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TOWARDS –ACHIEVING THE RIO+20 OUTCOME' THE FUTURE WE WANT'-OPPORTUNITIES THROUGH 3RS AND RESOURCE EFFICIENCY MEASURES

(Background Paper for Plenary Session 1 of the Provisional Programme)

Final Draft

This background paper has been prepared by Dr Heinz Schandl for the Fourth Regional 3R Forum in Asia. The views expressed herein are those of the author only and do not necessarily reflect the views of the United Nations.

Background Paper: Towards Achieving the Rio+20 Outcome 'The Future we Want' – Opportunities through 3Rs and Resource Efficiency Measures

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Main message

The global economic context is changing and natural resources are becoming less affordable and prices more volatile. It will be more difficult to secure the resource base that will underpin future competitiveness and human development in Asia. It will be instrumental to make resource efficiency the front and centre of national development planning. 3R policies and policy instruments will be one of the most important means of achieving improvements in resource efficiency and will help steer the region towards sustainable consumption and production and achieving the sustainable development goals set out at Rio+20. Evidence based policy making that integrates economic, social and environmental objectives will support such achievements. Policies will need to provide guidance to businesses and households and guide new directions for business strategies and consumption behaviours to earn a triple dividend of increased human wellbeing, equitable development, and environmental integrity.

Rio+20 goals: renewed global support for sustainable development goals

The Rio+20 outcomes have demonstrated renewed international agreement on the importance of furthering sustainable development. It was recognized that poverty eradication, enabling sustainable patterns of consumption and production and managing the natural resource base of social and economic development are important goals for all nations. These important goals will require international collaboration, knowledge exchange and improved forms of governance to be successfully implemented. It was recognized that sustainable development will not occur spontaneously but will benefit from well designed policies that deliver a triple dividend of increased standards of living, and equitable participation in human development, based on a healthy environmental and resource base. Overarching strategies of inclusive green economy, sustainable production and consumption and sustainable use of natural resources were seen as important guidelines for the policy community across the globe to decide polices and policy instruments that are appropriate to achieve those sustainable development goals. In this context, the 3R's – reducing, reusing and recycling natural resources – and 3R policies and policy instruments will play a major role in furthering an economic transition to underpin sustainable development in Asia and globally.

A changing economic context: from labour productivity to resource productivity

For most of the 20th century economic growth and human wellbeing were enabled and fuelled by the abundance and affordability of natural resources. Resource prices were low and, for most of the 20th century, declining. Incentivized by such an economic context most businesses invested in labour productivity and were supported by national policy settings

which allowed for large increases in the output of goods and services. Increasing productivity allowed for higher wages, helped increase the material standard of living of households and supported more generous arrangements for recreation and free time. The material standard of living in OECD countries, but also in many cities in Asia, has grown impressively. In developing countries, millions of people were lifted out of poverty.
This came at a cost, however, of growing pressures on the natural resource base and how ecosystems function. The fast increasing demand for natural resources has depleted those reserves that could easily be accessed and exploited at affordable cost. While it is becoming more difficult and expensive to service the global economy with the existing natural resource base, demand for natural resources has also grown significantly over the last few decades. The emergence of new middle classes in many developing countries and the large amount of infrastructure that has been built in growing cities, especially in Asia, have meant that demand for natural resources has also grown rapidly. As a consequence, pressure points including food security, water availability, peak oil, rising prices for metals and climate change have converged in an unprecedented manner. This has created a new economic context of much higher and more volatile prices for natural resources. In order to be competitive in the future, to deliver human development outcomes and to alleviate poverty, countries and businesses need to refocus their policies and business strategies. A new focus on resource efficiency needs to replace the primacy of investing in labour productivity.

In many ways, the need for resource efficient economic behaviour is especially important in Asia because of its large population, population density, its growing dependence in sourcing natural resources from global markets, and the large need for improving the material standard of living of its people.

