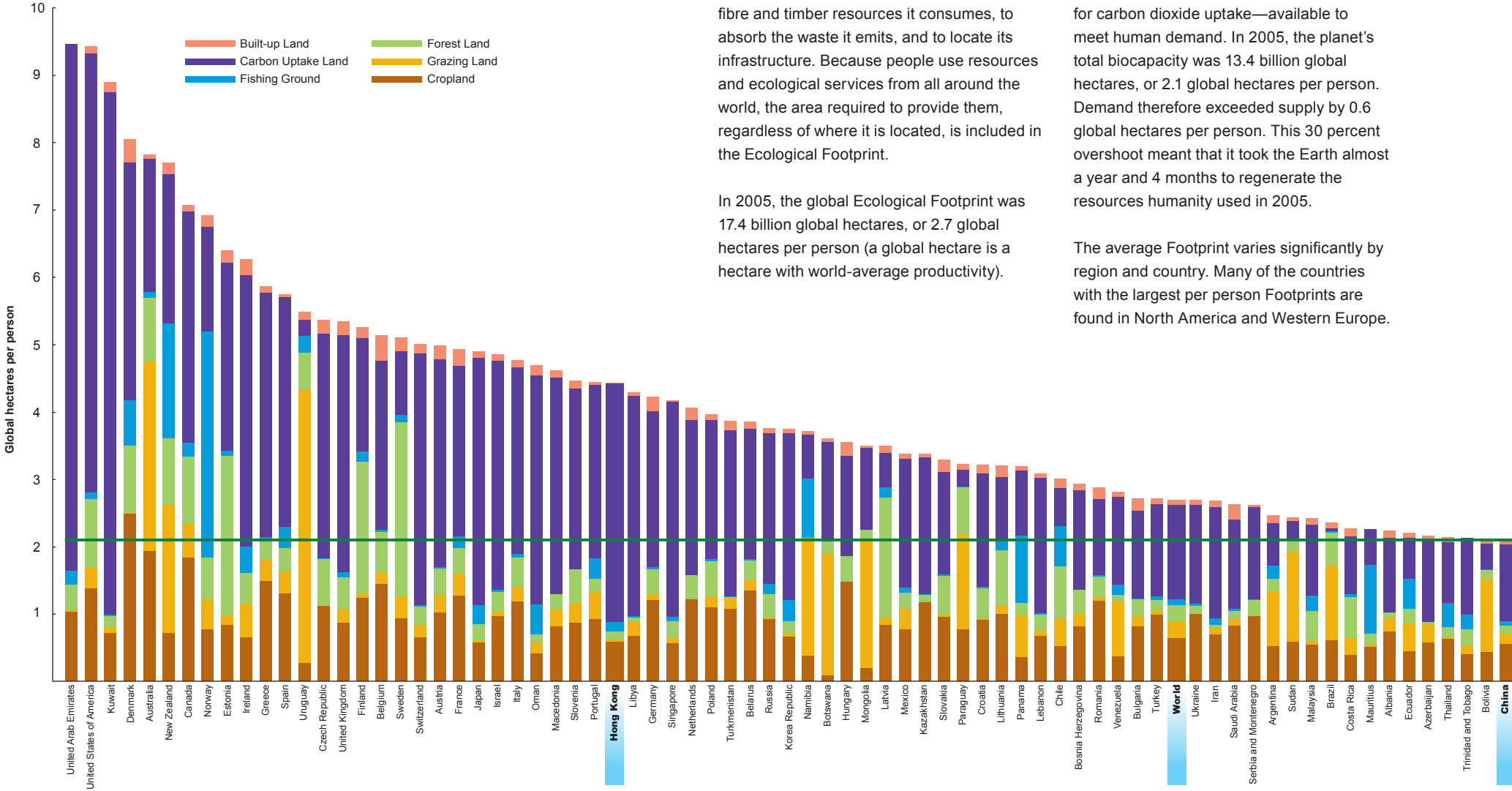


FIGURE 2: RATIO OF HONG KONG'S ECOLOGICAL FOOTPRINT TO ITS BIOCAPACITY, 1961 - 2005



THE GLOBAL CONTEXT: HUMANITY'S ECOLOGICAL FOOTPRINT

FIGURE 3: ECOLOGICAL FOOTPRINT PER PERSON, BY COUNTRY, 2005



The Ecological Footprint is a widely used measure of humanity's demand on nature. A nation's Ecological Footprint is the sum of the land and sea area used to provide the food, fibre and timber resources it consumes, to absorb the waste it emits, and to locate its infrastructure. Because people use resources and ecological services from all around the world, the area required to provide them, regardless of where it is located, is included in the Ecological Footprint.

In 2005, the global Ecological Footprint was 17.4 billion global hectares, or 2.7 global hectares per person (a global hectare is a hectare with world-average productivity).

This demand on nature can be compared to the planet's biocapacity, the amount of biologically productive area—cropland, grazing land, forest, fishing grounds, land for carbon dioxide uptake—available to meet human demand. In 2005, the planet's total biocapacity was 13.4 billion global hectares, or 2.1 global hectares per person. Demand therefore exceeded supply by 0.6 global hectares per person. This 30 percent overshoot meant that it took the Earth almost a year and 4 months to regenerate the resources humanity used in 2005.

The average Footprint varies significantly by region and country. Many of the countries with the largest per person Footprints are found in North America and Western Europe.

Hong Kong SAR's Ecological Footprint in 2005 was 4.4 global hectares per person, giving Hong Kong the 29th highest Footprint when compared to 150 nations that year. For Hong Kong and many high-income nations, the area required to absorb carbon emissions comprises the majority of their Ecological Footprint.

FIGURE 4: TOTAL ECOLOGICAL FOOTPRINT, FOR HIGH, MIDDLE AND LOW-INCOME COUNTRIES, 1961-2005

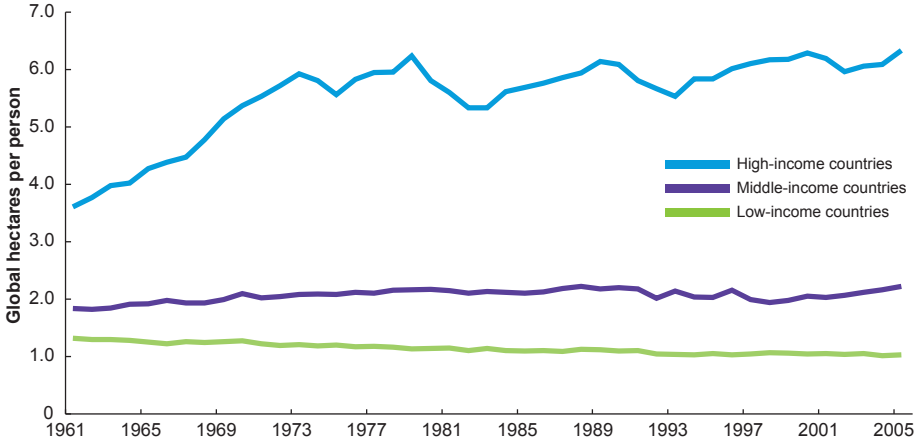
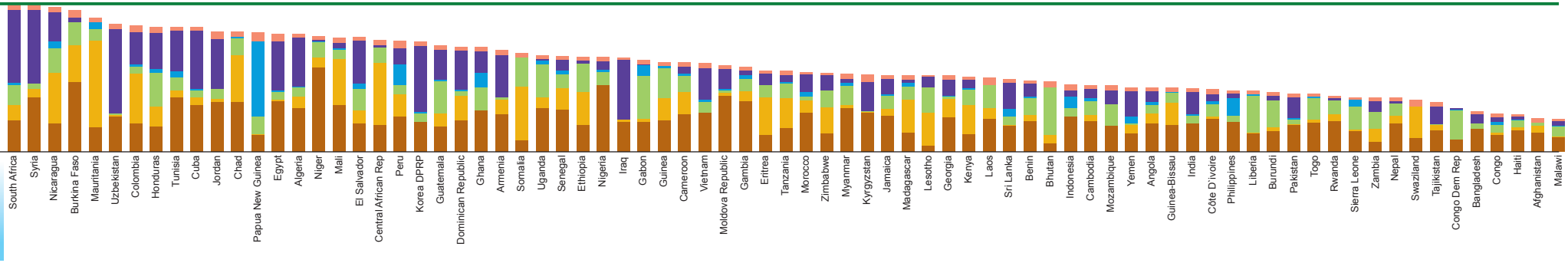


Figure 4: Ecological Footprint by income group, over time. The average demand per person in high-income nations has nearly doubled, while the Ecological Footprint in middle and low-income nations has remained relatively steady.

Figure 3: Ecological Footprint per person, by country, by land type. 150 nations, the world, and Hong Kong are shown with their Ecological Footprint divided into major land types. For most high-income nations, the largest portion of the Footprint comes from carbon dioxide emissions; for low-income nations, from cropland.

