WWF

REPORT

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THIS REPORT HAS BEEN PRODUCED IN COLLABORATION WITH:

Global Footprint Network
Advancing the Science of Sustainability

Hong Kong Ecological Footprint Report 2010

Paths to a Sustainable Future

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WWF – Solutions for a living planet
WWF is the world's leading conservation organisation, with a network active in more than 100 countries. WWF's mission is to build a future in which humans live in harmony with nature. WWF-Hong Kong has been working since 1981 to deliver solutions for a living planet through Conservation, Footprint and Education programmes. For more information, please visit: wwf.org.hk

Global Footprint Network
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 resources we use, how much we have and who uses what. Our work seeks to make the planet's ecological limits central to policy- and decision-making at all levels. Global Footprint Network is a key indicator partner of the Biodiversity Indicator Partnership established by the Convention on Biological Diversity. In combination with other indicators, the Ecological Footprint is used as one of the large scale indicators of the underlying pressures that cause biodiversity loss.

CONTENTS

FOREWORD

All our actions as individuals, or collectively as a city, have an impact on the state of our planet's natural resources. Our planet is our home and we only have one. We rely entirely on this one planet to produce the natural resources which underpin our access to food and clean water, as well as providing the materials to build our homes and infrastructure that power our energy requirements and supply the clean air that we breathe. It is also the place where we dispose of our waste and belch out our emissions.

The world's population is expanding and our patterns of consumption are changing, which combine to impact on nature as never before. China is now the world's second largest economy, with a 1.3 billion population seeking resources increasingly from within its borders and around the world. What does this mean for Hong Kong? What does it mean for the world? How can Hong Kong play a leadership role in working with other parts of China to ensure that we consume resources responsibly, ensuring a sustainable future for this and coming generations?

WWF, in partnership with Global Footprint Network, has been producing the global Living Planet Report every other year since 1998, which says that humanity's demand on the biosphere is increasing, and at the same time species diversity around the world is decreasing. In 2010, WWF China, in partnership with the China Council for International Cooperation on Environment and Development, produced the second report on China's Ecological Footprint. In that report, international and national data are combined to analyze how demand on land and water resources has changed in the 31 provinces of mainland China.

In parallel with the China Ecological Footprint Report 2010, this year's Hong Kong Ecological Footprint Report clearly demonstrates that the trend in our consumption over the last 45 years has increased massively, until recently. Highlighted in the first Hong Kong report, published in 2008, was that Hong Kong will always be an "ecological debtor", by which we mean Hong Kong will always need more resources than our land and sea mass can sustain. We will always have an "Ecological Footprint" that extends far beyond our territory. Despite this, we can still strive towards a more balanced consumption and development pattern. We can encourage our future generations to manage our use of resources more responsibly and creatively.

As Hong Kong's leading environmental organization addressing conservation, footprint and education, WWF-Hong Kong is well placed and has the tools to assist individuals, companies and government in addressing their Ecological Footprint and related sustainability issues.

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EXECUTIVE SUMMARY

This report gives a unique insight into Hong Kong's use of renewable natural resources, and provides solutions for responsible use in the areas of energy, seafood and timber products. It updates Hong Kong's Ecological Footprint from the first report in 2008, and is intended both as a tool to aid Hong Kong's sustainable development, and as a city case-study to compliment the China Ecological Footprint Report 2010, which notes a continuing increase in China's overall and per person Ecological Footprint. This report uses 2007 data, whereas the 2008 report used data from 2005. Also included are the Ecological Footprints for select cities in China in 2008, which were calculated by the Institute of Geographic Sciences and Natural Resources Research (IGSNRR), under the Chinese Academy of Sciences, and presented in the China Ecological Footprint Report 2010.

The Ecological Footprint is an accounting tool used to measure humanity's demand on the regenerative capacity of the planet's biosphere, or "biocapacity". Human demand for biocapacity is determined by evaluating production and trade flows of crop, timber, forest, fish, and meat products, as well as the amount of forest land needed to absorb CO_2 emissions. The Ecological Footprint is expressed in units of global hectares (gha), defined as hectares with world-average biological productivity. By the most recent calculations available, humanity's Ecological Footprint first exceeded the Earth's biocapacity in 1976, and by 2007 the global total Ecological Footprint was 1.5 times available biocapacity. In other words, it would take at least a year and six months for the Earth to absorb the CO_2 emissions and regenerate the renewable resources that people used in that year.

'Ecological Footprint is an effective tool to measure human demand for natural resources. In essence, it can provide guidance in developing an "ecological civilization".'

Zhu Guangyao, Secretary General, China Council for International Cooperation on Environment and Development

This report finds that:

- Hong Kong has an average per person Ecological Footprint of 4.0 gha, among the higher in the Asia–Pacific region. This is more than double the 1.8 gha of biocapacity - the area actually available to produce renewable resources and absorb CO_2 - available per person globally. Hong Kong has the 45th largest Ecological Footprint per person compared to countries with populations larger than 1 million people. If everyone in the world lived a similar lifestyle, we would need the equivalent of 2.2 planets.
- Hong Kong has an available biocapacity of just 0.04 gha per person, less than 3 percent of the world average biocapacity available per person. Due to this very low domestic availability of ecological resources, most of Hong Kong's Ecological Footprint comes from imports. This reflects a substantial economic reliance on resource use from China and other countries, as well as on CO_2 emissions abroad associated with manufactured goods consumed in Hong Kong.
- In contrast to the rest of China, Hong Kong's Ecological Footprint per person has declined and leveled off, since it peaked in the late 1990s. The decrease is primarily due to a decline in the carbon Footprint, resulting from a combination of a slower growth rate in local carbon emissions from within Hong Kong and an increase in Hong Kong's exports of carbon emissions embodied in goods between 2000 and 2007, as well as a reduction in the cropland Footprint, the latter due to reduction in imports. Despite this improvement, Hong Kong's Ecological Footprint per person is still higher than that of Beijing and Shanghai, but 26 percent lower than Singapore.
- The Ecological Footprint for all of Hong Kong has followed a similar trend to that of its average citizen and also declined in recent years, but to a lesser degree as population continues to rise. The per person consumption patterns have proven to be a more powerful driver than population growth in determining the total Ecological Footprint. Hong Kong's total Ecological Footprint peaked at 34.4 million gha in 1998, and was 27.7 million gha in 2007, a decline of 19.5 percent, compared with a drop in the per person Ecological Footprint of 24.5 percent over the same period (5.3 to 4.0 gha).
- Hong Kong's carbon Footprint is significant, making up 60 percent of the total Ecological Footprint in 2007. Internal CO_2 emissions account for 26 percent of the total carbon Footprint, equivalent to 21 million tonnes of CO_2. The remaining 74 percent is embodied in imports, meaning that 58 million tonnes of CO_2 are emitted elsewhere to supply imports to Hong Kong. Of the various sectors that comprise the carbon Footprint, the Services sector contributes the largest portion, followed by Construction.
- In 2007 the carbon Footprint for household consumption was 74 percent of the total carbon Footprint. This comprises CO_2 emissions from within Hong Kong, as well as external emissions embodied in imported goods, such as the CO_2 emissions from manufacturing products including clothing, electronics, furniture, household appliances, and tools. Almost half of Hong Kong's carbon Footprint of households is attributed to the purchase of manufactured goods.
- On related sustainability issues, Hong Kong's consumption of timber is modest and decreasing but 20–30 percent may be from illegal sources, and most is likely to be from unsustainable sources, hence leading to the destruction of rainforests.
- Paper consumption equates to around 86 kg per person per year in Hong Kong, which can also lead to deforestation if the fibre comes from unsustainable sources.
- The shift in diet from the 1960s from the 1990s, when people consumed small amounts of fish, meat and vegetables with rice, to increasing amounts of everything but rice and eggs[1] continues with increasing amounts of seafood and beef in particular.
- Hong Kong consumes a relatively large amount of seafood per person, but a larger issue is that much of it is produced unsustainably. In particular, the consumption of imported live reef food fish and shark fin, is having regionally and globally significant impacts. The number of countries supplying live reef food fish to Hong Kong leapt from 18 in 1998 to 50 in 2009.
- Hong Kong's heavy reliance on imported goods and natural resources is also contributing to climate change, threatening biodiversity and placing Hong Kong at risk in a more resource-constrained world. Hong Kong needs to act to:
  - reduce excessive, inefficient and wasteful consumption;
  - greatly increase its percentage of goods and natural resources produced sustainably;
  - transform its modest agriculture, aquaculture and fisheries industries so that they produce increasing quantities of high-quality product with minimum impact to the environment.

80%
CITIES ARE RESPONSIBLE FOR AS MUCH AS 80 PERCENT OF GLOBAL GREENHOUSE GAS EMISSIONS

24
THE PER PERSON CARBON FOOTPRINT HAS INCREASED 24 TIMES SINCE 1962

Overall, Hong Kong is well positioned to transform itself into a leading low carbon city that prides itself on sustainable development, and whose influence as a financial and trading hub catalyses positive change throughout the region.

The following approaches to assist Government, Business and Individuals in addressing their Ecological Footprint and related sustainability issues are recommended.

Government

- Transform Hong Kong into a genuine low carbon city, substantial changes will be needed to both reduce the amount of CO_2 emitted in power generation, and to increase the efficiency of power usage. Specific targets and supporting

measures should be introduced, for both supply side management and demand side management. A demand side management target to reduce absolute carbon emissions by 25 percent by 2020, using 1990 as a base level, would essentially remove the need to increase additional nuclear power generation. This is the target proposed by the UN's Intergovernmental Panel on Climate Change (IPCC) for developed cities.[2]

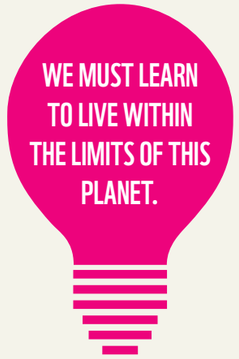
- Apply Building Energy Codes (BEC) to the existing building stock, which could result in a 45 percent reduction in emissions compared to the buildings without BEC. For new buildings, tightening the requirements of the BEC by making all new commercial building 50 percent more energy efficient, as compared with 2005 building stock, would make a further contribution to emissions reduction.
- Expand the Mandatory Energy efficiency labeling scheme to include the 10 most energy-consuming household appliances.
- Start to address the high proportion of the carbon Footprint emitted elsewhere to supply imports to Hong Kong, by educating the community on this new area of concern, and leading change through the introduction of procurement policies for government favouring goods and natural resources with relatively lower carbon intensity supply chains.
- Further develop responsible timber/paper procurement policies and ensure such policies are uniformly adopted across government.
- Establish sustainable seafood dining policies and say no to shark fin.
- Introduce new policies and extend existing ones to enable Hong Kong to transform its agriculture, aquaculture and fisheries industries so that they produce increasing quantities of high-quality product with minimum impact to the environment.

Business

- Conduct carbon audits of all operations, set targets and take action to reduce carbon emissions. WWF's Low-carbon Office Operation Programme (LOOP) can assist office-based companies to calculate, track and reduce their carbon emissions associated with electricity use, transportation and paper consumption.
- WWF's Low Carbon Manufacturing Programme (LCMP) equips factories in the Pearl River Delta with tools to identify and report areas of emissions reductions and cost savings, and recognize positive actions to reduce Greenhouse Gas (GHG) emissions by granting labels to manufacturers after assessing their performance based upon reductions in carbon intensity, GHG management systems and implementation of technological best practice.
- Sustainably produced paper, timber and seafood are more available than ever. Businesses should develop sourcing policies that reduce the negative environmental and social impacts of their operations on the production of these natural resources. Sustainable procurement policies favouring Forest Stewardship Council (FSC) or recycled paper, and FSC timber where relevant can be effective tools that most companies should consider implementing. The WWF Guide to Buying Paper and Seafood Choice Initiative provide practical advice.
- Refrain from promoting, and consuming shark fin while there are no sustainable sources. The WWF "No Shark Fin Corporate Pledge" is one of the most effective ways to contribute to shark conservation.
- Hotels and restaurants can consider joining WWF's "Ocean-Friendly Menu" and "Alternative Shark-free Menu" programmes.

Individuals

- Use the Climateers Carbon Calculator to calculate your carbon footprint, and the interactive low carbon tips to try and cut down your personal carbon emissions by at least 10 percent.
- Refer to WWF's Low Carbon Living Appliances Guide, when buying new home appliances. Household energy and financial savings in the order of 46 percent are



possible through its use.

- Buy FSC or recycled paper products. FSC paper products are now widely available and FSC timber products are now becoming more available as responsible retailers and individuals create demand. Avoid tropical hardwoods if the vendor cannot provide credible information as to the sustainability of the wood source.
- Use the WWF's Seafood Guide when purchasing seafood and say no to shark fin while no sustainable sources exist. Check WWF's website to see which restaurants offer "Ocean-Friendly" and "Alternative Shark-free" menus, and use them.
- Reduce excessive and wasteful practices - try to only purchase goods you really need, and avoid wasting food.
- Moderating your diet can have a considerable cumulative impact. Consider reducing the amount of beef in your diet, if relevant.

Carbon Terminology

There are many different ways of categorizing the release of carbon compounds into the atmosphere, and their impacts on our planet. This report mentions several, which readers may find confusing without an awareness of their basic differences. For example, the term carbon Footprint, in relation to the Ecological Footprint is calculated as the amount of forest land that would be required to absorb only carbon dioxide emissions (details on p14).

This differs from other uses of the term "carbon footprint", which usually express emissions of a number of different greenhouse gases as quantities of CO_2 equivalent, which are termed in this report as CO_2-e emissions" or "GHG emissions". It is worth noting that some estimates of Hong Kong's "carbon footprint", such as that of Hertwich and Peters (2009),[3] are much higher than those produced by Global Footprint Network's National Footprint Accounts. That study reports results in CO_2-e and so is not directly comparable to the Ecological Footprint associated with emissions. However, this presents some evidence that the total CO_2 emissions embodied in Hong Kong's imports may be even larger than the estimates reported here.

The carbon Footprint calculated by GFN includes local CO_2 emissions from within Hong Kong, as well as "embodied CO_2 emissions" or "embodied carbon Footprint" of imports and exports. Embodied carbon is based on embodied energy, which is the energy used during a product's entire life cycle in order to manufacture, transport, use and dispose of the product. This concept is used in relation to trade as a way to attribute the demand for CO_2 emissions to the final user.