Progress in human development in Asia

Over the last three decades, Asia has made remarkable progress in human development and improving the material standard of living of its people. Many countries have invested in public infrastructure and urban development and have established a manufacturing base that has made Asia the ‘workshop of the world’, most notably the People’s Republic of China. Despite these remarkable developments much remains to be done in further developing the region, increasing opportunity and living standards for the millions of people who still live in poverty and disadvantage.
The success story of growing human development in Asia has come at a cost, as the amounts of natural resources used and the related waste and emissions of production and consumption activities have grown substantially. Today, Asia has a large impact on global material use and waste, energy consumption and emissions, and water and land use. This impact will increase in decades to come. The natural resource base in many countries of the region is already substantially diminished. The region has become a net importer of many natural resources, most importantly fossil fuels. The environmental impacts of consumption and production have also grown rapidly including greenhouse gas emissions, acidification and eutrophication of water bodies and soils. There have been severe impacts on forests and biodiversity, which are among the most important ecosystems in the region. This has also led to reduced ecosystem services and has brought many countries and the region as a whole much closer to the bio-capacity of their domestic natural systems.

It is increasingly understood that environment and development do not have to be viewed as competing goals, but that future development and prosperity in Asia depends on the integrity

of natural resources and ecosystems. To this end the region needs to invest in resource efficiency, which will make an important contribution to Asia's environmental sustainability and social wellbeing. Resource efficient production and consumption systems will allow countries to grow economically while reducing the resource and emission intensity of their economic growth. The largest potential for resource efficiency exists in a small number of broad economic activities including housing and construction, mobility and transport, and food and agriculture. Taken together, these sectors have the potential to deliver a large environmental and social dividend if the existing efficiency potential of 70 to 80% reductions in material and energy use and emissions can be harnessed.

While resource efficiency will underpin sustainable development, it will not be sufficient to mediate the speed and scale at which people improve their living standards and adopt a middle-class lifestyle, engaging in consumption behaviours enabled by higher and more reliable salaries. To accommodate an additional two billion middle-class consumers over the next 20 years, the region will need to invest massively in systems innovation and green economy measures. Systems innovation refers to the ability of economic systems to move beyond incremental efficiency improvements and to provide goods and services based on structurally different systems of production and consumption. New systems of provision may include renewable energy systems, water and material recycling, low energy and low carbon housing and transport systems and moving to less land intensive dietary patterns. Reduce, reuse and recycle policies will be at the heart of resource efficiency and systems innovation and will underpin Asia's prosperity and competitiveness in the 21st century.

Economic growth and natural resource use in Asia

At the beginning of the 21st century, Asia has overtaken the rest of the world to become the single largest user of materials including biomass, fossil fuels, ores, industrial and construction minerals. The annual use of materials had grown to 32 billion tonnes by 2005, out of a global total of 60 billion tonnes. Over the past 35 years, the resource base has shifted from predominantly biomass, over 50% in 1970, to mainly mineral materials, over 70% in 2005, signalling a transition from a traditional, agricultural and land based economy to an increasingly industrial and urban economy (West and Schandl, 2012).
In the 1970s and 1980s population was an important driver of growing material use. However, since the 1990s consumption has replaced population as the main driver. Material efficiency in Asia has declined substantially since the 1990s, and has contributed to growing material use combined with the growth caused by a growing population and increasing consumption. Losses in material efficiency occurred as production shifted from very material efficient countries such as Japan to less efficient countries such as the People's Republic of China and India. If unchecked, material use is expected to grow to about 80 billion tonnes per annum by 2050.

In energy use, Asia is well behind the rest of the world with a primary energy use of 180 EJ out of a global total of 480 EJ in 2005, or about one-third of global primary energy use. The region started from a very low base of 20 GJ per capita in 1970, rising to about 50 GJ per capita in 2005. The region has a growth potential to 325 EJ of primary energy use by 2050. More importantly, the primary energy base has shifted to coal and the share of renewable energy in the energy mix has decreased. This was caused by rapidly increasing demand for electricity to run newly established manufacturing infrastructure, and also emerging household consumption. Greenhouse gas emissions had reached 16 billion tonnes per

annum by 2005 and are expected to grow rapidly. Along with the use of materials, the increasing amount of waste and increases in energy and emissions, water use has grown substantially. Water use had grown to 1.5 peta litres by 2000, equivalent to about 0.55 mega litres per capita each year, with agriculture as the largest user accounting for about 80% of all water withdrawals (UNEP, 2011).

These overall trends in natural resource use have contributed to a new economic context of rising resource prices and have caused a number of temporal shortages of resources critical to production, including some metals and industrial minerals such as rare earth elements. These trends are concerning not only because of increasing prices of natural resources but also exaggerated climate change. It is also obvious to many that Asia's future growth model cannot mimic the historical growth model of today's industrialized countries. Considerable innovation will be needed to establish a new industrial system that can fuel prosperity in the region beyond the aggressive resource consumption of the old industrial system.