In 2005 the globally available biocapacity was 2.1 hectares per person



THE ECOLOGICAL FOOTPRINT OF THE ASIA-PACIFIC REGION

Compared to other regions of the world, the Asia-Pacific region has a relatively low Ecological Footprint per person (Figure 5). The large population of the region, however, gives it the largest total Ecological Footprint in the world. On a global scale, the Asia-Pacific region contains 55 percent of the world population and demands 43 percent of the total biological capacity of the planet (Figure 6).

The Ecological Footprint of the Asia-Pacific region is now twice as large as its own biological capacity. For comparison, in 1961, the region's total Footprint was only 14 percent of world biocapacity despite having 53 percent of world population. Although the regions' productive capacity has grown over the past 40 years, particularly through the green revolution and overall economic growth, demand for ecological services has simply outstripped supply.

While the region as a whole has entered ecological deficit, there is large variation in the magnitude of the Footprint within the Asia-Pacific region. While the average Australian lives on 7.8 global hectares with an ecological reserve of 7.6 global hectares, the average Bangladeshi uses only 0.6 global hectares but lives with an ecological deficit of 0.3 global hectares. The average resident of Hong Kong uses 4.4 global hectares of the planet's biocapacity.

China and India make up 68 percent of the Asia-Pacific regional population and 66 percent of its total Footprint. While the Footprint per person of both nations is well below the global average, both are operating with Footprints twice their own biocapacities.

How is it possible for the majority of a region to be living on more resources than they have within their borders? The Asia-Pacific region as a whole compensates for its ecological deficit of 2.8 billion global hectares in two ways: first, by liquidating the biological capital within the region and second, by importing resources and using the biological capacity of other countries and the global commons.

Figure 5: Ecological Footprint by region. Although North America has the highest Footprint per person, the large population of the Asia-Pacific region gives Asia-Pacific the largest total Ecological Footprint of all global regions.

Figure 6: Asia-Pacific's use of world biocapacity. The Asia-Pacific region's population and Ecological Footprint continue to grow. In 2005, the region's aggregate Footprint had nearly tripled since 1961.

FIGURE 5: ECOLOGICAL FOOTPRINT BY REGION, 1961-2005

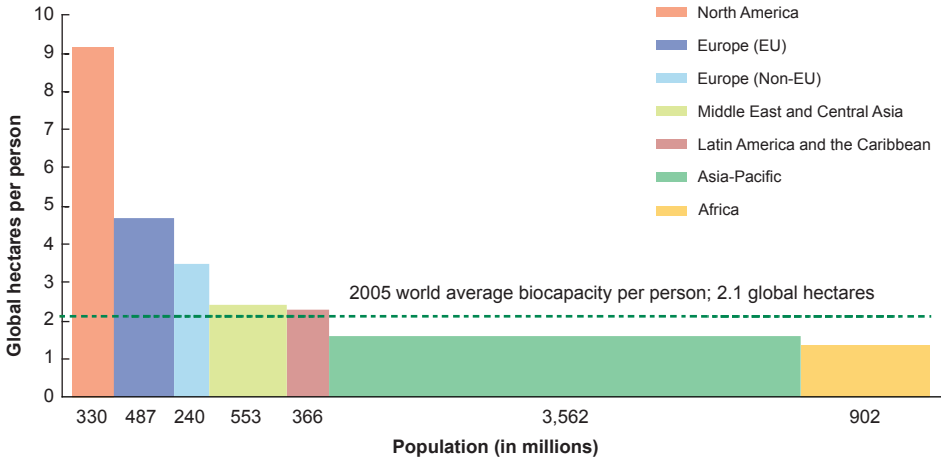
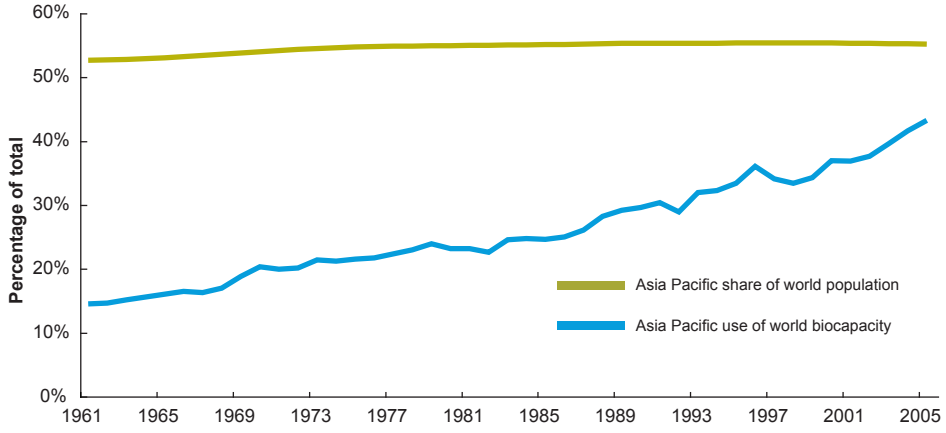


FIGURE 6: ASIA PACIFIC'S USE OF WORLD BIOCAPACITY, 1961-2005



CHINA'S ECOLOGICAL FOOTPRINT AND BIOCAPACITY

The story of China over the past 40 years is the story of growth. From 1961 to 2005, China's population doubled as did its per person Ecological Footprint, and China's total Footprint increased by a factor of four. China and the United States each used 21 percent of global biocapacity in 2005, more than any other country.

With its high demand, China is fortunate to have considerable biocapacity within its own borders. China has substantial amounts of cropland biocapacity, ranking fourth among nations for most cropland biocapacity and outstripping the cropland biocapacity of the EU by 647 million global hectares. Its grazing land biocapacity is 2.3 times that of the United States and China's forest biocapacity makes up nearly half of the Asia-Pacific region's overall forest biocapacity.

Sustainability requires that demand remain within the regenerative capacity of nature. If any country uses more than its own ecosystems can provide, it runs an ecological deficit. This deficit is only made possible by relying on biological capacity from other nations via imports or via emissions to the global commons, or by overharvesting ecosystems that lie within a country's own borders.

Since the early 1970s, China has run an ecological deficit. Its deficit in cropland has narrowed, but in 2005 China still imported an equivalent of 541 million global hectares of cropland biocapacity. China that year still had ecological reserves in forest and fishing ground, but these reserves are generally shrinking over time. A small reserve in grazing land biocapacity in previous years became a deficit in 2005.

The most significant change over this time has been the rapid increase in China's carbon Footprint. This parallels a rapid increase of almost 22-fold in overall energy consumption in China over the past 40 years. Per person, since 1971, China's carbon dioxide emissions have increased more than five-fold. Given China's relatively high carbon emissions per kilowatt of electricity production, reducing these emissions will be an important step towards shrinking China's ecological deficit.

Figure 7: China's use of world biocapacity, 1961-2005. China began demanding more capacity than its own ecosystems could support in the late 1960s. The nation's Footprint is now more than twice its biocapacity.

Table 1: China's total Ecological Footprint and biocapacity by land type, 2005**.** China had an ecological deficit in all but two land types, forest and fishing ground. Total biocapacity of the five land types shown in the table comprises the entire productive area of the world; thus land which uptakes carbon is accounted for in other biocapacity totals.

EVIDENCE

FIGURE 7: CHINA'S USE OF WORLD BIOCAPACITY, 1961-2005

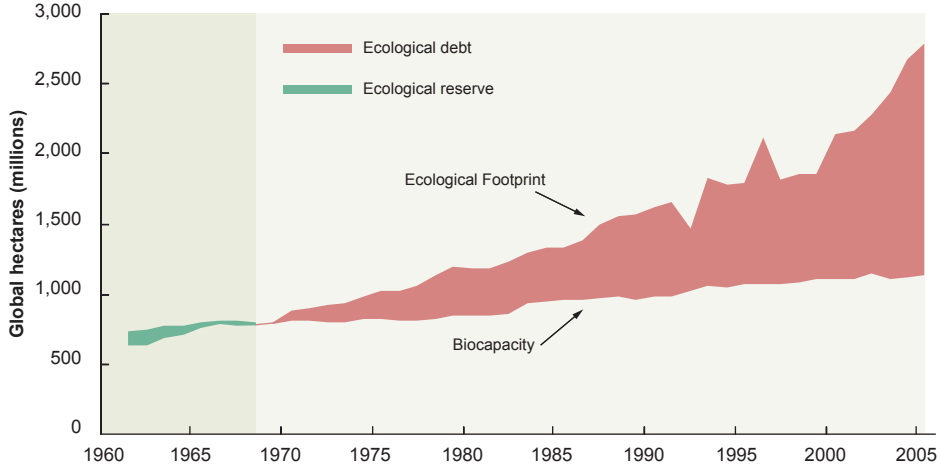


TABLE 1: CHINA'S TOTAL ECOLOGICAL FOOTPRINT AND BIOCAPACITY PER LAND TYPE, 2005

Land types	Total Ecological Footprint (millions of gha)	Total Biocapacity (millions of gha)
Cropland	737.0	521.0
Grazing land	199.0	197.0
Forest	165.0	215.0
Carbon uptake land	1,500.0	—
Built-up land	99.0	99.0
Fishing ground	87.4	101.0
Total	**2,790.0**	**1,133.0**

HONG KONG'S ECOLOGICAL FOOTPRINT AND BIOCAPACITY

At 4.4 global hectares per person, Hong Kong's average Ecological Footprint is nearly twice that of the rest of China. It is comparable to that of other Asian urban centers such as Singapore.