GLOBAL CONTEXT AND HONG KONG OVERVIEW

The Ecological Footprint measures the extent of human demand for the regenerative capacity of the biosphere. The availability of this regenerative capacity is referred to as biocapacity. Both quantities are expressed in units of global hectares (gha), defined as hectares of land and sea area at world average bioproductivity.

This demand can be compared to the total availability of biocapacity. In 2007, there were 1.8 global hectares per person available, or 11.9 billion global hectares total. This biocapacity figure is smaller than what was reported in the previous WWF Living Planet Report in 2008. The change in findings is mainly due to changes in the structure of the datasets used to calculate biocapacity, rather than a decline in total bioproductivity.
At a global level, the demand for renewable resources as measured by the Ecological Footprint was 1.5 times greater than the amount of natural resources available. Expressed another way, a total of 1.5 Earths would be needed to generate the renewable resources used in 2007.

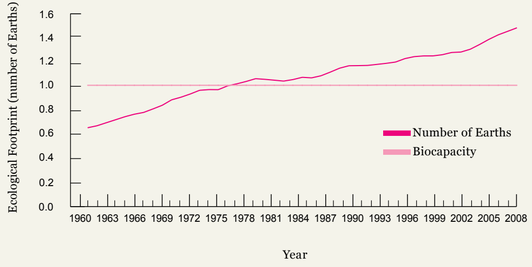


Figure 1 Humanity's Ecological Footprint compared to global biocapacity, 1961 - 2007

Figure 2 Ecological Footprint per person, by country and Hong Kong, 2007

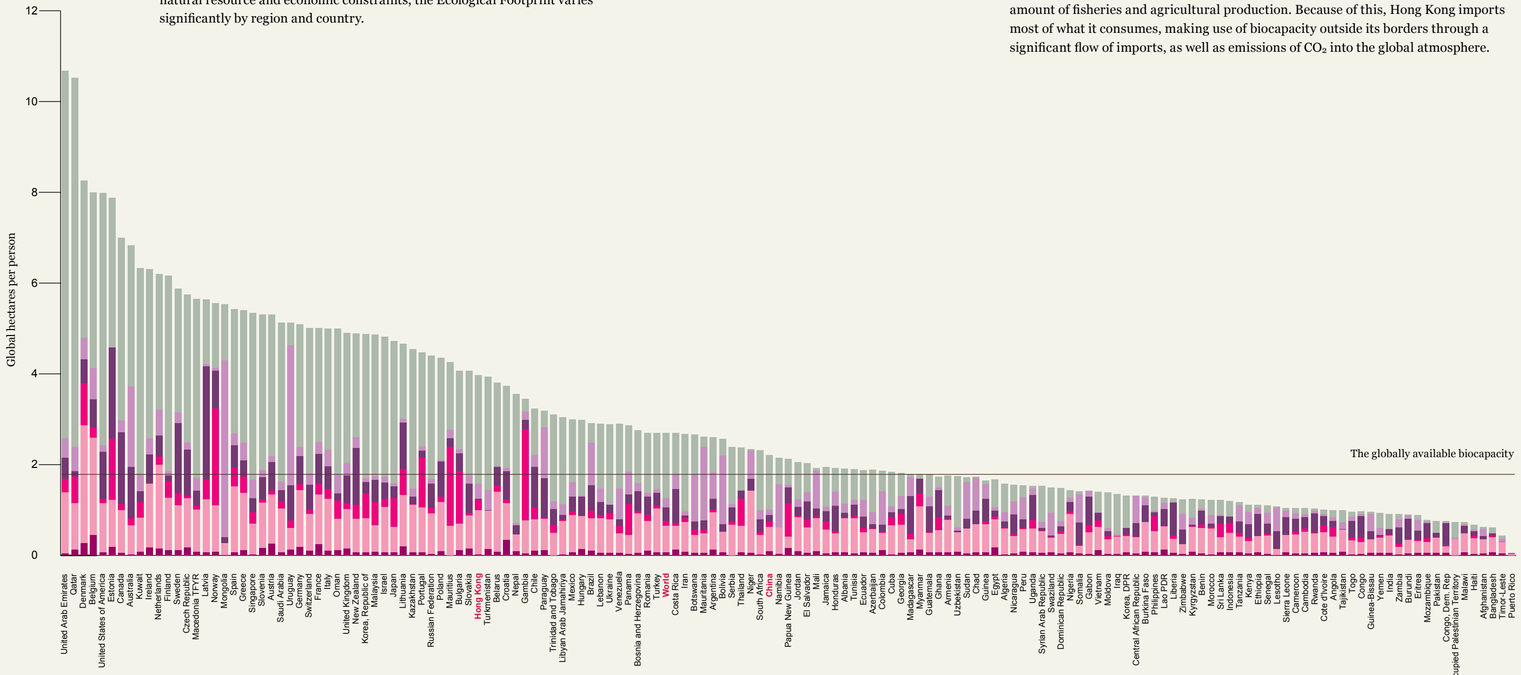
Key

- Carbon
- Grazing Land
- Forest Land
- Fishing Grounds
- Cropland
- Built-up Land

Biocapacity is unevenly spread across the globe, and it is also utilized differently by different populations. For example, Brazil is the country with the largest amount of total biocapacity (1.7 billion total gha), and its Footprint of Production is less than 35 percent of this quantity. By contrast, India has the largest degree of overshoot when considering its Footprint of Production, which is 628 million gha (less built-up land and carbon Footprint), or 6 percent greater than its available biocapacity of 594 million total gha.

Singapore is the country with the lowest total biocapacity at 83,000 gha, although its Footprint of Production is within these natural resource limits (33,000 total gha). Hong Kong also has a small amount of biocapacity with 251,000 total gha; however, its Footprint of Production exceeds its biocapacity by 1.1 million gha.

Because different countries have different consumption patterns, due to differing natural resource and economic constraints, the Ecological Footprint varies significantly by region and country.



Hong Kong's total Ecological Footprint in 2007 was 4.0 global hectares per person. Of this total, 2.4 global hectares, a full 60 percent, was accounted for by the carbon Footprint (2.4 global hectares per person or 8.1 tonnes CO_2 emissions), defined as the bioproductive area required to absorb carbon emissions. In the most recent national Ecological Footprint estimates, the city of Hong Kong has the 45th largest Ecological Footprint per person among countries with populations greater than one million. Hong Kong's estimated Ecological Footprint per person has decreased slightly (-0.4 gha per person) since 2005 when it was ranked 29th. However, slight increases in the Ecological Footprints of other countries with a similar Ecological Footprint per person have caused Hong Kong's rank to drop significantly.

Hong Kong's biocapacity was considerably less than its Ecological Footprint of Consumption, at 0.04 global hectares available per person. Hong Kong is a densely populated city of nearly 7 million with extremely limited land area and a small amount of fisheries and agricultural production. Because of this, Hong Kong imports most of what it consumes, making use of biocapacity outside its borders through a significant flow of imports, as well as emissions of CO_2 into the global atmosphere.

HOW IS ECOLOGICAL FOOTPRINT MEASURED?

$EF_C = EF_P + EF_I - EF_E$

Ecological Footprint of Consumption

The quantities of resources that are consumed nationally are directly related to domestic well-being. In order to assess the biocapacity required to serve the consumption of a population, we use the Ecological Footprint of Consumption (EF_C). EF_C accounts for both the export of national resources, and the import of resources used for domestic consumption. EF_C is most amenable to change by individuals through changes in their consumption behavior.

The Ecological Footprint of Consumption indicates the total demand for biocapacity embodied in the goods a country's inhabitants consume.

Ecological Footprint of Production

A country's Footprint of Production measures direct demand for resources from cropland, grazing land, fishing grounds, and forests, as well as a country's built-up land and direct carbon emissions. It is analogous to the gross domestic product (GDP), which represents the total value of all goods and services produced within a country's borders. The Footprint of Production may be compared to biocapacity to determine if a country's localized demand is greater than what can be regenerated within its borders.

The Ecological Footprint of Production is the Footprint directly incurred in a country. If carbon and built-up land are excluded, it gives a measure of a country's direct harvest of its own biocapacity.

Net Ecological Footprint of Trade

Embodied in trade between countries is a demand for biocapacity, the net Ecological Footprint of Trade. This is defined as the Ecological Footprint of imports minus the Ecological Footprint of exports. If the Ecological Footprint embodied in exports is high, the resources used to support this trade have the potential to reduce domestically available biocapacity. If the Ecological Footprint embodied in imports is high, then there is an indication that the country may be more susceptible to resource constraints at the global scale.

The Ecological Footprint of exports and imports indicate the demand for biocapacity associated with a country's flows of imports and exports.

Calculating the Footprint

The Ecological Footprint represents demand for biocapacity, and biocapacity represents the regeneration rate of resources on bioproductive land. For any land-use type, the Ecological Footprint (EF_P) of a country, in global hectares, is given by: EFP = P/Y_N * YF * EQF; where P is the amount of a product harvested or waste emitted, Y_N is the national average yield for P, and YF and EQF are the yield factor and equivalence factor, respectively, for the land-use type in question.

A country's biocapacity (BC) for any land use type is calculated as follows:
BC = A*YF*EQF; where A is the area available for a given land-use type.

Source: Japan Ecological Footprint Report 2009

Figure 3 Concept and calculations of the Ecological Footprint

Summary of Land Uses

Carbon dioxide emissions from burning fossil fuels, are the only waste product included in the National Footprint Accounts. It includes embodied carbon (see p9). The carbon Footprint component of the Ecological Footprint is calculated as the amount of forest land that would be required to absorb these carbon dioxide emissions. It is the largest portion of humanity's current Footprint.

CARBON FOOTPRINT
(60 percent of the total Ecological Footprint in 2007)

The built-up land Footprint is calculated based on the area of land covered by human infrastructure — transportation, housing, industrial structures, and reservoirs for hydropower. Built-up land may occupy what would previously have been cropland.

BUILT-UP LAND
(1 percent of the total Ecological Footprint in 2007)

The fishing grounds Footprint is calculated using estimates of the maximum sustainable catch for a variety of fish species. These sustainable catch estimates are converted into an equivalent mass of primary production based on the various species' trophic levels. This estimate of maximum harvestable primary production is then divided amongst the continental shelf areas of the world. Fish caught and used in aquaculture feed mixes are included.

FISHING GROUNDS
(6 percent of the total Ecological Footprint in 2007)

The forest Footprint is calculated based on the amount of lumber, pulp, timber products, and fuel wood consumed by a country on a yearly basis.

FOREST LAND
(1 percent of the total Ecological Footprint in 2007)

Grazing land is used to raise livestock for meat, dairy, hide, and wool products. The grazing land Footprint is calculated by comparing the amount of livestock feed available in a country with the amount of feed required for all livestock in that year, with the remainder of feed demand assumed to come from grazing land.

GRAZING LAND
(8 percent of the total Ecological Footprint in 2007)

Cropland is the most bioproductive of all the land-use types and consists of areas used to produce food and fiber for human consumption, feed for livestock, oil crops, and rubber. Cropland Footprint calculations do not take into account the extent to which farming techniques or unsustainable agricultural practices may cause long-term degradation of soil. The cropland Footprint includes crop products allocated to livestock and aquaculture feed mixes, and those used for materials.

CROPLAND
(24 percent of the total Ecological Footprint in 2007)

What does overshoot really mean?
How can humanity be using the capacity of 1.5 Earths, when there is only one?

Overshoot describes the situation when the amount of natural resources demanded by human consumption activities exceeds the amount of natural resources being regenerated. This is analogous to withdrawing more money from a bank account than the interest the money generates – natural resources are harvested at a faster rate than they are being regenerated, or CO_2 emissions are accumulating faster than they can be absorbed. Overshoot can only occur for a limited amount of time until the resources become depleted.

On a global scale, human demand exceeds the regenerative capacity of the planet. In the 1970s, global consumption of natural resources surpassed the rate of regeneration, and humanity's CO_2 emissions and demand for natural resources, or Ecological Footprint, has continued to increase ever since.

The same concept can be applied to individual countries. A country with a Footprint of Consumption larger than its domestic biocapacity is said to have a biocapacity deficit. This is not necessarily a detrimental situation, but it means that a country is either drawing down its domestic resources, accumulating CO_2 in the global atmosphere, relying on imports from other countries, or a combination of these.

Overshoot is most apparent in Hong Kong through the continued harvesting of fish from the sea at rates faster than many species can regenerate. The result - populations of some common fishes such as sharks, croakers and groupers have crashed in recent decades, resulting in an increased need to fish further away from Hong Kong, and to rely on seafood imports from across the planet.

ASIA-PACIFIC REGION

The Asia-Pacific region has been home to more than half of the world's population since before 1961. In 2007, the population of the Asia-Pacific region was 54 percent of the world total. Due to an average per person Ecological Footprint that is lower than the world average, the region's consumption still accounts for only 35 percent of the total global Footprint. This is equal to 53 percent of the world's total biocapacity.

With an average Ecological Footprint of 1.74 gha per person, the Asia-Pacific region is just below the world average available per person biocapacity of 1.78 gha.

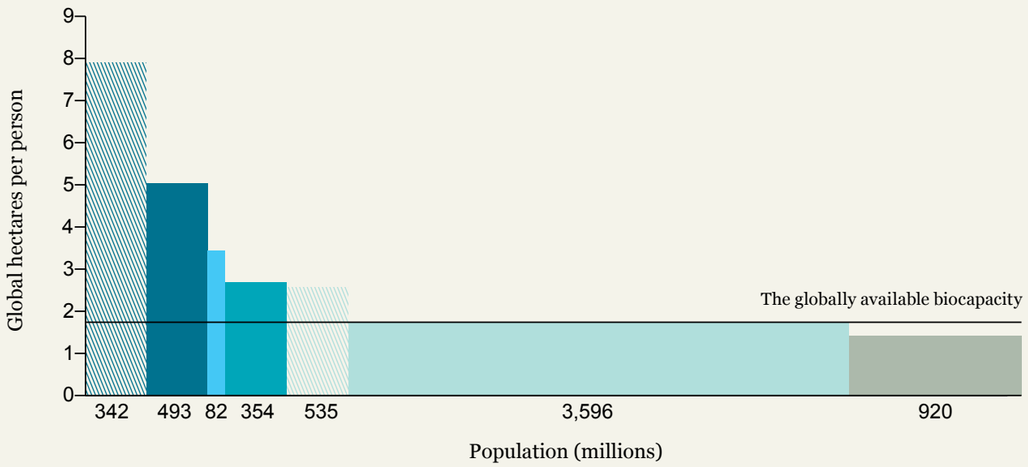
The Ecological Footprint of the Asia-Pacific region as a whole exceeded its biocapacity in 1973, but there are significant differences between the countries within this region. For example the country with the highest Ecological Footprint per person was Australia (6.8 gha per person), although this is still within its biocapacity of 14.7 gha per person. The lowest Ecological Footprint (0.6 gha per person) was in Bangladesh, and even this modest Ecological Footprint exceeds Bangladesh's biocapacity of 0.4 gha per person.