Human development, raising material standards of living and poverty reduction as overarching goals

The main challenges for economic and environmental policy making in Asia are the dual objectives of development and environment. The region will require future economic growth to enable an increasing standard of living for households and to combat poverty, which is still entrenched in many parts of the region. According to a recent report by the Asian Development Bank poverty reduction has been significant in the region. Despite the Global Financial Crisis (GFC) an estimated 150 million people had exited extreme poverty by 2008. The number of extreme poor was reduced from 903 million in 2005 to 753 million in 2008, which means that the percentage of people living on less than $1.25 per day has declined to 21.9% from 27.1% in 2005. The economic dynamism of the region has not only enabled a growth in new middle classes with consumption behaviours similar to OECD consumers, but has also contributed considerably to poverty reduction (ADB, 2011).
Poverty reduction has been, however, uneven across countries with the People's Republic of China in particular outperforming the rest of the region. In a number of countries the incidence of extreme poverty has been on the rise, driven by fast population growth, with poverty reduction not keeping up. In 2008, India continued to be home of the largest number of the region's poor followed by the People's Republic of China, Bangladesh, Indonesia and Pakistan. Numbers for 2009 suggest the GFC slowed progress in poverty reduction. The challenge of combating poverty in Asia remains large, with two-thirds of the world's poor living in this region.

Increasing the eco-efficiency of production in Asia through the 3Rs

One important aspect of the 3Rs, which has been addressed by academic research and policy efforts since the 1980s, is the potential for cleaner production and greater eco-efficiency of production. Reducing the natural resources used in production as well as related waste and emissions is beneficial to the environment and also saves production costs, making it an attractive strategy for businesses particularly in material, energy and emission intensive industries.
The greatest potential for eco-efficiency often exists in the heavy industry sectors of steel and cement, the building and transport sectors and in agriculture. Many other manufacturing activities also present large potential for saving resources and reducing emissions.

To give an example, most steel produced globally is produced in a small number of countries, which each have access to similar production technologies because of the global character of the industry. This should result in relatively similar production efficiencies in different producer countries, however this is not the case. The average energy efficiency in steel producing countries can vary by a factor of two between very efficient steel producers such as Germany and less efficient producers such as the People's Republic of China and India. Steel making globally uses two main types of furnaces, either a basic oxygen furnace (BOF) or an electric arc furnace (EAF). The latter uses one-tenth of the fuel, one-eighth of the water, one-fifth of the air and less than one-fortieth of other materials compared with traditional basic oxygen blast furnace steel plants. This indicates that there is large potential for reducing resource use and emissions in an industry which contributes an important share to global natural resource use and emissions. There are similar reduction scenarios for the cement industry, which produces around 3.5 billion tonnes of cement a year, 60% of which are produced in the People's Republic of China and India alone. Strategies for improving the eco-efficiency of the steel industry include fuel switching, heat and power recovery, and using renewable energy as well as investments in water and material productivity.

The building, transport and agricultural sectors also offer large potential for savings, especially in the use phase of buildings and for mobility. The saving potential may be as large as 70% to 80% for many natural resources without reducing the level of service or comfort. This offers a window of opportunity for Asia. The amount of infrastructure, buildings, roads and manufacturing capacity that will need to be established over the next three decades is considerable, offering very large potential for investing into cleaner production and green infrastructure. This will require additional investment for lower income countries and the redirection of existing investment in emerging economies to 3R activities and a green economy.

New consumers and the 3Rs

Reducing, reusing and recycling in Asia have two important aspects, the need to attend to under-consumption (see above) but on the other hand, the growing consumer classes and their very high consumption levels. Lifestyles and consumption patterns of millions of consumers in Asian developing countries are now converging with those of OECD countries. This is particularly the case among younger and well-educated elites. This global consumer class already totalled 1.7 billion people in 2004 (Worldwatch Institute, 2004) of whom almost 40% or 680 million lived in Asia.
The consumption patterns of the new consumer classes will result in larger houses and apartments fitted with new appliances, new modes of transport and increasing private car ownership, increased air travel, new diets based on much larger amounts of meat and dairy and a whole range of manufactured goods. There is an important opportunity to guide the transition in consumption in Asia towards sustainability through policy settings and frameworks that privilege environmentally friendly and socially just products and services. This can happen through labelling, subsidies and information campaigns, which are all areas in which government intervention will be of great importance.