Since 1965, Hong Kong's per person Ecological Footprint has more than doubled, with the carbon component increasing approximately seven-fold (Figure 8). This is despite Hong Kong's urban lifestyle providing some overall energy efficiencies through compact housing and transportation infrastructure.

The demand on the biosphere by Hong Kong residents goes well beyond what Hong Kong itself can provide. If everyone on the planet lived like an average Hong Kong resident, it would require a little more than two Earths to provide the resources being used and to absorb the wastes being generated.

If Hong Kong residents were to depend solely on the biological capacity of their land and sea base, they would require more than 250 Hong Kongs. But like Singapore, in modern times, Hong Kong's growing economy has never been dependent on its own limited biocapacity. Even by the mid 1940s, there were few forests left and sail-powered junks traveled as far as Hainan Island to fish. Instead, its consumption is largely dependent on the biocapacity of other regions and the global commons. Hong Kong's net import Footprint is 17.6 million gha, nearly 58 percent of its total consumption Footprint (Table 2). An additional 39 percent of Hong Kong's Footprint comes from carbon dioxide that is emitted to the atmosphere from within its own borders.

Much of Hong Kong's imported biocapacity comes from other regions of China. Other major trade partners include Pacific Rim countries such as Japan, South Korea and the United States (Table 3). Hong Kong's major imports include metals and minerals, plastics, and food. Major exports, which include re-exports, consist of manufactured products, electrical machinery, and metals.

This high level of dependence on trade has important implications for Hong Kong's economic security and the future well-being of its residents. As resource demand around the world continues to grow and resources become increasingly scarce, this degree of dependency on external biocapacity poses considerable risk. To help offset some of this risk, Hong Kong's government and residents can apply a resource accounting system such as the Ecological Footprint to better understand the nature and extent of their demand on, and the availability of biocapacity, then develop strategies for investing in infrastructure and encouraging lifestyles that are less dependent on the use of these critical assets.

FIGURE 8: HONG KONG'S ECOLOGICAL FOOTPRINT BY LAND TYPE, THREE YEAR AVERAGES, 1964-2005

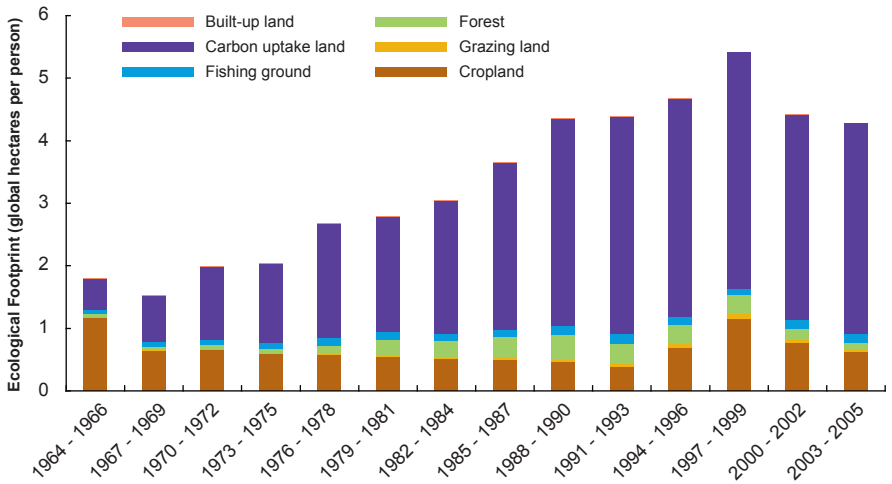


TABLE 2: HONG KONG'S TOTAL ECOLOGICAL FOOTPRINT AND BIOCAPACITY PER LAND TYPE, 2005

Land types	Total Ecological Footprint (millions of gha)	Total Biocapacity (millions of gha)
Cropland	4.00	0.01
Pasture land	0.25	0.02
Forest	0.81	0.03
Carbon uptake land	24.00	—
Built-up land	0.04	0.04
Fishing ground	0.99	0.02
Total	**30.00**	**0.12**

FIGURE 9a: IMPORTED FOOTPRINT TO HONG KONG FROM TOP TRADE PARTNERS, 2005

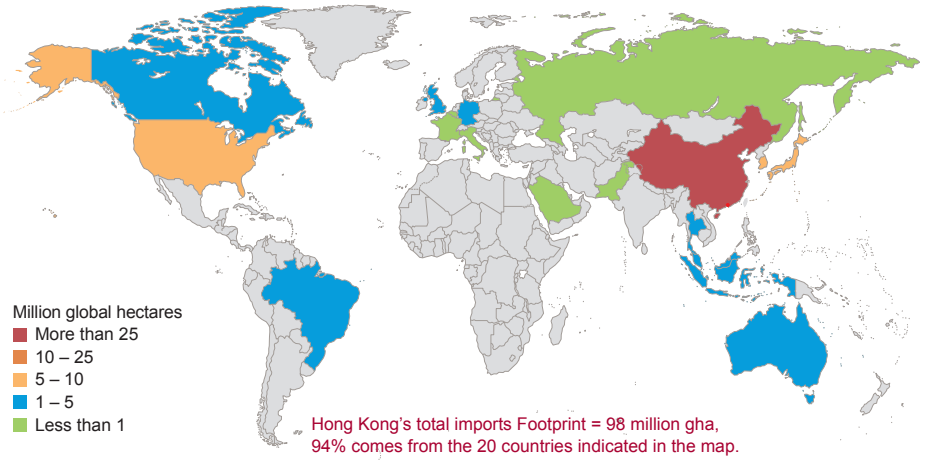


FIGURE 9b: EXPORTED FOOTPRINT FROM HONG KONG TO TOP TRADE PARTNERS, 2005

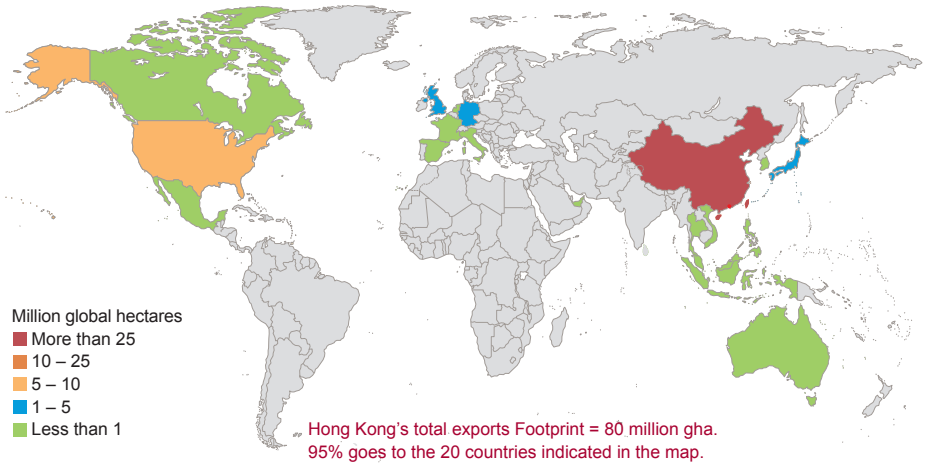


TABLE 3: HONG KONG'S FOOTPRINT OF IMPORTS FROM, AND EXPORTS TO, TOP TRADE PARTNERS, 2005

Trading Partner	Footprint of Imports (millions of gha)	Footprint of Exports (millions of gha)	Net Footprint of Imports (millions of gha)	Major Products Imported	Major Products Exported
China	42.88	56.25	-13.37	Crude fertilizers and crude materials; Miscellaneous manufactured items	Plastic materials; Iron and steel
Japan	9.84	2.87	6.97	Non-metallic mineral manufactures; Plastic materials	Miscellaneous manufactured articles; Electrical machinery, apparatus and appliances
Republic of Korea	6.07	0.54	5.54	Plastic materials; Iron and steel	Miscellaneous manufactured articles; Electrical machinery, apparatus and appliances
Thailand	4.53	0.54	3.98	Plastic materials; Cereals and cereal preparations	Textile yarn, fabrics, made up articles, etc.; Electrical machinery, apparatus and appliances
United States of America	5.61	9.03	-3.42	Plastic materials; Fruit and vegetables	Miscellaneous manufactured articles; Electrical machinery, apparatus and appliances
Malaysia	2.93	0.43	2.50	Plastic materials; Fixed vegetable oils and fats	Crude fertilizers and crude minerals; Electrical machinery, apparatus and appliances
Singapore	2.69	0.62	2.07	Plastic materials; Chemical elements and compounds	Miscellaneous manufactured articles; Electrical machinery, apparatus and appliances
Indonesia	1.56	0.35	1.21	Coal, coke and briquettes; Textile yarn, fabrics, made up articles	Miscellaneous manufactured articles; Textile yarn, fabrics, made up articles
Australia	1.67	0.70	0.97	Nonferrous metals; Iron and steel	Miscellaneous manufactured articles; Electrical machinery, apparatus and appliances
Netherlands	1.56	0.67	0.89	Plastic materials; Chemical elements and compounds	Miscellaneous manufactured articles; Electrical machinery, apparatus and appliances

THE GLOBAL DEVELOPMENT CHALLENGE

The world has changed dramatically over the past forty years. Many nations, including those in the Asia-Pacific region, have experienced rapid economic growth, a reduction in poverty, and an improved quality of life. These positive changes, however, have often been accompanied by a corresponding rise in Ecological Footprint. As economies develop and mature, how will higher living standards be decoupled from resource throughput and carbon dioxide emissions?