Most of the population of the Asia-Pacific region is in China (37 percent) and India (32 percent), with average Ecological Footprints of 2.2 and 0.9 gha per person, respectively. Both China and India's Ecological Footprints are almost double their respective domestic biocapacity (1.0 gha/person and 0.5 gha per person, respectively).

Figure 4 Ecological Footprint by region, 2007

Key

- North America
- Europe (EU)
- Europe (Non-EU)
- Middle East/ Central Asia
- Latin America
- Asia Pacific
- Africa



CHINA ECOLOGICAL FOOTPRINT AND BIOCAPACITY

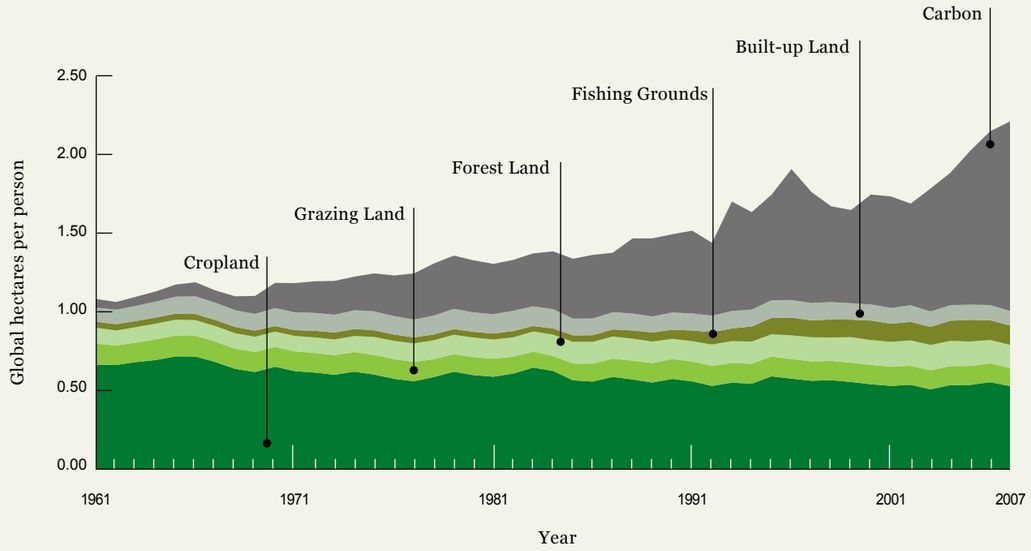
Figure 5 China's Ecological Footprint by land-use type, 1961 - 2007

Source: China Ecological Footprint Report 2010

As China's economy has expanded over the last 40 years, its Ecological Footprint has risen as well. This growth is most evident in China's carbon Footprint, which has steadily increased while the Footprint for the other land-use types has stayed relatively constant on a per person basis (Figure 5). This reflects a shift in consumption patterns to include larger quantities of fossil fuel-intensive manufactured goods, which has accelerated in recent years.

Although China continues to have a low Ecological Footprint per person relative to other nations in the world (Figure 2), it continues to increase. China's increasing Ecological Footprint per person, combined with a population that has doubled since 1961, has resulted in a significant total Ecological Footprint. In 2007, China and the United States of America had a combined total Ecological Footprint of 5.4 billion global hectares, equal to 46 percent of total global biocapacity.

In 2007, China's carbon Footprint was more than half of its total Ecological Footprint. The land use-type with the second largest Ecological Footprint was cropland (24 percent of the total Ecological Footprint). Cropland also makes up almost half of China's total biocapacity.



HONG KONG ECOLOGICAL FOOTPRINT AND BIOCAPACITY

In 2007, Hong Kong's Ecological Footprint was 4.0 global hectares per person, which was far higher than China's Ecological Footprint of 2.2 global hectares per person, and more than double the average Ecological Footprint of the Asia-Pacific region (1.7 global hectares per person). Similar to China, most of Hong Kong's Ecological Footprint is carbon Footprint. Hong Kong's Ecological Footprint has followed an increasing trajectory similar to China's since the 1970s, but in contrast to the overall situation in China, Hong Kong has seen its per person Ecological Footprint level off and even decline in recent years.

Despite this reduction in per person Ecological Footprint, Hong Kong is clearly in biocapacity deficit, demanding far more biocapacity than is available within its borders (Figure 7). Most of this demand comes in the form of CO_2 emissions, which represent a demand for global rather than localized biocapacity. However, even excluding CO_2 emissions, Hong Kong's Ecological Footprint associated with imports is significantly larger than that of its domestic productions, meaning that Hong Kong is heavily reliant on the renewable natural resources of its trade partners.

The changes in Hong Kong's total Ecological Footprint are largely driven by its carbon Footprint. In 2007, the carbon Footprint was 60 percent of the total Footprint of Consumption. Most of the decline since 2001 was due to a decrease in the carbon Footprint, and, to a lesser degree, the cropland Footprint.

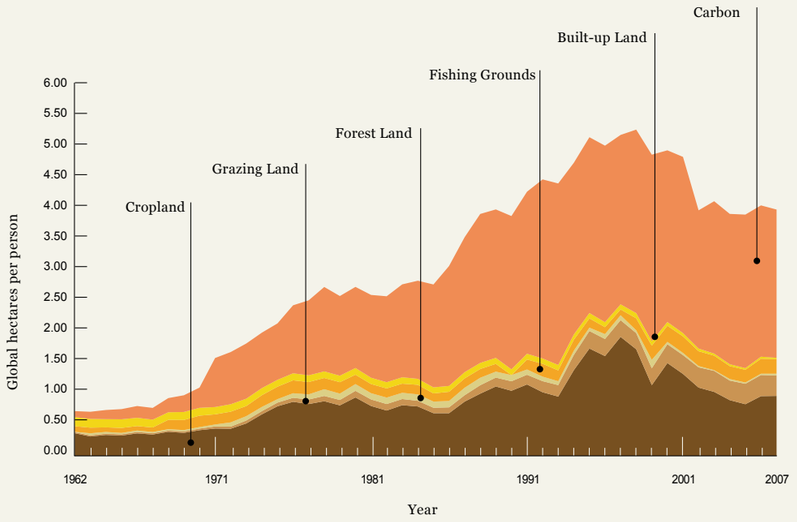


Figure 6 Hong Kong Ecological Footprint by land-use type, 1962 – 2007 . Trade data were not available for Hong Kong during the year 1961.

BIOCAPACITY PER PERSON HAS DECLINED PRIMARILY BECAUSE OF THE INCREASE IN POPULATION FROM 3.2 MILLION IN 1961 TO 7 MILLION IN 2007

The decline in the carbon Footprint of Consumption was due to a combination of relatively constant Footprint of Production and an increase in the embodied CO_2 emissions in exported commodities. Prior to 2000, the carbon Footprint of Production (the Footprint from direct emissions generated within Hong Kong) was increasing each year to 2 gha per person in 1999. But it started to level off at around 1.8 gha per person between 2000 and 2007. This leveling off could be due in part to the use of less carbon-intense sources of energy. During this same time period, the embodied carbon Footprint in goods exported from Hong Kong increased. To understand how changes in exports affect the Footprint of Consumption, it is useful to look more closely at the supply chain for goods.

To supply manufacturing activities within Hong Kong, raw materials are imported, such as rubber; pulp and paper; natural and synthetic textile fibers; lumber; metals ores and scrap; minerals; and chemicals. These imported raw materials all have embodied CO_2 emissions from where they were imported. When in Hong Kong, they are used to make finished goods, such as electrical machinery; office machines and equipment; clothing; furniture; and chemicals. These finished goods are used in Hong Kong or they are exported. During the manufacturing processes, energy is used to turn raw materials into finished goods, and CO_2 emissions are generated. When these finished goods are exported, the embodied CO_2 emissions from the raw materials imported and the CO_2 emissions generated in the manufacturing process are all included in the embodied carbon Footprint of the exported finished goods, and subtracted from Hong Kong's carbon Footprint.

Although Hong Kong is a net importer of both raw materials and finished goods, between the years 2000 and 2007, exports of finished goods with higher carbon intensities increased. Increases in energy-intense exports means that less of the local emissions from within Hong Kong are attributed to the population of Hong Kong; rather, these emissions are attributed to the end user of the finished goods in the place the goods are exported to. Because the volume of trade into and through Hong Kong is so high, even slight variations in imports and exports have a large effect on the Footprint of Consumption.

A high dependence on trade also underlies the decline of the cropland Footprint. The cropland Footprint of Production accounts for less than 1 percent of the cropland Footprint of

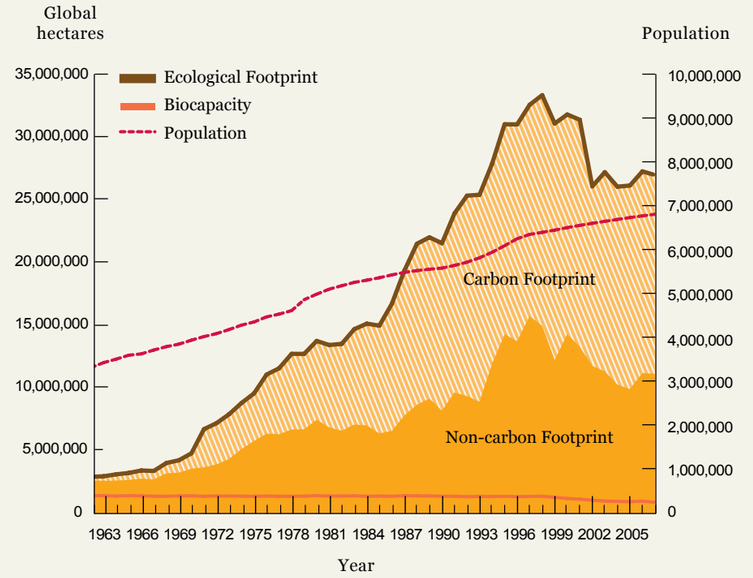


Figure 7 Hong Kong's total Ecological Footprint and biocapacity (left axis) and population (right axis), 1962 – 2007

Consumption, and changes in the cropland Footprint are completely driven by trade. Between the years 2000 and 2007, imports of products such as rapeseed and soybean oils, refined sugar, oranges, grapes, frozen potatoes, and wheat bran decreased. While exports also decreased between these years, this was to a lesser extent, and the cropland Footprint of Consumption consequently fell. While the cropland Footprint has been decreasing, the grazing land and fishing ground Footprints of Consumption have been increasing very slightly since the 1990s, indicating a slow shift in diet that includes more meat and fish products (although these Footprints combined are still about half the cropland Footprint).

In 2007, cropland was the second largest contributor to the Footprint of Consumption, representing 24 percent of Hong Kong's total Ecological Footprint. This is also the land-use type with roughly half of Hong Kong's biocapacity.

The Ecological Footprint per person (Figure 6) is calculated as an average: the total Ecological Footprint is divided by the size of the population. Although the size of Hong Kong's population has increased from 3.3 million people in 1962 to 7 million people in 2007, other factors have also influenced the changes in Hong Kong's total Ecological Footprint and biocapacity (Figure 7).

Between the 1970s and 1990s, the increase in Hong Kong's total Ecological Footprint was accelerating due to an increasing Ecological Footprint per person, combined with an increasing population (more people and each consuming more goods and natural resources). However, during the 2000s, the per person Ecological Footprint decreased, while population grew at a slightly slowly rate. As a result, Hong Kong's total Ecological Footprint declined. Hong Kong's total Ecological Footprint peaked at 34.4 million gha in 1998, and was 27.7 million gha in 2007, a decline of 19.5 percent, compared with a drop in the per person Ecological Footprint of 24.5 percent over the same period (5.3 to 4.0 gha).

Biocapacity per person has declined because of the increase in population from 3.3 million in 1962 to 7 million in 2007, as well as decreases in total biocapacity. Hong Kong's total biocapacity in 2007 was 31 percent what it was in 1962 (a decrease from 808,000 total gha to 251,000 gha - irrespective of changes in population). This decrease came mostly from a decline in total crop production as agricultural lands have fallen into disuse, or been built on.

HONG KONG'S TOTAL ECOLOGICAL FOOTPRINT DECLINED NEARLY 20 PERCENT FROM 1998 TO 2007

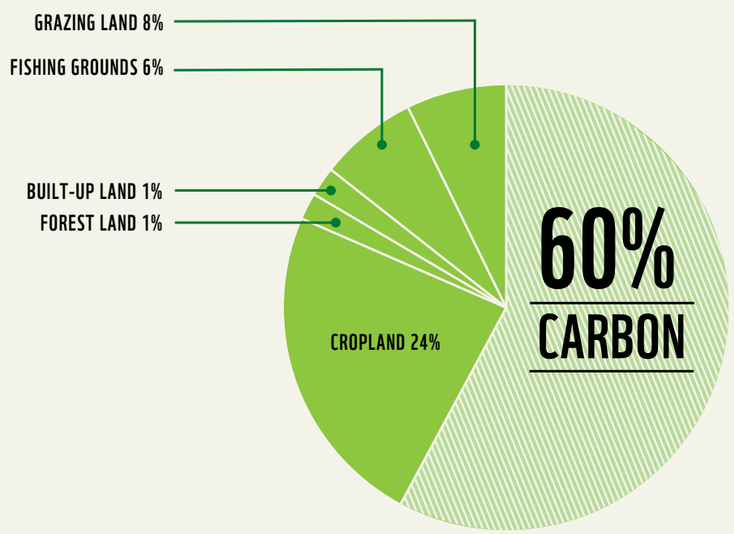
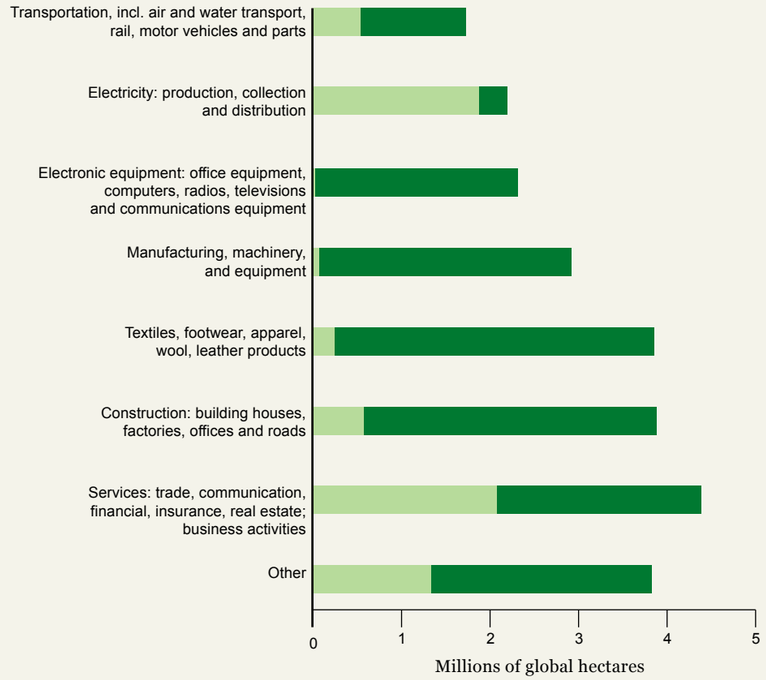


Figure 8 Hong Kong's Ecological Footprint of Consumption by land-use type, 2007

Figure 9 Total carbon Footprint by economic sector, 2007. "Internal" emissions are local emissions of CO_2 from within Hong Kong. "External" emissions are emissions generated elsewhere and embodied in imported goods and services consumed within Hong Kong.