Each person alive today consumes more on average than a person did forty years ago. But at the same time, the amount of biological capacity available per person has fallen, as population growth has outpaced increases in the area and yield of productive ecosystems. This increased consumption and decreased per person biocapacity has led to growing ecological deficits in many nations.

Hong Kong's Ecological Footprint trends over the past forty years have been similar to Japan's. Both were already ecological debtors by the 1960s, and experienced rising prosperity and per person Footprints until the 1990s, when these started leveling off. Hong Kong and Japan both have high per person income and a relatively low population growth rate, and are industrialized countries with an Ecological Footprint dominated by carbon emissions.

China's Footprint has doubled over the last forty years, along with increasing prosperity for its average resident. During the same period, as its population grew, biocapacity available per person in the country declined. As China continues to industrialize and increases its consumption and dependence on outside resources, it will confront the challenge of sustaining its economic growth while facing tightening constraints on resources.

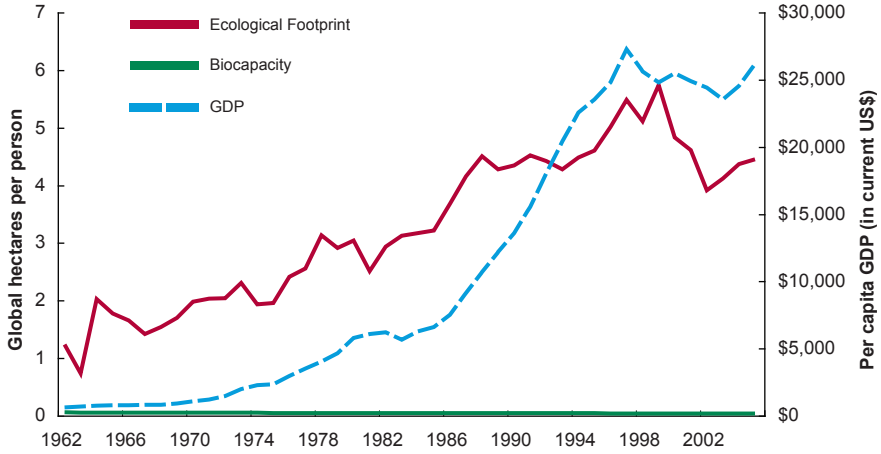
Australia and Indonesia both have an ecological reserve, with biocapacity exceeding their Ecological Footprints. Australia's historically high per person Footprint may be accounted for in part by transportation requirements between widely separated cities, and by its relatively high meat consumption. Despite this high Footprint, Australia continues to have access to a significant, although slowly diminishing, reserve of biocapacity. As an industrialized ecological creditor nation with both natural and financial capital, Australia may have more options for maintaining a viable economy than will nations already running ecological deficits.

Indonesia, a middle-income nation, has a modest Footprint that is converging with its still slightly greater biocapacity. Because its carbon Footprint is relatively small, Indonesia's Footprint suggests a resource consumption pattern based more on meeting basic needs such as food, and less on discretionary spending. With considerable forest biocapacity still remaining, a developing market for carbon credits may help protect Indonesia's ecological assets while providing it with an important ongoing revenue stream.

The impact of increasing resource constraints on economic viability differs among nations, depending on factors that include population growth, consumption growth and strategic management of biological assets. Carbon emissions, and how and when they will be treated under international agreements, are an increasingly key factor both for high-income countries, whose carbon Footprints comprise a significant percentage of their overall Footprints, and for industrializing nations, where energy resources play a key role in emerging from poverty.

For most countries, carbon dioxide emitted as a by-product of economic activities is currently dumped into the global commons of the atmosphere at no economic cost to polluters other than the diffused cost to all that results from climate change. As emitted carbon becomes a commodity traded or regulated by international treaties, the economic consequences of a high carbon Footprint will become an increasingly important consideration in the strategies countries adopt for improving the well-being of their citizens while maintaining the robustness of their economies.

FIGURE 10: HONG KONG'S ECOLOGICAL FOOTPRINT, BIOCAPACITY AND GDP, 1961-2005



Figures 10-14: Ecological Footprint, Biocapacity and GDP per person for Hong Kong, China, Japan, Indonesia and Australia, 1961-2005.

FIGURE 11: CHINA'S ECOLOGICAL FOOTPRINT, BIOCAPACITY AND GDP, 1961-2005

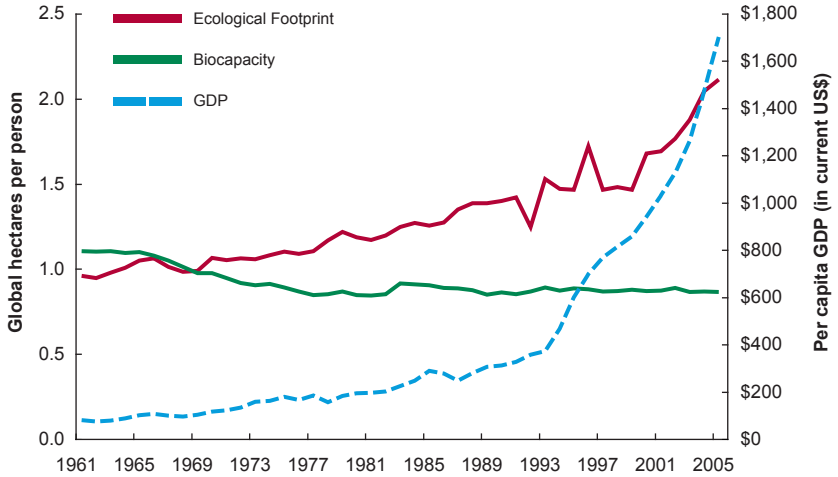


FIGURE 12: JAPAN'S ECOLOGICAL FOOTPRINT, BIOCAPACITY AND GDP, 1961-2005

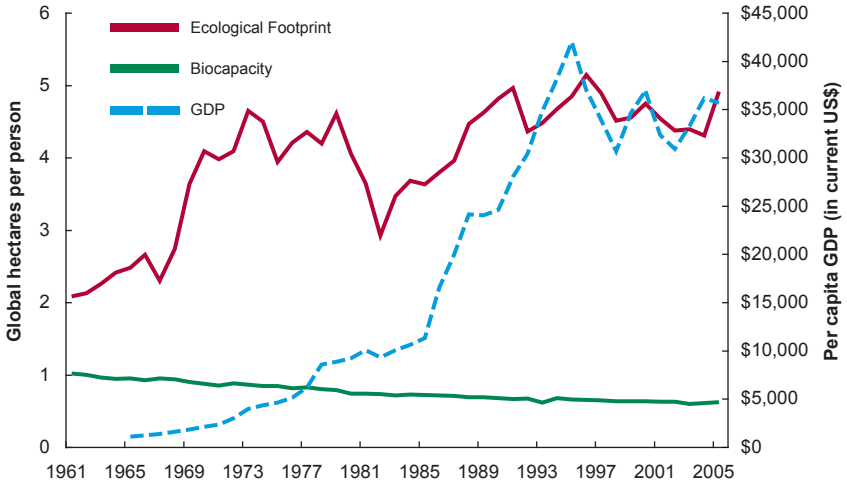


FIGURE 13: INDONESIA'S ECOLOGICAL FOOTPRINT, BIOCAPACITY AND GDP, 1961-2005

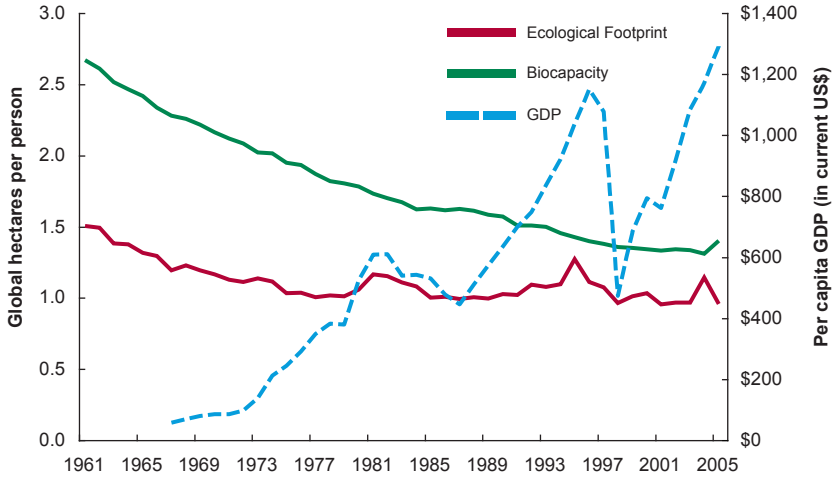
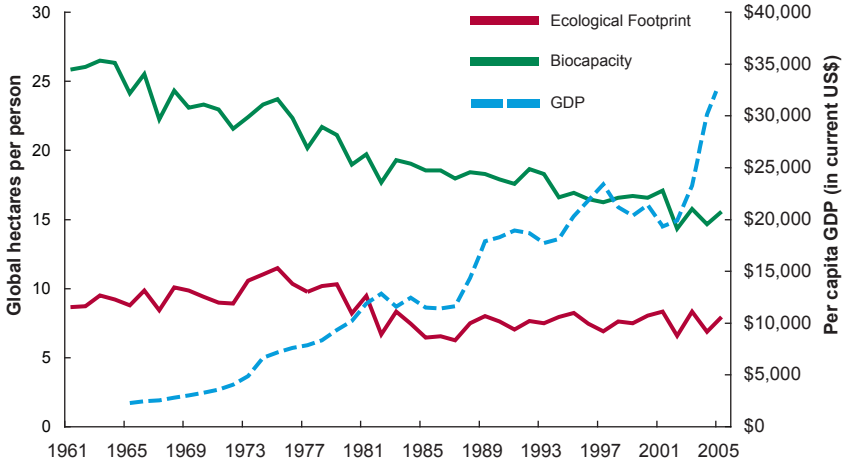


FIGURE 14: AUSTRALIA'S ECOLOGICAL FOOTPRINT, BIOCAPACITY AND GDP, 1961-2005



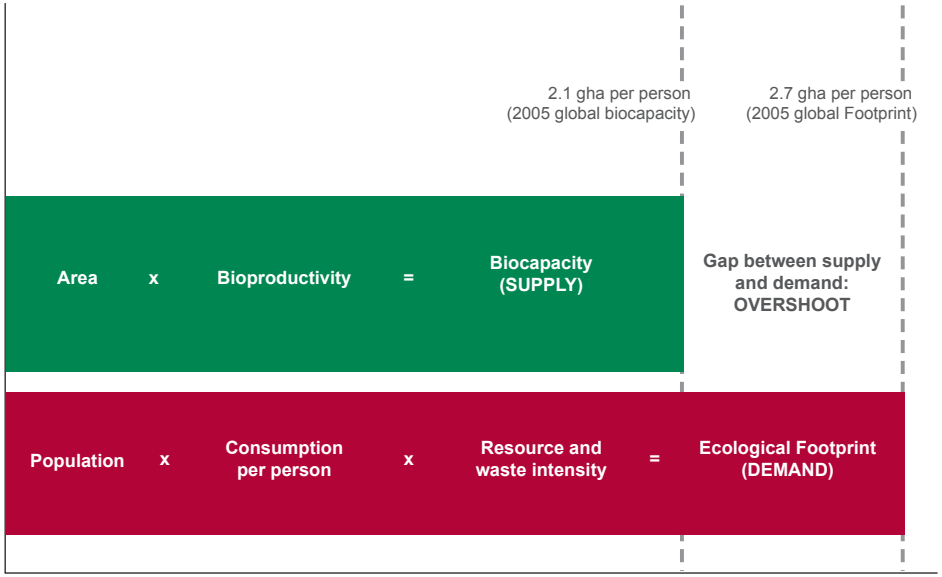
PATHS FOR THE FUTURE

If humanity continues on its current trajectory, even optimistic United Nations projections with moderate increases in population, food and fibre consumption, and carbon dioxide emissions suggest that around 2030 humanity will demand resources at more than double the rate at which the Earth can regenerate them. This degree of overshoot risks not only the loss of biodiversity, but also damage to ecosystems and their ability to provide the resources and services on which humanity depends. The alternative to the current trajectory is to eliminate overshoot.

Within this global context, Hong Kong has important decisions to make regarding resource use and an ever-increasing dependence on biocapacity from outside of the administrative region.

Five factors determine the extent of global overshoot, or a nation's ecological deficit. Three of these factors shape the Ecological Footprint: population size, the average consumption per person in that population, and the resource and waste intensity per unit of consumption. Two factors determine biocapacity: the amount of productive area available, and the productivity of that area.

FIGURE 15: FOOTPRINT AND BIOCAPACITY FACTORS THAT DETERMINE GLOBAL OVERSHOOT



1. The Population Factor

Increases in population can be slowed and eventually reversed by supporting families in choosing when to have children. Offering women access to safe and affordable family planning, better education, economic opportunities, and health care are proven approaches to achieving this. Hong Kong's population growth rate is currently less than one percent, but total population makes Hong Kong one of the most densely populated areas in the world, with 6,303 people per square kilometer.

2. The Consumption Factor

The potential for reducing consumption depends in part on an individual's economic situation. While people living at or below subsistence may need to increase their consumption to move out of poverty, there are many opportunities for more affluent people to reduce consumption while still improving their quality of life. With a high level of human development as defined by the United Nations, and a high per person income, Hong Kong is well-positioned to reduce its Footprint while enhancing its lifestyle.

Figure 15: Five factors that determine global overshoot. In order to reduce its ecological deficit, Hong Kong can either increase its biocapacity or reduce its Ecological Footprint.

3. The Technology Factor
The amount of resources used and wastes emitted in the production of goods and services can be significantly reduced. This can be accomplished through energy conservation and efficiency in manufacturing and in the home, waste minimization, increased recycling, more fuel-efficient vehicles, and a reduction in the distance goods are transported. Business and industry react to government policies that promote resource efficiency and technical innovation – where such policies are clear and long term – as well as to consumer pressure.

4. The Area Factor
Bioproductive area can be extended: non-productive lands can be made fertile through careful management. Terracing has had historical success, and irrigation, too, can make marginal lands more productive, though the gains may not persist. Above all, good land management must ensure that bioproductive areas are not lost, for example, to urbanization, salinization or desertification.

5. The Bioproductivity Factor
The amount of resources produced per hectare depends both on the type of ecosystem and the way it is managed. Agricultural technologies can boost productivity, but can also diminish biodiversity. Energy intensive agriculture and heavy reliance on fertilizer and pesticides may increase yields, but at the cost of a larger Footprint. If these inputs impoverish soil, yields may ultimately begin to fall.

In choosing investments that will help reduce its ecological deficit, there are two complementary paths that Hong Kong can simultaneously pursue:

Path #1: Invest in things that are quick and easy to change.

This strategy involves solutions that are simple, cheap and the public is ready to embrace. Investments in clean technology, such as energy efficient light bulbs, often are able to quickly reduce Footprint intensity without reducing the quality of life of end consumers, and create new opportunities for businesses. This strategy can result in very rapid, short-term gains, while building momentum that can help set society on a low-Footprint path.

Path #2: Invest in things that change slowly.

Reducing Hong Kong's ecological deficit in the long run will require decision-making within a long-term framework (Figure 16). Often the decisions with the largest long-term Footprint impact are not those that place the greatest demand on the planet today, but those that lock development into an unsustainable track. Although highways may be cheaper in the short-term to build and maintain, the construction of a light rail system may, over the long-term, result in a much smaller transportation Footprint. Likewise, investments in power generation should be mindful of the carbon Footprint that will accumulate over the lifespan of the facility. Today, proactive decisions about human population size and infrastructure development will have the most enduring and significant impacts on Hong Kong's future ecological deficit, and its ability to ensure the well-being of its residents.

FIGURE 16: LIFESPAN OF PEOPLE, ASSETS AND INFRASTRUCTURE

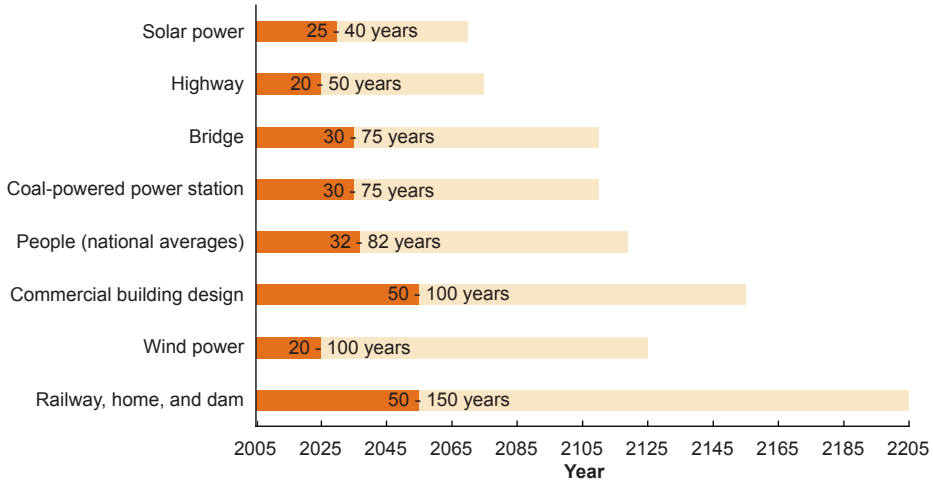


Figure 16: Lifespan of people, assets and infrastructure. The long life of infrastructure means that the infrastructure Hong Kong invests in today will detemine levels of resource use for decades.