Key

Internal
External



58M

58 MILLION TONNES OF CO_2 ARE EMITTED ELSEWHERE TO SUPPLY IMPORTS TO HONG KONG

Carbon Component of Hong Kong's Ecological Footprint

A significant portion of Hong Kong's Ecological Footprint is associated with CO_2 emissions. The carbon Footprint accounted for 60 percent of the total Ecological Footprint of Consumption in 2007, while direct CO_2 emissions within Hong Kong accounted for 89 percent of the Ecological Footprint of Production. There are several useful ways of subdividing the total Ecological Footprint of Consumption, among other things examining the Footprint of individual consumption activities (by household), and the Footprint according to its economic sector of origin. The results by sector and consumption category reported here are derived from a model by Muñoz and Steininger (2010).[4]

Carbon Footprint of Consumption by Economic Sector

The breakdown by economic sector covers all the goods and services purchased by different consumers, including households and government. Firms also use goods and services in order to produce their own output. The Ecological Footprint of these intermediate products is included in the Ecological Footprint associated with the purchasing sector's output. The total Ecological Footprint of an economic sector's output can be further subdivided to reveal how much of this Footprint stems from domestic sources, and how much from imports.

The Services sector contributes the largest portion to the total carbon Footprint (Figure 9). It is also the fastest growing sector in Hong Kong. This includes activities such as retail and wholesale trade, communications, financial services, insurance and real estate. Almost half of the carbon Footprint in this sector is from local CO_2 emissions emitted within Hong Kong.

The Electricity sector is the only economic sector with a carbon Footprint that is mostly (85 percent) from direct emissions of carbon within Hong Kong's borders. In contrast,

the carbon Footprint of the Textiles, Manufacturing, and Electronics sectors that provide all of the goods consumed by households (the largest household expenditure category), are primarily from the manufacturing processes that produce these goods abroad.

After the Services sector of Hong Kong's economy, the largest carbon Footprint is associated with the output from the Construction sector. Of the carbon Footprint associated with construction activities in Hong Kong, 85 percent is embodied in imported goods and services. In addition to direct emissions from the Construction sector, this Footprint includes emissions from all upstream material inputs to construction activities. For example, emissions from electricity used in refining ores and manufacturing metal products for buildings are included in the Footprint of the Construction sector's output.

Emissions from electricity used in construction, whether used directly in construction activities or indirectly in manufacturing some other construction input, are the largest contributors to the carbon Footprint of the Construction sector's output. Emissions from the production of metals and minerals are also substantial contributors to the carbon Footprint associated with construction in Hong Kong. More information on the Construction sector breakdown can be found on WWF-Hong Kong's website, see Further Information.

Looking at the sum of all economic sectors, internal CO_2 emissions account for 26 percent of the total carbon Footprint, or 21 million tonnes of CO_2 emitted locally. The remaining 74 percent is embodied in imports, meaning that 58 million tonnes of CO_2 are emitted elsewhere to supply imports to Hong Kong.

Ecological Footprint attributed to Final Demand

Another way to consider the Ecological Footprint is in terms of the consumption patterns of individuals within a population. The Ecological Footprint of an individual consists of personal and societal components. Assessment of this personal component of an individual's Footprint can be made through household consumption patterns. The term household consumption is defined here as the final demand for goods and services by households based on expenditure patterns. The societal component includes government spending on social services (such as law enforcement and health services), as well as gross fixed capital investments.

Carbon Footprint of Household Consumption

In 2007, the carbon Footprint associated with the goods and services consumed by the typical household was 74 percent of the total carbon Footprint for Hong Kong. This is the personal component of the Ecological Footprint, the portion associated with the consumption of individuals. In 2007, the individual consumption portion of the carbon Footprint was 2.1 gha per person, which is about 6 tonnes of CO_2 emitted per person in the process of supplying the goods and services they use. This includes CO_2 emissions from within Hong Kong, as well as external emissions embodied in imported goods, such as the CO_2 emissions from manufacturing clothing, electronics, furniture, household appliances, tools, and medical equipment.

Although external emissions occur outside of the borders of Hong Kong, they are released into the global atmosphere. Within the Ecological Footprint, this is considered to be a demand for global sequestration capacity. Based on household expenditure patterns, we can see that almost half of embodied CO_2 emissions serving household consumption in Hong Kong come from providing manufactured goods. And most of the emissions (94 percent) associated with manufacturing these goods come from sources outside of Hong Kong (Figure 10).

Another large portion of Hong Kong's carbon Footprint of household consumption is from mobility. This includes not only direct emissions from personal vehicles and public transportation, but also the embodied carbon in parts and services for the maintenance

70%
OF THE HOUSEHOLD CARBON FOOTPRINT IS IN EMBODIED GOODS AND SERVICES

of vehicles. Mobility is the largest household consumption category for internally generated CO_2 emissions, accounting for 43 percent of total internal CO_2 emissions. Improvements in transportation are highlighted in Hong Kong's Climate Change Strategy and Action Agenda (Environment Bureau, Hong Kong Government, September 2010) as part of the effort to reduce Hong Kong's GHG emissions.[5] Because mobility is a large contributor to the total carbon Footprint of household consumption, targeting transportation activities has the potential for substantial emissions reductions.

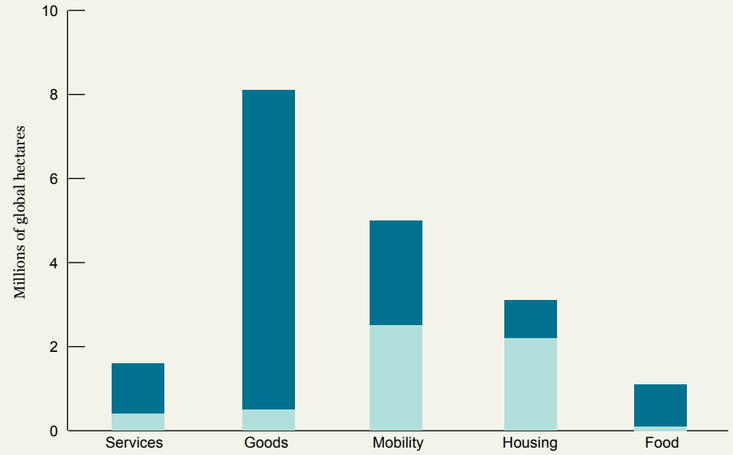
Housing is the only consumption category for which more than half of the carbon Footprint comes from internal emissions. This is primarily attributable to gas and electricity use (including air conditioning). Only a small portion of the emissions due to housing related consumption are embodied in imports. Other consumption categories (Services, Goods, and Food) rely heavily on imports. Overall, only 30 percent of the total carbon Footprint from household consumption comes from internal CO_2 emissions. The other 70 percent is comprised of emissions released elsewhere, and embodied in imported goods and services.

Looking at the carbon Footprint by economic sector yields a similar conclusion: a significant portion of CO_2 emissions associated with Hong Kong's total consumption are from sources outside of Hong Kong. Imported goods and their associated Footprint play a large role in supporting Hong Kong's consumption, as well as providing intermediate goods for its economic production activities.

Figure 10 Total carbon Footprint by household consumption category, 2007. Internal and external emissions as per Figure 9.

Key

Internal
External



Hong Kong's Ecological Footprint and Trade

Hong Kong is a net importer of embodied carbon. Manufactured goods are imported mostly from other parts of the Asia-Pacific region, although Russia and South Africa are also major net exporters to Hong Kong (Table 1). Hong Kong's largest trade partner is China; more than 70 percent of the carbon emissions that are embodied in the manufactured goods Hong Kong buys originate in China. Hong Kong's second largest trade partner in terms of net imports is Russia, a country that supplies Hong Kong primarily with fine metals and diamonds.

At the same time, Hong Kong's manufacturing sector produces exports for other countries (including China), with a large trade partner in the United States of America. The CO_2 emissions embodied in goods ultimately exported from Hong Kong to the United States of America is larger than the embodied CO_2 emissions in goods imported from United States of America.

Hong Kong's major trade flows: sources of imported goods into Hong Kong and destinations of goods exported from Hong Kong

Table 1 Embodied carbon Footprint of imports from, and exports to, Hong Kong's 10 largest trade partners, 2007.
Arrows show trade flows greater than 100,000 gha.

Key

Export
Import

	Trade Partner	Imports (total gha)	Exports (total gha)	Net Imports (total gha)	Major Products Imported (by weight)	Major Products Exported (by weight)
1	China	8,671,423	1,351,469	7,319,954	Electronic equipment; Thermionic valves and tubes, transistors; Office machines	Thermionic valves and tubes, transistors; Office machines
2	United States of America	1,413,142	1,480,693	-67,552	Thermionic valves and tubes, transistors; Office machines	Clothing and accessories, knitted or crocheted; Clothing of text fabric, not knitted or crocheted; Outer garments knitted, not elastic, nor rubber
3	Japan	1,016,128	841,524	174,604	Thermionic valves and tubes, transistors; Telecommunications equipment; Office machines and parts	Telecommunications equipment; Clothing and accessories, knitted or crocheted
4	Indonesia	775,899	80,495	695,404	Coal, anthracite, bituminous; Eggs; Phonographs, tape & other sound recorders	Telecommunications equipment; Phonographs, tape & other sound recorders
5	Russian Federation	713,906	35,294	678,612	Platinum; Diamonds; Gold, silver.	Statistical machines cards or tapes; Children's toys, indoor games; Medical instruments
6	Republic of Korea	540,175	211,921	328,255	Thermionic valves and tubes, transistors; Telecommunications equipment; Plastic products	Thermionic valves and tubes, transistors; Phonographs, tape & other sound recorders; Accessories of gramophones, tape & sound recorders
7	Australia	501,066	164,959	336,107	Zinc and zinc alloys; Crustacea & molluscs, fresh, chilled, salted, dried; Aircraft including jet propulsion engines	Clothing and accessories, knitted or crocheted; Phonographs, tape & other sound recorders; Medicaments
8	Thailand	432,374	55,725	376,648	Statistical machines cards or tapes; Thermionic valves and tubes, transistors; Plastic products	Office machines; Apparatus for electrical circuits
9	South Africa	415,087	46,194	368,894	Diamonds; Crustacea & molluscs, fresh, chilled, salted, dried; Jet & gas turbines for aircraft	Footwear; Children's toys, indoor games; Telecommunications equipment
10	Malaysia	349,763	27,951	321,812	Thermionic valves and tubes, transistors; Telecommunications equipment; Office machines and parts	Thermionic valves and tubes, transistors; Apparatus for electrical circuits; Phonographs, tape & other sound recorders

CITY COMPARISON

Hong Kong's Ecological Footprint per person can be compared to available data for other cities in China and Singapore.

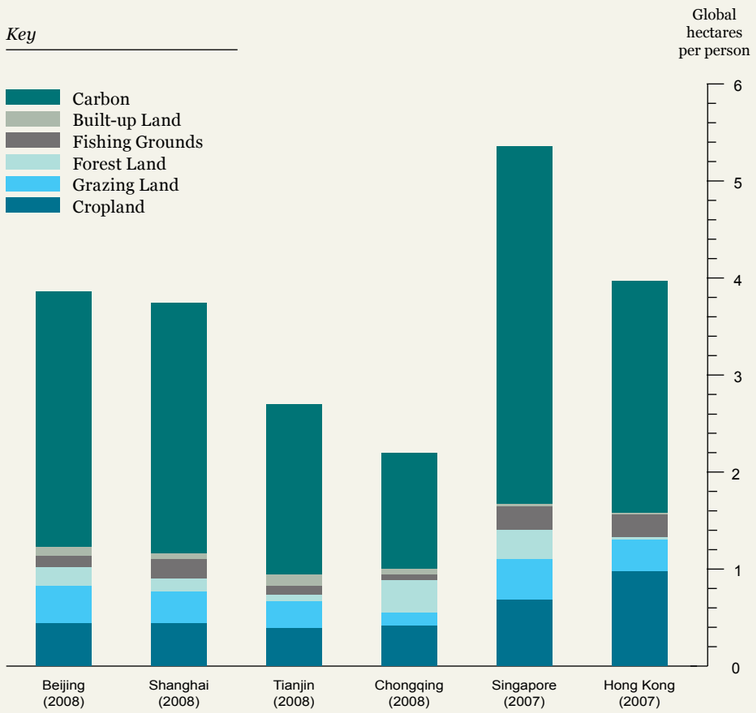


Figure 11 City Ecological Footprint per person. The Ecological Footprint estimates for Hong Kong and Singapore are from Global Footprint Network's National Footprint Accounts, using data from the year 2007, as with the rest of this report, while the other China city averages were calculated using a slightly different methodology, and data from 2008 (China Ecological Footprint Report 2010). Due to these differences, comparisons between all six cities are limited.

Beijing and Shanghai have comparable city Footprints due to their broad-scale similarities. Both are large metropolitan centers in China with populations close in size (22 million and 19 million respectively), and both have service-based economies with the predominant businesses being finance, banking, and trade. Both have similar total Ecological Footprints (3.9 global hectares per person in Beijing and 3.8 global hectares per person in Shanghai), and similar carbon Footprints that make up 68 percent and 69 percent of their Ecological Footprints, respectively.