HONG KONG: TRANSFORMATION TO SUSTAINABILITY

In his 2008-09 Policy Address, HKSAR's Chief Executive embraced the challenge of sustainable development. Hong Kong is fortunate in having the financial resources to meet this challenge, to transform itself into a truly modern city where its residents can live well on a modest Ecological Footprint. In doing so, Hong Kong can lead by example, providing a sustainability blueprint for other cities in China and around the world.

CARBON

The Policy Address advised that environmental protection will be further strengthened through close collaborations with neighbours in the Pearl River Delta in the areas of post-2010 emission reduction arrangements, the optimisation of the fuel mix for power generation, and the development and wider use of renewable energy. In this regard, Government, commercial firms and individuals all have a role to play in achieving sustainability.

The Chief Executive also endorsed the need to address climate change by building a low carbon economy based on energy conservation, the usage of clean fuels and a reduction in the use of coal.

Some 80% of Hong Kong's total Ecological Footprint in 2005 was the carbon component. This is expressed as an estimate of the area of world forest that would be required to remove and retain the carbon dioxide emissions from fossil fuel combustion. Reducing carbon emissions is therefore essential to reducing Hong Kong's overall ecological overshoot.

Carbon Reduction Strategies:

Governmental. Hong Kong's per capita Ecological Footprint has grown rapidly since 1965, and has since continued to rise due to the dramatic increment in its carbon component. Over 60% of carbon dioxide is emitted by the burning of fossil fuels for electricity generation. Hong Kong's electricity is mostly generated by coal-fired power stations. In terms of carbon dioxide emissions, coal is double that of natural gas.

In the Policy Address, The HKSAR Chief Executive committed to exploring ways to gradually increase the use of clean energy sources, for example, natural gas for power generation from the current 28 percent to 50 percent. However, without a specific timetable for implementation, it remains to be seen how effective such broad policy directives will be in contributing to a low carbon economy.

Hong Kong would certainly benefit from the introduction of stringent government Renewable Obligations (RO) to the electricity utilities. Such a RO would place an obligation on Hong Kong suppliers of electricity to increase the proportion of renewable energy in their current generation portfolio within a specific timeframe. Voluntary initiatives are unlikely to result in city-wide reductions fast enough to meaningfully support global commitments of emissions reductions.

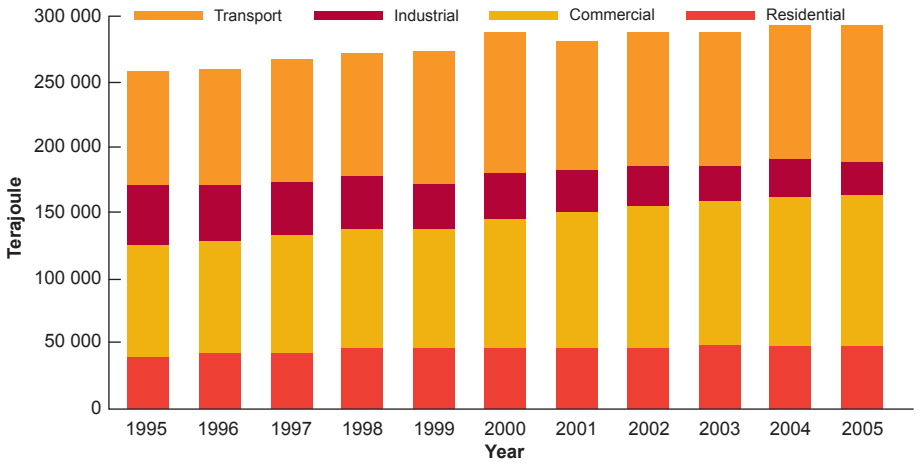
Commercial. Commerce is the highest consumer of energy in Hong Kong, above the transport, industrial and residential sectors. It accounts for 37 percent of total energy use (Figure 17). Office buildings consume much of the energy in the commercial sector. Some 48 percent of the energy consumption in an office building is typically for space conditioning, 22 percent for office equipment, 19 percent for lighting, and 11 percent for lifts and the others. Building owners and construction companies can increase implementation and adoption of effective low-carbon designs and management systems for buildings and offices. Carbon audits for buildings can provide guidance and tools for both owners and tenants to reduce emissions.

Individual. The individual contribution made by Hong Kong residents towards a sustainable society can be substantial. Individuals can measure the carbon emissions produced by their own personal consumption using WWF's carbon calculator (www.climateers.org). Actions can be taken to change daily habits at home and at work, which will bring a significant reduction in personal carbon footprint.

LIVE REEF FOOD FISH

Hong Kong's demand for seafood has long exceeded the amount its limited territorial waters can produce. Indeed, the demand from Hong Kong and mainland China for certain species of reef fish that can be chosen live just before being cooked has led to Hong Kong becoming not only an importing consumer, but also the centre for significant global trade, primarily for re-exports to mainland China. This huge demand for Live Reef Food Fish (LRFF) has driven the rapid expansion of this fishery in Asia (Figure 18). In the 1970s,

FIGURE 17: HONG KONG ENERGY CONSUMPTION BY SECTORS, 1995-2005



the fishery for LRFF was mainly in the South China Sea bordering the Philippines, Spratley, Paracel and Pratas Islands. When these areas became depleted, in the 1980s, the LRFF fishery expanded to waters off Malaysia, Singapore, Palau and Indonesia; by the 1990s the areas fished had quadrupled in response to the unsustainable demand. Hong Kong and increasingly southern mainland China now take a significant portion of the total stock of live fish, particularly high-value groupers and wrasses, from the Pacific and the Indian Oceans.

The number of countries involved in the LRFF trade escalated from 18 in 1998 to 35 in 2005, while the imports of three important wild-caught LRFF species increased by almost 60 percent from 1999 to 2006. Since 1999 (when species-level trade data first became available), leopard coral trout has been the most heavily-traded species, followed by squaretail coral trout and humphead wrasse. The record quantity for import of these three species into Hong Kong reached almost 3,400 tonnes in 2006. Humphead wrasse is now listed in Appendix II of CITES (Convention on the International Trade of Endangered Species of Flora and Fauna), while the current conservation status of squaretail coral trout is 'Vulnerable' on the IUCN Red List 2008. All three species (except leopard coral trout from Australia) are in the WWF Hong Kong Seafood Guide "Avoid" category.

LRFF Reduction Strategies:

Sustainable fishery management. Catches from local waters are poor, and composed mostly of small and low value species, as a result of unsustainable fishing practices. Initiatives to design and implement sustainable fisheries management and restore fish stocks have begun, and if fully implemented will result in increased catches of larger species of high value, and potentially an increase of 7 percent in self-sufficiency in 25 years.

Individuals and businesses. Local, unsustainably harvested seafood can be substituted for that which is sustainable; WWF's Seafood Guide is a handy reference. Products which are inherently unsustainable today, such as shark fin, should simply be avoided. Seafood products with a Marine Stewardship Council (MSC) label have been sustainably harvested.

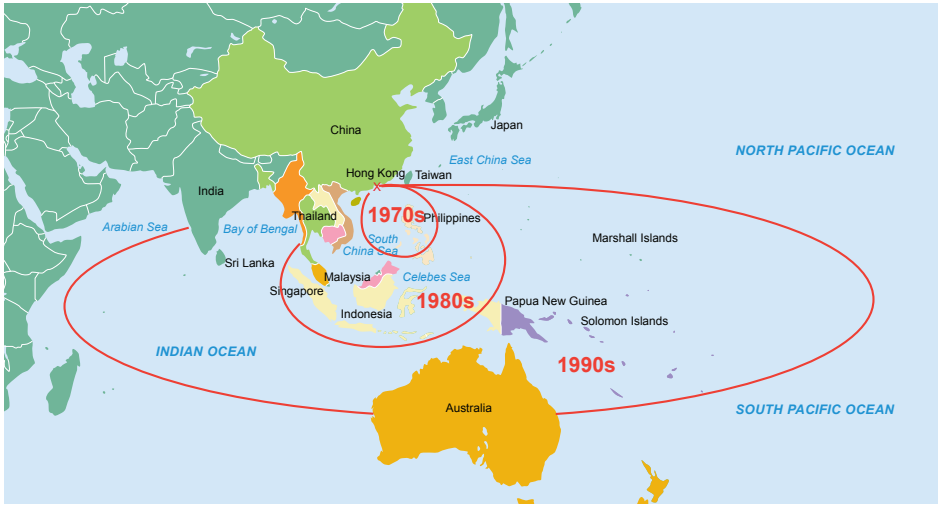
SUSTAINABLE FINANCE AND CONSUMPTION

The public sector in Hong Kong is a major end user of imported natural resources, and can guide the commercial sector. At present sustainability targets are used only sporadically in procurement policies, and are neither initiated nor developed in a strategic manner. Introducing targets and policies top down across all bureaus and government departments would help reduce Hong Kong's Footprint. For example, a requirement can be set that paper and timber products come from recycled or legal, sustainably harvested sources (e.g. Forest Stewardship Council certified), with industry and individuals encouraged to do the same.

Companies are increasingly finding new and innovative ways to shift towards sustainable practices. As a financial hub where many multi-national companies locate offices and operations, Hong Kong can lead in the adoption of sustainable business practices, encouraging other cities to do the same.

Through its financial investment mechanisms, Hong Kong plays a globally important role in the sourcing and utilization of natural resources. Institutions based in Hong Kong still finance some dubious practices, directly and indirectly, despite this ultimately being bad for business, and potentially damaging to their reputation. While more progressive leaders have established sustainability policies, others can do more. Stock exchange regulations can be changed to eliminate Hong Kong's direct or indirect financing of unsustainable practices such as illegal logging and deforestation operations.

FIGURE 18: SOURCE COUNTRIES FOR LIVE REEF FOOD FISH IMPORTED INTO HONG KONG, CHINA



Adapted from While Stocks Last – *The Live Reef Food Fish Trade,* Asian Development Bank

FREQUENTLY ASKED QUESTIONS

How is the Ecological Footprint calculated?

The Ecological Footprint measures the amount of biologically productive land and water area required to produce the resources an individual, population or activity consumes. It simultaneously measures the area required to absorb the waste we generate, given prevailing technology and resource management. This area is expressed in global hectares, which have world-average biological productivity. Footprint calculations use yield factors to take into account national differences in biological productivity (e.g., tonnes of wheat per UK hectare versus per Argentina hectare) and equivalence factors to take into account differences in world average productivity among land types (e.g., world average forest versus world average cropland).

Footprint and biocapacity results for nations are calculated annually by the Global Footprint Network. The continuing methodological development of these National Footprint Accounts is overseen by a review committee (www.Footprintstandards.org/committees). A detailed methods paper and copies of sample calculation sheets can be obtained at www.footprintnetwork.org.

What does a per capita national Footprint actually mean?

A per capita national Footprint measures the amount of bioproductive space under constant production required to support the average individual of that country. For example, a five-hectare per person Footprint means that an average individual in that country uses all of the resources provided by five hectares of world-average productive land. This land does not need to be within the borders of the individual's country as biocapacity is often imported from other countries to meet consumption demands.

What is included in the Ecological Footprint? What is excluded?

To avoid exaggerating human demand on nature, the Ecological Footprint includes only those aspects of resource consumption and waste production for which the Earth has regenerative capacity, and where data exist that allow this demand to be expressed in terms of productive area. For example, freshwater withdrawal is not included in the Footprint, although the energy used to pump or treat it is.

Ecological Footprint accounts provide snapshots of past resource demand and availability. They do not predict the future. Thus, while the Footprint does not estimate future losses caused by present degradation of ecosystems, if persistent this degradation will likely be reflected in future accounts as a loss of biocapacity.

Footprint accounts also do not indicate the intensity with which a biologically productive area is being used, nor do they pinpoint specific biodiversity pressures. Finally, the Ecological Footprint is a biophysical measure; it does not evaluate the essential social and economic dimensions of sustainability.

How do you measure biocapacity and how do you determine how much is available?

Biocapacity per person is calculated by taking the total amount of bioproductive land worldwide and dividing it by world population. It is a globally aggregated measure of the amount of land and sea area available per person to produce crops, livestock (pasture), timber products (forest) and fish (fishery grounds), to support infrastructure (built-up-land) and to sequester carbon emission. A nation's biocapacity may include more global hectares than the nation has actual hectares if its land and sea area are highly productive. Biocapacity assessments reflect technological advancements that increase yields, as the conversion of hectares into global hectares takes into account productivity.

How does the Ecological Footprint account for the use of fossil fuels?

Fossil fuels such as coal, oil, and natural gas are extracted from the Earth's crust rather than produced by current ecosystems. When burning this fuel, carbon dioxide is produced. In order to avoid carbon dioxide accumulation in the atmosphere, the goal of the UN Framework Convention on Climate Change, two options exist: a) human technological sequestration, such as deep well injection; or b) natural sequestration. Natural sequestration corresponds to the biocapacity required to absorb and store the carbon dioxide not sequestered by humans, less the amount absorbed by the oceans. This is the Footprint for fossil fuels. Currently, negligible amounts of carbon dioxide are sequestered through human technological processes.

The sequestration rate used in Ecological Footprint calculations is based on an estimate of how much carbon the world's forests can remove from the atmosphere and retain. One 2005 global hectare can absorb the carbon dioxide released by burning approximately 1525 litres of gasoline per year.

The fossil fuel Footprint does not suggest that carbon sequestration is the key to resolving global warming. Rather the opposite: It shows that the biosphere does not have sufficient capacity to cope with current levels of carbon dioxide emissions. As forests mature, their carbon dioxide sequestration rate approaches zero, and the Footprint per tonne of carbon dioxide sequestration increases. Eventually, forests may even become net emitters of carbon.

How is international trade taken into account?

The national Ecological Footprint accounts calculate each country's net consumption by adding its imports to its production and subtracting its exports. This means that the resources used for producing a car that is manufactured in Japan, but sold and used in India, will contribute to the Indian, not the Japanese consumption Footprint.

The resulting national consumption Footprints can be distorted, since the resources used and waste generated in making products for export are not fully documented. This can bias the Footprints of countries whose trade-flows are large relative to their overall economies. These misallocations, however, do not affect the total global Ecological Footprint.

Does the Ecological Footprint matter if the supply of renewable resources can be increased and advances in technology can slow the depletion of non-renewable resources?
The Ecological Footprint measures the current state of resource use and waste generation. It asks: In a given year, did human demand on ecosystems exceed the ability of ecosystems to meet this demand? Footprint analysis reflects both increases in the productivity of renewable resources (for example, if the productivity of cropland is increased, then the Footprint of 1 tonne of wheat will decrease) and technological innovation (for example, if the paper industry doubles the overall efficiency of paper production, the Footprint per tonne of paper will be cut by half). Ecological Footprint accounts capture these changes as they occur and can determine the extent to which these innovations have succeeded in bringing human demand within the capacity of the planet's ecosystems. If there is a sufficient increase in ecological supply and a reduction in human demand due to technological advances or other factors, Footprint accounts will show this as the elimination of global overshoot.

Does the Ecological Footprint ignore the role of population growth as a driver in humanity's increasing consumption?
The total Ecological Footprint of a nation or of humanity as a whole is a function of the number of people consuming, the quantity of goods and services an average person consumes, and the resource intensity of these goods and services. Since Footprint accounting is historical, it does not predict how any of these factors will change in the future. However, if population grows or declines (or any of the other factors change), this will be reflected in future Footprint accounts.

Footprint accounts also show how resource consumption is distributed among regions. For example, the total Footprint of the Asia-Pacific region, with its large population but low per person Footprint, can be directly compared to that of North America, with its much smaller population but much larger per person Footprint.

How have the 2008 National Accounts been adapted for Hong Kong?
Due to a lack of available data, several alterations to the standard National Footprint Accounts methodology were necessary to calculate Hong Kong's Footprint and biocapacity over time. These adaptations involved using alternate data sources to calculate Footprint components. In some cases, only a single year's data was available, requiring time series data to be estimated based on population.

Cropland
The FAOSTAT statistical database does not contain agricultural harvest or trade data for Hong Kong separately from China. The cropland Footprint of production for Hong Kong was estimated for 2005 based on production data for a few broad crop categories, then extrapolated to previous years using a constant per capita Footprint of production. Trade in crop products was estimated based on data from the UN COMTRADE database.

Grazing Land
Like cropland, the grazing land Footprint of production was estimated for 2005, and assumed to be proportional to population in previous years. Trade in livestock was also estimated based on data from the UN COMTRADE database.

Forest Land
The forest land Footprint of production was assumed to be zero. The embodied Footprints of traded forest products was estimated based on the UN COMTRADE database, since Hong Kong is not included in the FAO ForesSTAT database.

Fishing Grounds
Traded quantities of fish commodities were derived from the UN COMTRADE database.

Built-up Land
Land cover areas used for Footprint and biocapacity calculations were from the planning department of the government of the Hong Kong SAR. They were taken from http://www.pland.gov.hk/info_serv/statistic/landu_e.html (Accessed 30 August 2008). This source only provides land cover data for the years 2003-2007, so 2005 numbers were used and were assumed to be constant in previous years.