Immediately south of Beijing is Tianjin, which has a smaller population (12 million) and a rapidly growing manufacturing sector. Its per person Ecological Footprint is lower than that of Beijing or Shanghai, although it does have the largest built-up land Footprint. Tianjin's carbon Footprint makes up 65 percent of its total Ecological Footprint per person.

Although Chongqing has the highest population of these five cities with 31 million people, it also has the most land area at 82,300 km^2 in the upper Yangtze. Chongqing has the smallest Ecological Footprint compared to the other five cities. It has the smallest fishing and grazing Footprints of these cities. It also has proportionally the smallest carbon Footprint, which accounts for only 56 percent of its total Ecological Footprint.

Singapore and Hong Kong have smaller populations than the other four cities (Singapore has 5 million people and Hong Kong 7 million). Like Beijing and Shanghai, both Singapore and Hong Kong have strong service sectors. The carbon Footprint accounts for 69 percent of Singapore's total Ecological Footprint and 60 percent of Hong Kong's, primarily from the embodied carbon in imported goods. The total carbon Footprints for the two cities are similar (16.5 million gha and 16.7 million gha, respectively), but because Hong Kong has a larger population, the total carbon Footprint is spread across more people.

60%
CARBON FOOTPRINT MAKES UP 68-69 PERCENT OF THE ECOLOGICAL FOOTPRINT PER PERSON IN BEIJING, SHANGHAI AND SINGAPORE, HIGHER THAN HONG KONG AT 60 PERCENT

Note that the Ecological Footprints calculations for Hong Kong and Singapore are from different datasets and are for different years than the other cities presented here. The Ecological Footprint figures for both Singapore and Hong Kong are subject to regular updates in the Footprint methodology. Many improvements were made to the Footprint accounts between the 2008 and 2010 Living Planet Reports; mainly, country-specific information replaced global averages for data such as yield factors, extraction rates, feed rates, and carbon intensities. As a result of these methodology updates, Ecological Footprint figures can be slightly higher (as for Singapore) or slightly lower than previously reported.

According to China Ecological Footprint Report 2010, the regional per person Ecological Footprint shows a strong overall correlation with the level of urbanization. In China, urban areas tend to support concentrations of high-income segments of the population and corresponding intensive resource consumption and carbon emissions. Therefore, municipal cities with higher urbanization level have higher per person Ecological Footprint. Among the four mainland Chinese cities included here, Chongqing has the lowest urbanization level and its per person Ecological Footprint is the lowest. Beijing and Shanghai have the highest urbanization level, and the highest Ecological Footprint per person.

The China Ecological Footprint Report 2010 also suggests, through analysis of China's provinces, that when the average person begins earning more than what is needed for basic survival, excess income can become a driving factor for an increase in Footprint. The four cities in mainland China have an average per person income exceeding basic survival requirement. Among them, Chongqing has the lowest per person income and the lowest per person Ecological Footprint while Beijing and Shanghai with highest per person income are associated with highest per person Ecological Footprint.

HONG KONG SUSTAINABILITY FOCUS

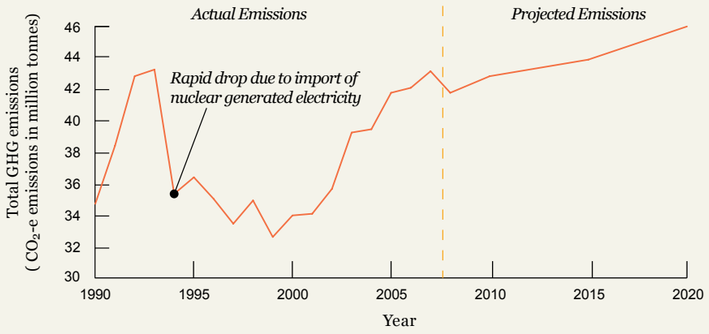
The Ecological Footprint analysis presented in this report provides a unique insight into the sustainability of Hong Kong's activities on renewable resources relative to different types of resources, and to other localities and the finite resources of planet Earth. One limitation of this approach is that most of the global data sets that enable such comparisons capture data at a fairly coarse level, and do not capture more detailed information relevant to Hong Kong, such as whether the natural resources consumed (e.g. seafood and timber products) were produced in a sustainable manner. Other data sources and analysis with particular local relevance and that provide additional insight into sustainability issues are presented here.

Climate Change

Climate change is upon Hong Kong, and the Hong Kong Observatory predicts that it will result in increasingly heavy rainfall, floods and uncomfortably hot weather. Such environmental changes will impact biodiversity as well as people, and changes in the migratory patterns of birds for example, are already evident. Although Hong Kong's overall GHG emissions (and total carbon Footprint) are relatively small at a global level, as a developed and prosperous city, Hong Kong has an obligation to join the global battle to reduce emissions, avoid dangerous levels of warming and resultant damage to ecosystems.

GHG Emissions

According to the Hong Kong Government, electricity generation is by far the largest source of local GHG emissions in Hong Kong, accounting for 67 percent of Hong Kong's total emissions in 2008.[5] Nearly all (89 percent), of Hong Kong's electricity generated is consumed by buildings, meaning buildings contribute about 60 percent of Hong Kong's total GHG emissions.[5] Transport contributes 18 percent to Hong Kong's GHG emissions, making it the second largest source of local emissions, followed by waste treatment (5 percent), and industrial processes and agriculture (4 percent).[5]



Source: Environment Bureau, Hong Kong Government "Hong Kong's Climate Change Strategy and Action Agenda Consultation Document" September 2010.

Figure 12 Past and future GHG emission trends of Hong Kong under the business-as-usual scenario, 1990-2020

Looking ahead, Hong Kong's GHG emissions are predicted to rise steadily under a "business-as-usual" scenario, and in the absence of new government measures to address climate change (Figure 12).

Local Estimates of Individual GHG Emissions

According to government data, in 2008, the total GHG emissions of Hong Kong were 42 million tonnes CO_2-e, or 6 tonnes on a per person basis.[5] Of this total, 40 million tonnes were reported as actual CO_2 emissions. The remaining is emissions of other GHG. However, this figure does not fully represent the direct GHG emissions that Hong Kong citizens generate as it does not take into account personal aviation emissions. While data on the annual emissions from airlines based in Hong Kong are not available, air travel accounted for nearly 55 percent of the average annual carbon emissions for nearly 6,000 people who used WWF's carbon calculator. This gives a strong indication that air travel emissions would be a substantial contributor to personal GHG emissions (although personal air travel would contribute to the Ecological Footprint of Consumption rather than of Production).

Office GHG Emissions

The CO_2-e emissions associated with work in offices can be as much as 12.7 tonnes per employee per year. The average CO_2-e emissions per employee is 4 tonnes per year, according to data generated by WWF-Hong Kong's Low-carbon Office Operation Programme (LOOP) and verified by third parties.

30%

Rearing livestock uses 30 percent of the Earth's entire land surface

Beef Consumption

Beef production has a considerable effect on global warming due to emissions of GHG such as methane, nitrous oxide and carbon dioxide. Globally, emissions from livestock account for 18 percent of total world emissions and are higher than that of transport worldwide.[6] Producing just one kilogram of beef releases an average of 36 kilograms of CO_2-e.[7]

More pasture is used for cattle than all other domesticated animals and crops combined. In some areas, raising cattle is a major contributor to deforestation. Livestock uses 30 percent of the Earth's entire land surface, mostly permanent pasture, but also including 33 percent of the global arable land used to produce feed for livestock.[6] In Latin America, for example, some 70 percent of former forests in the Amazon have been turned over to grazing.[8]

Hong Kong is contributing to this problem. Per person beef consumption in Hong Kong was 15.0 kg in 2007 (and has since shot up to 30.3 kg in 2010), according to 2010 data.[9] The 2010 figure is over seven times that of mainland China and almost double than that of the European Union (although less than that of Australia at 35.3 kg, and the United States at 38.5 kg in 2010).

Seafood

Hong Kong's Global Significance

Global fisheries stocks are dwindling at alarming rates due to unsustainable fishing. In 2007, the UN Food and Agricultural Organization (FAO) estimated that 52 percent of fisheries resources were fished at the maximum biological limit, and 27 percent depleted or overfished.[10] Worldwide, large predatory marine fishes such as tuna, billfish and sharks are particularly threatened, with declines of 90 percent over the past 50 – 100 years.[11]

Hong Kong's growing appetite for seafood, combined with limited local fishery resources is exacerbating the problem. Seafood consumption per person in Hong Kong ranks third in Asia and is 3.6 times that of the global average.[12] Local seafood production in Hong Kong cannot maintain pace with the cities' demand, and 85-90 percent of seafood is imported,[12] from more than 150 countries and territories.[13] Much of this seafood is produced unsustainably, harming marine ecosystems, and even causing globally significant impacts in the case of the live reef food fish and shark fin trades.

Locally Caught Seafood

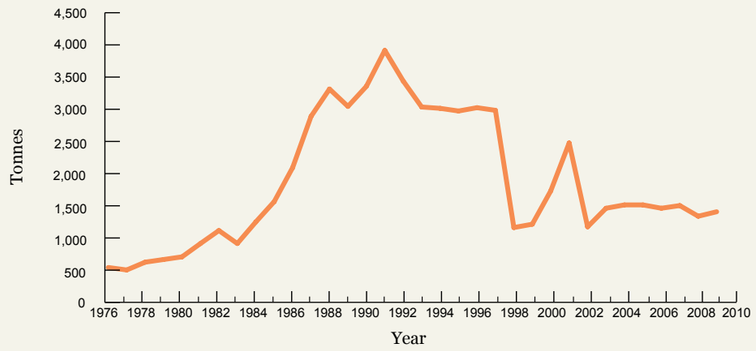
By the mid to late 1980s, it was apparent that fish stocks in Hong Kong waters were declining. Contributing factors were, and still are, a lack of fisheries management; unreliable catch data; and severe disturbance and loss of marine habitat due to pollution, large-scale reclamation, and dredging and dumping operations.

Catch rates are only one quarter of what they once were, and much of the catch now is juveniles and/or species of little commercial value. A number of previously important food species are now commercially extinct in Hong Kong, including: sharks, Chinese bahaba, Hong Kong grouper, Knobsnout parrotfish and Blackspot tuskfish.[14-18]

Local Mariculture

Paradoxically, current mariculture practices in Hong Kong are exacerbating overfishing, rather than alleviating the stress on local fisheries. Some fish farms encourage overfishing through the use of "trash fish" – small fish, including the juveniles of commercially valuable species, which are deliberately targeted in significant quantities to be chopped up and fed to farmed fish.

Beyond the problem of overfishing, aquaculture operations in Hong Kong—often located in shallow sheltered bays with typically slow flushing rates—generate pollution severe enough to cause die-offs and disease in the fish farms themselves.[19] Mariculture production in Hong Kong grew rapidly in the late 1980s, peaking in 1991 at 3,860 tons



Source: Agriculture, Fisheries and Conservation Department Annual Reports

62KG

On average, every person in Hong Kong ate 62 kg of seafood in 2005

Figure 13 Annual marine fish culture production in Hong Kong, 1976 - 2009

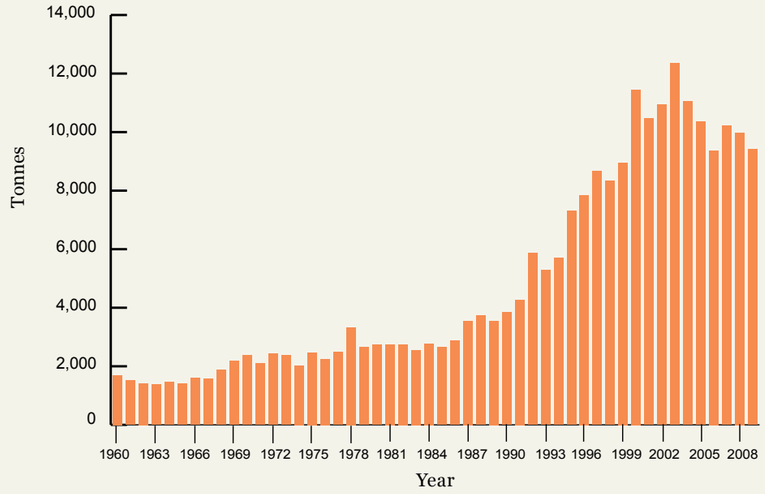
and thereon steadily declined, down to 1,437 tons in 2009.[20] This severe drop is largely due to high mortality, poor quality of surviving fish and cheap imports from the mainland.[19]

Sharks

Numerous shark populations around the world are heading towards extinction due to overfishing, with Asia's insatiable demand for shark fin being a major economic driver. Hong Kong alone accounts for about 50 percent of the global shark fin trade, and is one of the largest consumers per person of shark fin in the world.[21-22] Sharks are particularly vulnerable to overfishing as many sharks grow relatively slowly, take many years to mature and produce relatively few young. Hence populations may not be able to replenish at the same rate they are being fished.

Declining shark populations are starkly reflected by the IUCN Red List of Threatened Species, which shows an alarming increase from 15 sharks and related species threatened with extinction in 1996, to 181 in 2010 (Figure 15). According to the IUCN, over 40 percent of such species have not yet been assessed, so the number under threat could be much higher. Although not all sharks are at risk, it can be very difficult for consumers in Hong Kong to determine what species different fins are from, and whether or not they are from threatened species. Furthermore, there are no fisheries for true sharks currently known to be sustainable under the principles of ecosystem-based management.

Figure 14 Hong Kong annual shark fin import volume, 1960-2009



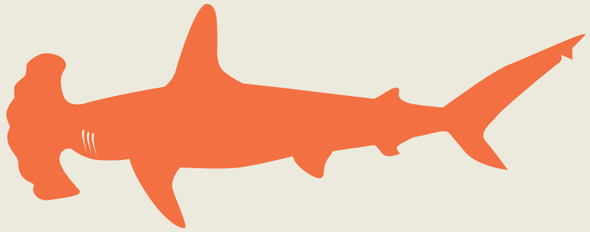
Source: The Hong Kong Census & Statistics Department

Figure 14 illustrates the increase in total import volume of all shark fin products into Hong Kong from all countries, including China, between 1960 and 2009. Note that the import figures include both processed and unprocessed fin, and is likely to include some double-counting of fin imported into Hong Kong, exported to China for processing and then re-imported, and is not equivalent to consumption by Hong Kong.