Why has Hong Kong's Ecological Footprint declined since the late 1990s?
A number of factors may have played a role. Two historical events occurred in 1997: the Asian market crisis, and Hong Kong's return to Chinese sovereignty. Analysis of how these two events impacted Hong Kong's trade flows and consumption patterns would show the extent to which they contributed to the Footprint decline. However, this goes beyond the scope of the current report.

More information about Ecological Footprint methodology, data sources, assumptions and definitions can be found in The Ecological Footprint Atlas 2008, available at: *www.footprintnetwork.org/atlas*

TECHNICAL NOTES

ECOLOGICAL FOOTPRINT ACCOUNTING

The Ecological Footprint is a well known resource accounting tool that measures how much biologically productive land and water area an individual , a city, a country, a region, or humanity uses to produce the resources it consumes and to absorb the wastes it generates, using prevailing technology and resource management. The Ecological Footprint is most commonly expressed in units of global hectares.

A global hectare is a hectare that is normalized to have the world average productivity of all biologically productive land and water in a given year. Because of international trade and the dispersion of wastes, hectares demanded can be physically located anywhere in the world.

Hong Kong's Ecological Footprint measures the biological capacity needed to produce the goods and services consumed by residents of Hong Kong, as well as the capacity needed to assimilate the carbon emissions they generate. Resources used for the production of goods and services that are exported are counted in the Ecological Footprint of the region where the goods and services are ultimately consumed.

Biocapacity (or biological capacity) is the capacity of ecosystems to produce useful biological materials and to absorb waste generated by humans using current management schemes and extraction technologies. "Useful biological materials" are defined by the human economy that year. What is considered "useful" can change over time (e.g. the use of corn stover to produce cellulosic ethanol would result in corn stover becoming a useful material, thereby increasing the biocapacity for maize cropland).

An ecological deficit represents the amount by which the Ecological Footprint of a population exceeds the available biocapacity of that population's territory in a given year. A national ecological deficit measures the amount by which a country's Footprint exceeds its biocapacity. A nation can operate its economy with an ecological deficit by importing biocapacity from other nations, by placing demands on the global commons (e.g. carbon stocks in the atmosphere, fishing in the international waters), or by depleting its own domestic ecological assets. A global ecological deficit, however, cannot be offset through trade and inevitably leads to the depletion of ecological assets and/or the accumulation of wastes.

Populations with an Ecological Footprint smaller than their available biocapacity are operating with an ecological reserve, meaning that each year the land generates more bioproductivity than is consumed by the citizens. A nation's ecological reserve is not necessarily unused, however but may be occupied by the Footprints of other countries that import biocapacity from that nation. Countries also may choose to reserve this biocapacity for the use of wild species or for future generations.

DATA SOURCES

The Ecological Footprint results for Hong Kong and other nations found in this report are based on Global Footprint Network's National Footprint Accounts, 2008 Edition. These accounts calculate the Ecological Footprint and biocapacity of 150 nations with populations over one million from 1961-2005. Results are available by request from Global Footprint Network (data@footprintnetwork.org).

National Footprint Accounts calculations are based primarily on international data sets published by the Food and Agriculture Organization of the United Nations (FAO), the International Energy Agency (IEA), the UN Statistics Division (UN Commodity Trade Statistics Database – UN Comtrade), and the Intergovernmental Panel on Climate Change (IPCC). Other data sources include studies in peer-reviewed science journals and thematic collections. Because the FAO does not track data separately from China, the analysis of Hong Kong's Footprint required modification of the standard Footprint method (as detailed in the Frequently Asked Questions section).

METHODOLOGY

Ecological Footprint accounting is based on six fundamental assumptions:

- The majority of resources people consume and the wastes they generate can be tracked.
- Most of these resources and waste flows can be measured in terms of the biologically productive area necessary to maintain flows. Resource and waste flows that cannot be measured are excluded from the assessment, leading to a systematic underestimate of humanity's true Ecological Footprint.
- By weighing each area in proportion to its bioproductivity, different types of areas can be converted into the common unit of global hectares, hectares with world average bioproductivity.
- Because a single global hectare represents a single mutually exclusive use, and all global hectares in any single year represent the same amount of bioproductivity, they can be added up to obtain an aggregate indicator of Ecological Footprint or biocapacity.
- Human demand, expressed as the Ecological Footprint, can be directly compared to nature's supply, biocapacity, when both are expressed in global hectares.
- Area demanded can exceed area supplied if demand on an ecosystem exceeds that ecosystems regenerative regenerative capacity (e.g., humans can temporarily demand resources from forests or fisheries faster than they are being replaced). This situation, where Ecological Footprint exceeds available biocapacity, is known as overshoot.

Updates to the Methodology Since 2006

The most extensive change from the 2006 edition of the National Footprint Accounts to the 2008 edition was in response to a revision in the structure of the United Nations Food and Agriculture Organization's Corporate Statistical Database (FAO FAOSTAT Statistical Databases 2007). This database, which serves as the basis for the national Footprint calculations, formerly aggregated all products into 10 groups. FAO no longer provides these aggregated product groups, so in the 2008

edition of the NFA raw, non-aggregated data was used instead. This substantially increased the number of commodities for which production and trade data are available, leading to more detailed accounts but also requiring the use of additional conversion factors to determine the primary product equivalents of processed products. These new conversion factors were compiled from a variety of FAO and other UN sources.

Other specific changes to the 2008 accounts include tracking an increased number of commodities for cropland, estimating overall demand on grazing land by subtracting market feed and residues from animal feed requirements, and expansion of the list of fish species caught for the fishing ground Footprint. Additional sources of carbon dioxide emissions are accounted for in the 2008 accounts, including emissions from gas flaring, cement production, tropical forest fires, and some biofuels. Another significant change in the 2008 Edition was elimination of a proxy that estimated the nucler power in terms of the carbon dioxide that would have been emitted if an equivalent amount of electricity were generated using fossil fuels.

These methodological changes have resulted in a small increase in both per capita Footprint and biocapacity for China when results of the two editions are compared, for a given year (Table 4). However, the ratio between Footprint and biocapacity remained largely unchanged.

LIMITATIONS

Although the goal of Ecological Footprint accounting is to measure human demand on the biosphere as accurately as possible, no single indicator can capture every aspect of the relationship between human activities and natural ecosystems. The current Ecological Footprint methodology has several limitations that suggest areas where additional indicators may be used for more complete decision making.

Because the Footprint is an historical accounting tool, many activities that systematically erode nature's future regenerative capacity are not included in current and past Ecological Footprint accounts. These activities include the release of materials for which the biosphere has no significant assimilation capacity (e.g. plutonium, PCBs, dioxins, and other persistent pollutants) and processes that damage the biosphere's future capacity (e.g., loss of biodiversity, salination resulting from cropland irrigation, soil erosion from tilling). Although the consequences of these activities will be reflected in future Ecological Footprint accounts as a decrease in biocapacity, Ecological Footprint accounting does not currently include risk assessment models that could allow a present accounting of these future damages.

Similarly, Ecological Footprint accounts do not directly account for freshwater use and availability, since freshwater can act as a limit on the amount of biological capacity in an area but is not itself a biologically produced resource. Although the loss of biocapacity associated with water appropriation or water quality degradation is reflected as a decrease in overall biocapacity in that year, an Ecological Footprint reflecting this use is not currently allocated to water consumers.

Tourism activities are currently attributed to the country in which they occur rather than to the traveler's country of origin. This distorts the relative size of some countries' Footprints, overestimating those that host tourists and underestimating the home countries of travelers. Current data constraints also prevent the Footprint associated with the generation of internationally-traded electricity from being allocated to the final consumer of this energy.

Incomplete scientific knowledge about the fate of greenhouse gases other than carbon dioxide makes it difficult to estimate the biocapacity required to neutralize their climate change potential. The demand on biocapacity from emission of these other greenhouse gases is therefore not currently included in Ecological Footprint accounts. Carbon dioxide added to the atmosphere from flaring of gas and oil wells, chemical process in cement production, tropical rain forest fires and some biofuesls is included in the total global Footprint, but not allocated to individual countries.

TABLE 4: CHINA'S FOOTPRINT AND BIOCAPACITY IN 2003: COMPARISON OF RESULTS FROM THE 2006 VERSUS 2008 EDITION OF THE NATIONAL FOOTPRINT ACCOUNTS

	CHINA (2003)			
	2006 National Accounts		2008 National Accounts	
	Ecological Footprint (gha per person)	Biocapacity (gha per person)	Ecological Footprint (gha per person)	Biocapacity (gha per person)
Cropland	0.40	0.34	0.53	0.39
Grazing Land	0.12	0.12	0.15	0.15
Forest Land	0.12	0.16	0.13	0.16
Fishing Grounds	0.17	0.09	0.06	0.08
Carbon Uptake Land	0.75	—	0.92	—
Built-up Land	0.07	0.07	0.08	0.08
Total	**1.64**	**0.78**	**1.87**	**0.86**

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