Year	No. of Threatened Sharks (including rays and chimeras) on the IUCN Red List
1996	15
2000	19
2004	82
2007	114
2008	126
2010	181

Source: The IUCN Red List of Threatened Species 2010

Figure 15 Number of Threatened sharks on the IUCN Red List, 1996-2010



Scalloped Hammerhead Case Study

Scalloped hammerhead sharks—among the most highly valued in the international fin trade—have suffered major population declines in recent years. Approximately 2.7 million hammerhead sharks (including both Scalloped and Smooth hammerhead) are harvested annually for international trade.[23] Such heavy harvests have proved to be unsustainable, as evidenced by a 75-80 percent decline from the historical baseline in catch rates of Scalloped hammerhead sharks or a combination of hammerheads including two other species (Smooth hammerhead and Great hammerhead).[23] These drastic declines are due in part to the species' low intrinsic rate of population increase. This problem is made worse by the high demand for hammerhead fins, which has resulted in the harvesting of juveniles and neonates.

Live Reef Food Fish

Diminished local resources and inefficient mariculture practices, combined with the demand in Hong Kong and mainland China for live reef fish such as grouper, have resulted in rapidly growing imports of live reef food fish (LRFF) from other countries in recent decades, both for consumption in Hong Kong and re-export. The number of countries involved in the LRFF trade escalated from 18 in 1998 to 50 in 2009.[13]

The huge demand for LRFF in Hong Kong has led to serial depletion of these vulnerable fishery resources within the Western Pacific's Coral Triangle. Also, as much as 50 percent of these fishes are caught from the wild to be "grown-out" in cages for the export trade before they have had an opportunity to reproduce.[24] The Leopard coral trout is presently the most heavily traded species, and a high proportion comes from unsustainable fisheries in Southeast Asia. Just 23 percent of the Leopard coral trout imported to Hong Kong came from well-managed sources in 2009, down from 26 percent the year previously.[13,25]

50
COUNTRIES WERE INVOLVED IN THE LRFF TRADE IN 2009

Timber

Deforestation remains a major global environmental issue, and deforestation rates averaged 13 million hectares per year between 2000 and 2010.[26] Deforestation is responsible for significant ecosystem and species loss, as well as for around 20 percent of global GHG emissions.[27] Under a business-as-usual scenario, and in the absence of responsible forest management, deforestation threatens to generate more carbon emissions annually than any other source other than burning fossil fuels.

Superficially, Hong Kong is not a major contributor to global deforestation. Based on trade statistics, Hong Kong's end-usage of timber products has declined since the construction boom of the 1990s and, on a per person basis, is less than in countries which have a similar GDP per person to that of Hong Kong. For example, despite having a GDP just a third lower than of the UK and the Netherlands, Hong Kong's roundwood equivalent (RWE) consumption per person is nearly 70 percent lower than those countries.[28]

AROUND 20-30% OF TIMBER CONSUMED IN HONG KONG MAY BE FROM ILLEGAL SOURCES

The main environmental concern in Hong Kong regarding timber is not one of quantity but rather the sources of the wood-based products entering end-use. The amount of Forest Stewardship Council (FSC) certified products entering end-use in Hong Kong is unclear due to lack of data, but it is believed to be less than 5 percent. Conversely it is estimated that between 20 and 30 percent of the RWE volume of wood-based products that entered end-use in Hong Kong during 2007 might have comprised illegal timber.[28] This includes wood that is logged, milled or traded in violation of national or sub-national laws, or where access to forest resources, trade in wood-based products or the construction of mills is either fraudulent or authorised through corrupt practice. This volume is so significant that it makes it probable that consumers in Hong Kong encounter illegal timber in wood-based products every day. It is likely that the majority of illegal timber that enters end-use in Hong Kong is supplied by China, and the remainder made up of plywood supplied direct from Indonesia and Malaysia. Most of the illegal timber which Hong Kong imports other than from China is re-exported (i.e. exported without further processing) to China.[28] The trade in illegal timber supports the destruction of rainforests, and produces increased carbon emissions.

	Units	Imports other than from China net of exports to China	Imports from China net of exports other than to China
Sawn wood	m^3	60,000	40,000
Plywood	m^3	100,000	130,000
Moulding and Joinery	m^3	10,000	90,000
Furniture	tonne	10,000	40,000
Other timber	m^3	20,000	50,000

Source: Illegal Timber and Hong Kong, WWF-Hong Kong 2011

Figure 16 HongKong's estimated annual end-use of timber, 2001-2007

Roughly 600,000 tonnes of paper were used in Hong Kong in 2007,[28] equivalent to 86 kg per person. There is a risk that some non-FSC paper available in Hong Kong comes from unsustainable sources and my be contributing to the destruction of forests,[28] e.g. in Indonesia.

ADDRESSING OVERSHOOT

The major limitation to continued global development is resource constraints. Since the 1970s, humanity has been in ecological overshoot with the annual demand on natural renewable resources exceeding what the Earth can regenerate each year. Under current development trends, the Ecological Footprint continues to increase while biocapacity continues to decrease. While global total biocapacity has remained relatively stable, the global total Ecological Footprint has grown substantially. Figure 17 shows some of the driving forces behind changes in biocapacity and Ecological Footprint.

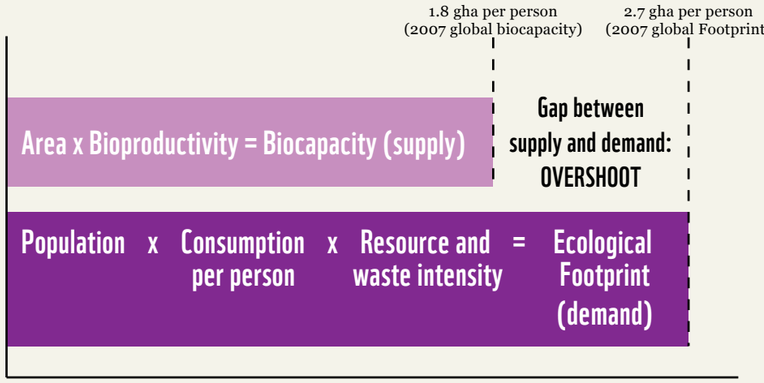


Figure 17 Footprint and biocapacity factors that determine global overshoot

Despite the recent recession, global development is still based on an assumption of increasing GDP. At the time of this report in late 2010, Hong Kong's GDP was beginning to rise out of the recession. Assuming Hong Kong's GDP continues to rise, the total Ecological Footprint of Production can be expected to increase as well (from local CO_2 emissions). In Figure 18, a business-as-usual scenario is graphed based on a constant GDP growth rate.

Specific to the carbon Footprint, the Hong Kong Government has begun to develop strategies for reducing internally generated GHG emissions (including methane from landfills). In their Hong Kong's Climate Change Strategy and Action Agenda document released by the Environment Bureau in September 2010,[5] a proposal was laid down "to adopt a voluntary carbon intensity reduction target of 50-60 percent by 2020 as compared with 2005 level...".

Carbon intensity is expressed as emissions per unit of monetary value (e.g. HKD or Yuan). If a policy for emissions reduction is linked to income, and income is linked to GDP, then carbon emissions will follow what the economy is doing: if GDP grows, total emissions (and the Ecological Footprint of Production) will also grow.

A projection of the strategy for a 50 percent CO_2 intensity reduction (compared with 2005) is illustrated in Figure 18. All else being equal (including population growth), linking an emissions reduction strategy to carbon intensity will lower direct CO_2

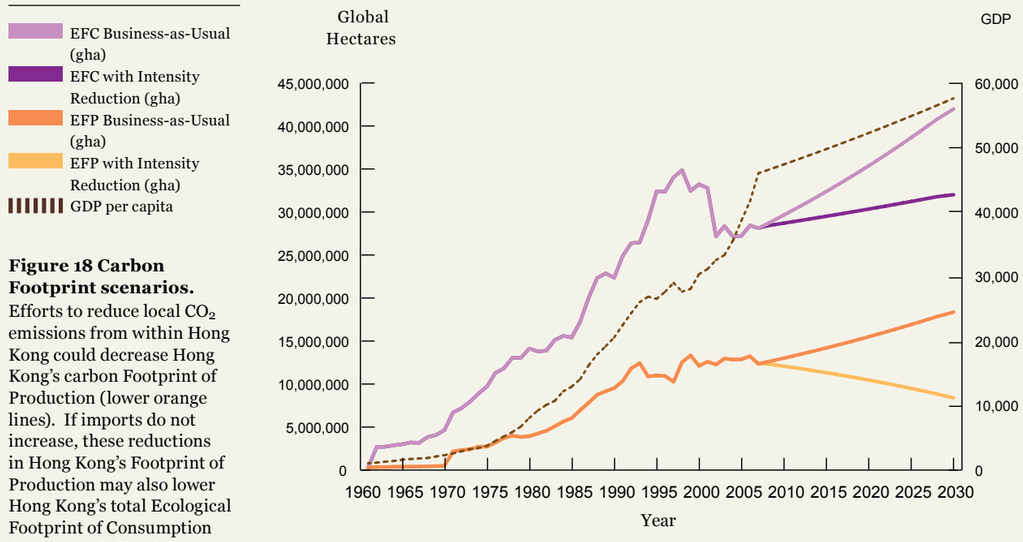


Figure 18 Carbon Footprint scenarios. Efforts to reduce local CO_2 emissions from within Hong Kong could decrease Hong Kong's carbon Footprint of Production (lower orange lines). If imports do not increase, these reductions in Hong Kong's Footprint of Production may also lower Hong Kong's total Ecological Footprint of Consumption (upper purple lines).

emissions, but the embodied CO_2 emissions represented by the Ecological Footprint of Consumption would still grow. These estimates also assume rates of economic growth lower than in previous years, so it is possible that faster growth could drive the Ecological Footprint higher than these projections.

Even if the GDP does not exhibit constant growth at the same rate for the next 20 years, the effect of a reduction in carbon intensity on the overall Ecological Footprint of Consumption will be minimal, since the majority of Hong Kong's carbon Footprint of Consumption consists of external emissions. Achieving a reduction in the overall carbon Footprint, and thus in total contribution toward global emissions, is also likely to require a shift toward more efficiently manufactured and transported imports i.e. those with relatively less embodied carbon.

Direct CO_2 emissions are more easily influenced by a country's policies. However, the large contribution of imports to Hong Kong's embodied CO_2 emissions limits the effectiveness of internal emissions reductions in reducing the overall Ecological Footprint. Efforts at emissions reduction must also take into account incurred emissions abroad.

For other non-carbon components of the Ecological Footprint, notably seafood (fishing grounds) and timber (forest land), the key focus needs to be on sourcing sustainably, rather than necessarily reducing overall consumption, although there are some specific products where there are currently no sustainable sources and the decline of wild populations is so severe that avoiding them completed is strongly advised, e.g. shark fin. In addition, eliminating food wastage and cutting down on beef consumption are measures that all should consider.

TRANSFORMATION TO SUSTAINABILITY

WWF strives to provide solutions that enable humanity to utilize renewable natural resources sustainably. A variety of solutions to tackle the issues particularly pertinent to Hong Kong, as highlighted in this report, are presented here.

A Low Carbon Economy

It is far more expensive to try and adapt to serious climate change, than to try and reduce it happening in the first place. In general, countries only need spend 1-2 percent of their GDP to prevent GHG from rising to dangerous levels, but 5-20 percent to deal with the impacts once they occur.[29]

To develop Hong Kong into a genuinly low carbon city, both measures of supply side management (e.g. the fuels required to generate energy) and demand side management (e.g. energy efficiency) should be introduced to reduce its carbon emissions. WWF and Arup & Partners Hong Kong released a study in September 2010 showing that by 2020 Hong Kong could reduce its absolute carbon emissions by 25 percent, using 1990 as a base level.[30] This is the target proposed by the IPCC for developed cities, and which is appropriately higher than carbon goals set for all of China. Under the Hong Kong Government's climate action plan unveiled in late 2010, Hong Kong would also set a reduction target higher than that of China, but would still only be required to reduce emissions by 8 or 14 million tonnes (from 42 million tonnes) by 2020. WWF & Arup, on the other hand, show that Hong Kong can reduce emissions by 25 million tonnes and crucially, without increasing nuclear power generation.

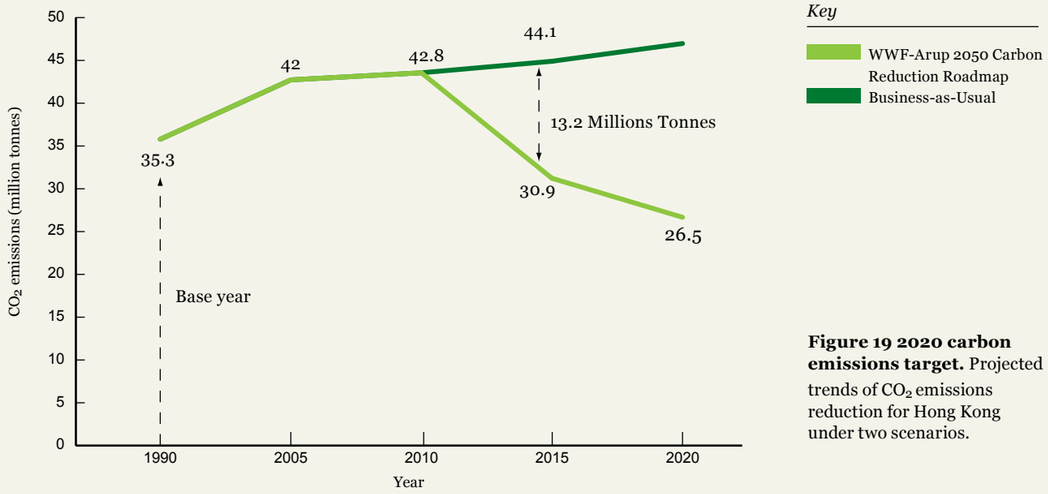


Figure 19 2020 carbon emissions target. Projected trends of CO_2 emissions reduction for Hong Kong under two scenarios.

Source: WWF-Arup 2050 Carbon Reduction Roadmap

Individual Actions
Individual actions to curb climate change can add up to significant carbon emission reductions. WWF-Hong Kong's Climateers programme acts as a climate change information and action hub for individuals, primarily through its carbon calculator, a first-of-its kind initiative in Asia. Individuals participating in the Climateers training programme have been able to reduce their carbon emissions, as measured by the carbon calculator, by an average of two tonnes per year, through taking simple low carbon actions in daily life. Changes to land transport, air travel and home electricity and water use can add up to a 23 percent savings in individual carbon emissions.

Solutions for Households
According to the Hong Kong Government,[31] household energy use accounts for a quarter of Hong Kong's total energy consumption. Room air conditioners, refrigerating appliances and compact fluorescent lighting together are the most energy intensive appliances, and together comprise about 70 percent of the electricity consumption in the residential sector.

Smart energy use in the residential sector is a vital component of low carbon city living. Unfortunately, Hong Kong lags behind many countries with regard to mandatory energy labeling, and WWF is keen to see the coverage of electrical appliance categories under the mandatory labeling scheme broadened from the current five appliance types to 10.

In order to promote the use of energy efficient appliances, WWF-Hong Kong launched the "Low Carbon Living Appliances Guide" in 2009, which covers 12 energy-intensive categories of home appliances available in Hong Kong. Energy and financial savings in the order of 46 percent are possible through the use of the Guide.*

Figure 20 Example of a household's financial and carbon savings by using low carbon appliances recommended in WWF's Low Carbon Living Appliances Guide

Appliances	Annual Electricity Reduction (kWh)	Annual Bill Saving ($)	Annual Carbon Reduction (kg)
Air Conditioner - 1 Horsepower	366	321.9	237.9
Lighting**	197.1	173.3	128.1
Refrigerator 170 L	247.9	218	161
Rice Cooker	109.5	96.3	71.2
LCD TV -42"	146.7	129	95.4
Computer**	616.7	542.4	400.9
Total saving	1,683.9	1,481	1,094.5
Reduction		**-46.1%**	

* Financial and carbon savings are calculated by comparing the energy data of appliances from CLP's PowerU[32] to the electricity consumption of the best performer introduced in this Guide under the same category.

** The electricity reduction on lighting requires switching from a 60W incandescent bulb to a 15W CFL (Compact Fluorescent Lamp). The electricity saving for computers requires switching from a desktop computer to an energy efficient laptop.

Solutions for Buildings

The building sector accounts for the vast majority of Hong Kong's total electricity consumption, and related carbon emissions, and there is tremendous potential for increased energy efficiency. Significant financial opportunities exist to reduce buildings' energy use at lower costs and higher returns than other sectors.[33] The IPCC Fourth Assessment Report estimates that by 2020, CO_2 emissions from building energy use globally can be reduced by 29 percent at no net cost.[34]

In Hong Kong, if Building Energy Codes (BEC) were applied to the existing building stock, a 45 percent reduction in emissions could be achieved compared to the buildings without BEC. For new buildings, tightening the requirements of the BEC by making all new commercial buildings 50 percent more energy efficient, as compared with 2005 building stock, would make a further contribution to emissions reduction. With 40 percent penetration of BEC in the existing commercial building (4.1 million sq meters) and tightened BEC for new buildings, it is estimated that 3.5 million tonnes of emissions can be reduced.[30]

Solutions for Offices

WWF-Hong Kong launched the Low-carbon Office Operation Programme (LOOP) in July 2009 to help Hong Kong office-based companies calculate, track and reduce their GHG emissions associated with emissions sources such as electricity use, transportation and paper consumption. As of late 2010, 60 offices had joined the programme. Offices are generating innovative approaches to reducing their GHG emissions, including lighting retrofits, employee engagement and the creation of low carbon office policies. Many LOOP verified offices are involving employees in the latter, by forming green committees to establish policies and guidelines for sustainability. The first 14 companies to opt for the LOOP labeling process were verified by third party auditors and received their LOOP labels in November 2010.

LOOP is a WWF initiative with certification from third parties

Solutions for Manufacturing

WWF-Hong Kong works with factories in the Pearl River Delta to reduce GHG emissions. The Low Carbon Manufacturing Programme (LCMP) equips factories with tools to identify and report areas of emissions reductions and cost savings, and recognize positive actions to reduce GHG emissions by granting labels to manufacturers after assessing their performance based upon reductions in carbon intensity, GHG management systems and implementation of technological best practice.

LCMP has conducted pilot programs in nine factories in the electronics, plastics and textiles/garments sector. The GHG emissions reductions measures identified from the pilot programmes, if extrapolated to all 55,000 factories in the Pearl River Delta, could lead to a potential of 74 million tonnes CO_2-e reduction per year. While emissions from locally owned factories based outside Hong Kong are not directly included in Hong Kong's Ecological Footprint as quantified in this report, Hong Kong clearly has a responsibility to address such emissions.

Solutions for Seafood

Hong Kong is the early stages of seriously addressing sustainability issues around wild-caught and farmed seafood. While some sustainable products are locally available, much of the readily available seafood is from unsustainable sources, and includes species threatened with extinction, and/or caught illegally. All consumers can play a positive and powerful role by avoiding unsustainable seafood, and requesting sustainable alternatives.

Regional Solutions

Marine Stewardship Council (MSC)

Established in 1997, with the WWF as a founding member, the Marine Stewardship Council (MSC) is an independent, non-profit organization that works with fisheries, retailers, and other stakeholders to identify, certify, and promote responsible, environmentally appropriate, socially beneficial, and economically viable fishing practices around the world. It is the world's leading certification and eco-labelling programme for sustainable seafood. The MSC meets the highest benchmarks for credible certification and eco-labelling programmes, including the FAO guidelines and the ISEAL Code of Good Practice.

As of late 2010, there were over 100 MSC certified fisheries, and 132 fisheries undergoing assessment.[35] Some 7000 MSC certified products are available around the world.[35] MSC fisheries remain limited in Asia, with just two certified fisheries in Japan and one in Vietnam. Increased certification would be greatly beneficial to the region, and help local consumers to recognize the value of sustainable fisheries. MSC labeled products are currently available in a small number of retail outlets in Hong Kong.

Sustainable Live Reef Fish Trade

In Hong Kong, WWF has specific programmes aimed at supporting consumers – be they individuals, schools, hotels and restaurants or seafood traders - to buy sustainable seafood. Other WWF offices in the Coral Triangle are working with specific coral reef fisheries, such as for groupers, to guide them towards sustainability.

MORE THAN 500,000 SEAFOOD GUIDES HAVE BEEN DISTRIBUTED IN HONG KONG

Local Solutions

Individuals, business and government all have a role to play in supporting the consumption of sustainable seafood in Hong Kong. WWF-Hong Kong's Seafood Guide (see Further Information) provides practical advice on the environmental impacts of common seafood products - which organizations can address through responsible procurement policies.

Corporations can support sustainable seafood by organizing an "Ocean-Friendly Green Spring Dinner" (annual dinner). Ocean-Friendly describes menus that only contain seafood that is not "Avoid" in the Seafood Guide (species that are over-exploited, caught or farmed in an ecological unfriendly way/or from fisheries that are not well managed). These dinners are a great way to introduce corporations and their staff to the importance of sustainable seafood, and increase demand for such in Hong Kong.

Chinese and Western restaurants and hotels can also work with WWF-Hong Kong to provide ongoing Ocean-Friendly menus, as an increasingly number are already doing (see Further Information). This helps those businesses to gain a competitive edge, by catering to the growing faction of environmentally conscious corporations and individuals.

Sharks

As part of its Seafood Choice Initiative—launched in 2007 as a response to the depletion of marine resources and fishery crisis worldwide—WWF-Hong Kong works with corporations to promote shark-free internal dining policies. As of late 2010, over 60 organisations had pledged not to sell or buy shark fin soup as part of their corporate activities (see Further Information).

WWF launched the Alternative Shark-free Menu initiative in May 2010 as a first step working with caterers to phase out shark fin consumption in Hong Kong. Some 53 hotels and restaurants had already joined the initiative by late 2010, and some also offer an Ocean-Friendly menu.

Hong Kong Fisheries

Marine fisheries are the only large-scale natural resource primary industry remaining in Hong Kong, yet most local fishermen are barely earning a living, primarily as fish stocks are exhausted and fuel costs high.[36] The situation is so bad that 54 percent of the fishing community is willing to switch away from fishing jobs and 75 percent are willing to have their vessel bought out of the fishery by government for a reasonable price.[36]

Through the introduction of sustainable fisheries management, Hong Kong has an opportunity to rebuild its presently decimated fisheries, preserve biodiversity, benefit society and offer profit-making solutions to fishermen. Research shows that responsible management of fisheries could make Hong Kong up to 10 percent more self-sufficient,[36] thereby reducing the need for imported seafood, creating economic benefit and saving carbon emissions through the reduction of food miles.

In order to achieve truly sustainable fisheries in Hong Kong, an effective licensing, monitoring, control and surveillance system, together with an incentive scheme for fishers to ensure sustainable and efficient fishing by the remaining Hong Kong fleet, will have to be put in place.[36] These actions will result in decreased annual catches in the short term, but all result in increased profitability in the long term. In 2010, the Hong Kong Government announced that it would introduce new legislation to ban all trawling in Hong Kong waters, a major step towards the establishment of sustainable fisheries.

Prohibiting fishing in marine parks, combined with a ban on bottom trawling in most of Hong Kong waters stands to yield the greatest long-term benefits, in the order of HK$600 million to the fishing community and HK$2.3 billion to society.[36]

Mariculture

If the Hong Kong mariculture industry is to be transformed into a healthy and financially viable industry producing quality seafood sustainably, government investment and increased regulation will be needed.[19,37] The use of trash fish as feed should be dramatically reduced, and modern practices employed to curb current levels of pollution. The former is increasingly a viable option, as the quality of pellet feed is increasing and cost decreasing, whereas the cost of trash fish has dramatically risen.

Unfortunately these changes have yet to be implemented in the Hong Kong mariculture industry and WWF does not currently recommend consuming any fish from local mariculture in its Seafood Guide.

Solutions for Timber Products

Government, business and the public alike can take immediate action to ensure that Hong Kong does not continue to support illegal timber, and the inherent devastation to communities, forests and biodiversity. The purchase of Forest Stewardship Council (FSC) certified wood and paper products is central to achieving this goal.

For those operations that manufacture, process or trade in timber or non-timber forest products, FSC chain of custody (CoC) allows credible tracking of FSC material from the forest, through all successive stages of the production process, to committed retailers and consumers.

Since the first printing companies received FSC CoC certification in Hong Kong in May 2005, there has been growing awareness among consumers and local companies of the

THE BAN ON TRAWLING WILL BE A MAJOR STEP TO ACHIEVING SUSTAINABLE FISHERIES

Forest Stewardship Council (FSC)

The FSC is an independent, non-governmental, not-for-profit organization widely regarded as one of the most important initiatives of the last decade to promote responsible forest management worldwide. FSC certification guarantees that a product is legally logged, processed and traded, as well as primarily from well managed natural forests or well managed plantations.[38] FSC is the fastest growing certification system in the world and as of 2008 the value of FSC labeled sales was over US$20 billion.[38] FSC certification ensures that timber and paper is not only legal but also that the forest management is environmentally appropriate, socially beneficial, and economically viable.

importance of FSC and CoC certification. This trend is largely demonstrated in the paper sector, which accounts for the vast majority of enterprises (399 as of December 2010)[38] holding valid FSC CoC certificates in Hong Kong.

Sustainable procurement policies favouring FSC or recycled paper, and FSC timber where relevant can be effective tools that most companies should consider implementing. Both the Global Forest and Trade Network' Guide to Legal and Responsible Sourcing and a number of other tools provided by WWF, such as the WWF Guide to Buying Paper, are invaluable resources for those seeking to implement sustainable purchasing policies. Printing corporate reports, leaflets and other printed materials on FSC paper using printers who have FSC chain of custody certification (which allows for use of the FSC logo) is a positive way to publicly demonstrate support for sustainably produced paper. Links to these tools can be found in Further Information.

It is worth noting that simply avoiding the use of timber products including paper is not the answer, although of course they should be used wisely. Wood is a valuable renewable resource and the FSC provides strong economic reasons to manage and conserve forests responsibly, and as such protect them from destructive exploitation.

Companies that deal in considerable quantities of wooden products should consider joining WWF's Global Forest and Trade Network (GFTN), which aims to eliminate illegal logging and transform the global marketplace into a force for saving the world's valuable and threatened forestry, by facilitating trade links between companies committed to achieving and supporting responsible forestry.

Finally - Impacts of Climate Change on Imported Natural Resources

A 2010 Hong Kong Government-funded report on the impacts of climate change on Hong Kong rightly notes that "Hong Kong is vulnerable to climate change beyond its borders due to its heavy reliance on imports of water, food, and both primary energy sources and electricity."[39] For example, research suggests that rice crops will be adversely impacted by climate change, which could exacerbate already rising prices. Climate change will spur on a 15 percent drop in irrigated rice yields and 12 percent increase in rice prices by 2050, according to an International Food Policy Research Institute (IFPRI) study.[40]

As well as reinforcing the global nature of climate change and the interconnectivity of man's impacts on our planet, this vulnerability provides additional impetus to increase efficiency and reduce wastage of the natural resources Hong Kong imports. It is worth noting that supplies of resources harvested from well-managed forests and oceans may also prove to be more stable and resilient to climate change than those over-harvested from depleted ecosystems, as healthy ecosystems are in general likely to adapt better to changing environmental conditions. This provides additional incentive to source sustainably.

CONCLUSIONS

Cities are the economic centers of the world and home to a growing proportion of the world's population. Migration to cities associated with new economic opportunities are contributing to improved standards of living across the country, while at the same time, demanding more resources and increasing impacts on the natural environment. The main causes of the huge demand that cities place on the environment are high population density, material consumption, energy consumption and waste discharge.

Hong Kong is a city living excessively, yet starting to respond to the challenges of a resource-constrained world. Each person is still using double the average global available biocapacity, but the recent decline in the Ecological Footprint evident in the Hong Kong Ecological Footprint Report 2008 is confirmed as a real trend. Hong Kong's total Ecological Footprint has followed a similar although slightly less substantial trend even in the face of a rising population, and is likely to attract considerable attention from policy makers outside its borders in the face of humanity's alarming overall Ecological Footprint (Figure 1).

There is no cause for complacency though, as the arrested Ecological Footprint – while no doubt benefiting from some increased efficiencies in the city – appears largely due to vagaries in the trade of the embodied carbon of goods and natural resources, and of cropland products (perhaps related to changes in diet), and as such is mostly not the result of sustainable development policies. Furthermore, the carbon Footprint per person remains excessive, and Hong Kong is still consuming seafood and timber products which are mostly from unsustainable sources, although the massive recent increase in FSC paper providers is evidence of increasing demand for sustainable product.

The situation does present an amazing opportunity for Hong Kong, as a major, prosperous city in the most populous country in the world, to actively progress the decline in its per person and overall Ecological Footprint, address related sustainability issues and act as a role model for other cities in China and beyond.

Solutions are readily available, and Hong Kong is a city used to reinventing itself. In the past 200 years alone it has transformed itself from a fishing community, to a trading outpost of the British Empire, then a manufacturing economy and currently, into one of the world's largest finance centres, in tandem with a major service economy and one of China's largest trading ports. Along the way Hong Kong has largely lost its agriculture, plantations, aquaculture, rearing of livestock and fishing industry. Some of these have been consciously planned decisions, others have occurred due to neglect.

While it is unrealistic to think that Hong Kong could ever be self-sufficient in terms of renewable natural resources, it has become heavily reliant on the natural resources of the rest of the planet. This reliance has not caused Hong Kong significant difficulties so far, as total consumption volumes are still relatively small and the city can well afford to import fossil fuels, food, goods and raw materials from across the planet. However, the increasing global ecological overshoot will inevitably mean more global competition for natural resources and is changing the rules of the game – rules that Hong Kong must adapt to.

Hong Kong's heavy reliance on imported foods and natural resources is also contributing to climate change, threatening biodiversity and placing Hong Kong at risk in a more resource-constrained world. Hong Kong needs to act to:

- reduce excessive, inefficient and wasteful consumption;
- greatly increase its percentage of goods and natural resources produced sustainably;

WE CANNOT ESCAPE THE IMPACTS OF OUR ACTIONS ON OUR WELL-BEING

- transform its modest agriculture, aquaculture and fisheries industries so that they produce increasing quantities of high-quality product with minimum impact to the environment.

Reducing Hong Kong's overall Ecological Footprint per person by half would approximate the biocapacity available per person globally and, therefore, make it a logical and sustainable objective. The carbon Footprint, which has grown by 24 times per person since 1961 and which is by far the largest component of Hong Kong's Ecological Footprint, must be the first place to look to reduce the overall Ecological Footprint.

Increasing energy efficiency within Hong Kong has been shown by WWF and others to have high potential to reduce emissions from the power sector, the major source of internally generated emissions. Measures to improve energy efficiency formed part of the Hong Kong Government's proposed climate change action agenda unveiled in late 2010,[5] but WWF believes an ambitious demand side management and GHG reduction target would spur greater actions.

A 2010 World Bank report notes that while the climate change challenges facing cities are dire, well-managed dense cities have the optimal scale for tackling climate change.[41] Hong Kong certainly fits this description and therefore has inherent advantages over many other world cities, advantages that it should maximize in transitioning to a low carbon economy.

Tackling externally generated CO_2 emissions embodied in imports will require education and a new mindset, as they represent a very new concept. Reducing this carbon Footprint will require acknowledgement of the carbon associated with imported natural materials and goods, the reduction of unnecessary consumption and wastage, increased efficiencies in transportation and the preferential sourcing of goods produced using relatively low amounts of carbon.

Examining the proportions of internal and external emissions, and tracking changes in these over time, would help to ensure that reductions in Hong Kong's domestic emissions are not negated by increases in those emissions abroad associated with consumption within Hong Kong. This WWF report offers a starting point in this direction.

With regard to the other components of Hong Kong's Ecological Footprint, the shortage of domestic biocapacity means increased dependence on China and other countries' ecological resources. Hong Kong's economic well-being, therefore, relies on the preservation of ecosystems elsewhere in the world, perhaps more so than for regions with more ecological resources available domestically. This risk can be reduced by demanding that the seafood and timber products we consume are produced sustainably. In this way Hong Kong's buying power can act as a regional catalyst to drive natural resource producers towards sustainability, thus increasing biocapacity and in turn creating increased and reliable sources of supply for Hong Kong. The potential impacts of climate change overseas to the resources Hong Kong imports provide additional self-interest incentives to increase efficiency, reduce wastage and source sustainably, and to do so sooner rather than later.

Finally, Hong Kong can transform its modest agriculture, aquaculture and fisheries industries so that they produce increasing quantities of high-quality product with minimum impact to the environment. Recent rises in interest in organic farming, in initiatives (including by WWF) to revive traditional freshwater fish farming, and Government measures announced in late 2010 to transform the marine fishing industry into a sustainable one, are steps in the right direction. They also have the potential to enhance local biodiversity, and reduce the CO_2 emissions associated with transporting food to market.

IT IS IN HONG KONG'S SELF-INTEREST TO ENSURE THAT OUR USE OF RENEWABLE RESOURCES IS SUSTAINABLE.

GOVERNMENT, BUSINESS AND INDIVIDUALS ALL HAVE A ROLE TO PLAY

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, and to absorb the wastes they generate, given prevailing technology and resource management. This area is expressed in global hectares—hectares with 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 across land-use types (e.g. world average forest versus world-average cropland).

Ecological Footprint and biocapacity results for nations are calculated annually by Global Footprint Network. Continuing methodological development of these National Footprint Accounts is overseen by a review committee. A detailed methodology paper and copies of sample calculation sheets can be obtained at: *http://www.footprintnetwork.org.*

Updates made to the calculation of the Ecological Footprint include:

- Data for more traded commodities made available.
- Carbon intensities for traded commodities are now more product-specific based on wider variety of current scientific literature available.
- Footprint intensities of exported livestock and fish products are now calculated to reflect the weighted average Footprint intensities of imports and domestic production.
- Country-specific percentage of un-harvested cropland computed instead of use of world average.

Footprint analyses can be conducted on any scale. There is growing recognition of the need to standardize sub-national Footprint applications in order to increase comparability across studies and longitudinally. Methods and approaches for calculating the Footprint of municipalities, organizations and products are currently being aligned through a global Ecological Footprint standards initiative. For more information on Ecological Footprint standards see *www.footprintstandards.org*.

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 accounts do 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. Being a biophysical measure, it also does not evaluate the essential social and economic dimensions of sustainability.

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 Footprint of Consumption for India, not Japan.

The resulting national consumption Footprints can be distorted, since the resources used and waste generated in making products for export are not fully documented. Inaccuracies in reported trade can significantly affect the Footprint estimates for countries where trade flows are large relative to total consumption. However, this does not affect the total global Footprint.

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 and are not renewable in ecological time spans. When these fuels burn, carbon dioxide (CO_2) is emitted into the atmosphere. There are two ways in which this CO_2 can be stored: human technological sequestration of these emissions, such as deep-well injection, or natural sequestration. Natural sequestration occurs when ecosystems absorb CO_2 and store it either in standing biomass such as trees or in soil.

The carbon footprint is calculated by estimating how much natural sequestration would be necessary to maintain a constant concentration of CO_2 in the atmosphere. After subtracting the amount of CO_2 absorbed by the oceans, Ecological Footprint accounts calculate the area required to absorb and retain the remaining carbon based on the average sequestration rate of the world's forests. CO_2 sequestered by artificial means would also be subtracted from the Ecological Footprint total, but at present this quantity is negligible. In 2007, one global hectare could absorb the CO_2 released by burning approximately 1,450 litres of gasoline.

Expressing CO_2 emissions in terms of an equivalent bioproductive area does not imply that carbon sequestration in biomass is the key to resolving global climate change. On the contrary, it shows that the biosphere has insufficient capacity to offset current rates of anthropogenic CO_2 emissions. The contribution of CO_2 emissions to the total Ecological Footprint is based on an estimate of world average forest yields. This sequestration capacity may change over time. As forests mature, their CO_2 sequestration rates tend to decline. If these forests are degraded or cleared, they may become net emitters of CO_2.

Carbon emissions from some sources other than fossil fuel combustion are incorporated in the National Footprint Accounts at the global level. These include fugitive emissions from the flaring of gas in oil and natural gas production, carbon released by chemical reactions in cement production and emissions from tropical forest fires.

Does the Ecological Footprint take into account other species?
The Ecological Footprint describes human demand on nature. Currently, there are 2.1 global hectares of biocapacity available per person on planet Earth, less if some of the biologically productive area is made available for use by wild species. The value society places on biodiversity will determine how much biocapacity should be reserved for the use of non-domesticated species. Efforts to increase biocapacity, such as through monocropping and the application of pesticides, may at the same time increase pressure on biodiversity; this means a larger biocapacity buffer may be required to achieve the same conservation results.

Does the Ecological Footprint say what is a "fair" or "equitable" use of resources?
The Footprint documents what happened in the past. It can quantitatively describe the ecological resources used by an individual or a population, but it does not prescribe

what they should be using. Resource allocation is a policy issue, based on societal beliefs about what is or is not equitable. Thus, while Footprint accounting can determine the average biocapacity that is available per person, it does not stipulate how that biocapacity should be allocated among individuals or nations. However, it provides a context for such discussions.

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 one 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 technological advances or other factors bring human demand within the capacity of the biosphere to meet this demand, Footprint accounts will show this as the elimination of global overshoot.

More information about Ecological Footprint methodology, data sources, assumptions, and definitions can be found in The Ecological Footprint Atlas 2010 and Calculation Methodology for the National Footprint Accounts, available at *http://www.footprintnetwork.org/en/index.php/GFN/page/methodology*.

TECHNICAL NOTES

Carbon Footprints
The carbon component of the Ecological Footprint is calculated as the amount of forest land required to absorb CO_2 emissions. The calculations for the carbon component of the Ecological Footprint are from international databases (the United Nations and International Energy Agency).[42] The carbon component of the Ecological Footprint includes the embodied carbon of traded goods, which accounts for the CO_2 emissions from the upstream manufacturing processes for imports and exports.

City Comparison
The Ecological Footprint values for Beijing, Tianjin, Shanghai, and Chongqin were computed by the IGSNRR. These are based on datasets from the National Bureau of Statistics in China and include sub-national results by urban and rural populations (a "bottom-up" approach).[43]

The international trade of carbon footprint was excluded from the IGSNRR analysis due to limited data availability for exports. Direct consumption data were used instead.

Regional per capita Ecological Footprint accounts are obtained by summing the weighted urban and rural population composition and the urban and rural per capita Ecological Footprints calculated as per urban and rural household sampling data. Total regional Ecological Footprint is the product of regional per capita Ecological Footprint and total regional population.

The Ecological Footprint values for Hong Kong and Singapore were calculated using the standard computation used at GFN:

EF of Consumption = EF of Production + EF of Imports - EF of Exports

A "top-down" approach is used, where aggregated data from government and UN websites are used.

Adaptation of the 2010 National Accounts for Hong Kong
Because data for Hong Kong are not reported separately from China in most of the statistical sources used in the National Footprint Accounts, some data specific for Hong Kong were obtained from different sources.

Gaps in data were either scaled by the amount of population change from year to year, or interpolated between years – depending on the type of gap.

Population
Typically population data are obtained from FAO. Population time series for 1961 – 2007 for Hong Kong were obtained from the U.S. Census Bureau, International Data Base.[44]

Cropland
Typically area harvested data, crop production, and imports/exports of crop products are obtained from FAOSTAT,[45] which does not separate Hong Kong from China. The following sources of data were used instead:

Area harvested: Agriculture, Fisheries, and Conservation Department (AFCD).[20]

Crop production: Census and Statistics Department.[46]

Imports/exports of crop products: COMTRADE.[47]

Grazing Land
Because FAOSTAT does not separate Hong Kong from the rest of China, livestock production data were from Census and Statistics Department.[12]

Forest Land
It was assumed that there was no production of forest products.

Because FAOSTAT does not separate Hong Kong from the rest of China, data for trade of forest products was taken from COMTRADE.[47]

Built-up Land
Land-use data were obtained from The Government of the Hong Kong SAR - Planning Department.[48]

Data for 2005 – 2009 were available. It was assumed that the area of Built-up land increased with population, so for the years 1961 – 2004 data were scaled from 2005 by the amount of population change from year to year. The other four land use types were also scaled in relation to the change in built-up area in proportion to relative areas in 2005.

FURTHER INFORMATION

Useful links
Supplemental information to this report, including a breakdown of the key figures and additional information on the Construction Sector.
http://wwf.org.hk/reports/footprint/supplement

WWF recent reports on Ecological Footprint
Living Planet Report 2010
http://wwf.panda.org/about_our_earth/all_publications/living_planet_report/
China Ecological Footprint Report 2010
http://wwf.panda.org/about_our_earth/all_publications/?uNewsID=196876
Japan Ecological Footprint Report 2009
http://wwf.panda.org/about_our_earth/all_publications/?196151/Japan-Ecological-Footprint
Hong Kong Ecological Footprint Report 2008
http://www.wwf.org.hk/en/whatwedo/footprint/

Climate and energy
WWF-Arup 2050 Carbon Reduction Roadmap
http://www.arup.com.hk/eanews/carbon_calculator/index.html
Climateers Carbon Calculator and Low-Carbon Living Appliances Guide
www.climateers.org
Low-carbon Office Operations Programme (LOOP)
https://loop.wwf.org.hk/
Low Carbon Manufacturing Programme (LCMP)
http://www.wwf.org.hk/en/whatwedo/footprint/climate/corpactions/corporate_lcmp/

Seafood
Marine Stewardship Council (MSC)
www.msc.org
WWF Seafood Choice initiative, Ocean-Friendly menus and Shark Fin initiatives
http://www.wwf.org.hk/en/whatwedo/footprint/seafood/
The Live Reef Food Fish Trade in Hong Kong and Identification Guide
http://apps.wwf.org.hk/seafood/eng/CTNI-lrff.htm

Timber and Paper
Forest Stewardship Council (FSC)
www.fsc.org, www.fscchina.org
WWF Timber and Paper, including WWF Guide to Buying Paper
http://www.wwf.org.hk/en/whatwedo/footprint/timber/
Illegal timber and Hong Kong, WWF-Hong Kong, 2011
http://wwf.org.hk/reports/timber
Global Forest and Trade Network' Guide to Legal and Responsible Sourcing (with examples of responsible procurement policies)
http://sourcing.gftn.panda.org/

General
The 10 Principles of One Planet Living
http://wwf.panda.org/what_we_do/how_we_work/conservation/one_planet_living/about_opl/principles/

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Hong Kong Ecological Footprint Report 2010

4 GLOBAL HECTARES

The Ecological Footprint per Hong Kong person is more than double what is globally sustainable on average.

74%

Amount of Hong Kong's carbon Footprint is emitted elsewhere to supply imports to Hong Kong.

3

Hong Kong's seafood consumption per person is the third highest in Asia.

1.5

The number of Earths required to produce the renewable natural resources used globally in 2007.

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