Governments are able to showcase best practice in their own consumption behaviour through green procurement and investment in energy efficient and low material intensity public buildings such as government offices, schools and hospitals and public infrastructure

for transport and recreation. These are investments which will greatly pay off in terms of sustainable natural resource use and climate change mitigation.

Absolute and relative decoupling – getting more from less

Decoupling of economic growth and environmental pressures and natural resource use is commonly seen as an important strategy to align economic and environmental objectives. Decoupling refers to providing more products and services with less resource use and at lower emissions. In other words, decoupling refers to an economic situation where GDP grows faster than environmental pressures and impacts. Usually, a distinction is made between absolute and relative decoupling. Absolute decoupling occurs when economic activities grow while the natural resource base and related emissions decline, i.e. the scale of the economy in terms of natural resource throughput declines. Absolute decoupling helps to achieve reduced environmental impacts such as resource depletion, loss of biodiversity, water depletion and climate change.
Relative decoupling occurs when economic activity grows faster than environmental pressures and impacts. In other words, the efficiency of natural resource use is increased. The 3Rs play a major role in achieving decoupling through reducing resource inputs but also through investment in recycling and reuse of natural resources.

For Asia, relative decoupling and resource efficiency will be the main objective. Because of the large development needs in the region a situation of absolutely reducing natural resource use is not foreseeable for the next two to three decades. Large gains in resource efficiency are feasible in Asia and will be achieved through investment into resource efficient urban housing and transport infrastructure, renewable energy systems and sustainable agriculture and diets. This will help minimize the environmental and economic costs of human development of the region.

Production versus consumption

Environmental pressures such as material and energy use, water use and emissions can be measured in two ways. They can refer to the production of goods and services that occurs in a national economy (territorial or production side accounting) or alternatively they can be attributed to final consumption in a country (consumption side or footprint accounting). Economies that produce a large amount of goods and services for export will have high production based indicators but may have lower consumption based indicators. Countries that import a large share of goods and services rather than producing within the country will appear to have low production based indicators but will show much higher footprints once all natural resources and emissions required for final consumption in that country have been attributed.
Material consumption for a number of Asian economies (including Australia) using domestic material consumption (DMC) as an indicator shows large differences among countries. Australia shows very high material use on a per capita basis, at about 50 tonnes, compared to much lower per capita use in the People’s Republic of China (18 tonnes) and Japan (10 tonnes).

Once material use is attributed to final consumption in a country and expressed by the material footprint (MF) indicator we see Australia at a much lower per capita level of around 35 tonnes and Japan at a much higher level (25 tonnes). This reflects the different roles the

two countries play in the global economy. Australia is a net exporter of natural resources while Japan imports most of its natural resources and therefore shifts some of the environmental burden of its resource intensive consumption to third countries.

3R policies will underpin future competitiveness in Asia

Asia has been the motor of world economic development for the past two decades, securing its place as a global centre of manufacturing. The region hosts around two-thirds of the world's people and about half of the world's consumers. The region has lifted millions of people out of poverty and continues to grow steadily. The economic transition in Asia is happening in an economic context that former World Bank economist Herman Daly has named 'full world economics' (Daly, 2007). This reflects upon an economic context in which natural resources and the absorptive capacity of ecosystems have increasingly become the limiting factor in economic growth and human development. While labour is available in abundance, resources will need to be extracted at ever-higher effort and climate change is setting clear limits on emissions.

In such a new economic context, governments, businesses and households need to care about resource efficiency and change to new ways of producing and consuming, to make room for further growth and prosperity. The changing context indicates that environment and development are no longer antagonistic goals but are intrinsically interrelated. Without resource efficiency and innovation for 3Rs, future prosperity will be increasingly difficult to achieve. Asia has a number of advantages in creating a green economy. These include its traditional culture, which is affirmative of sustainability, its people, many of them well-educated and ready for innovation, and the fact that a lot of the infrastructure required for the future has not yet been established, creating a huge window of opportunity for doing things well. Well-designed policies that guide green economic development, enabled by reducing, reusing and recycling, may well be a future economic driver and continue to create competitive advantages in the region.

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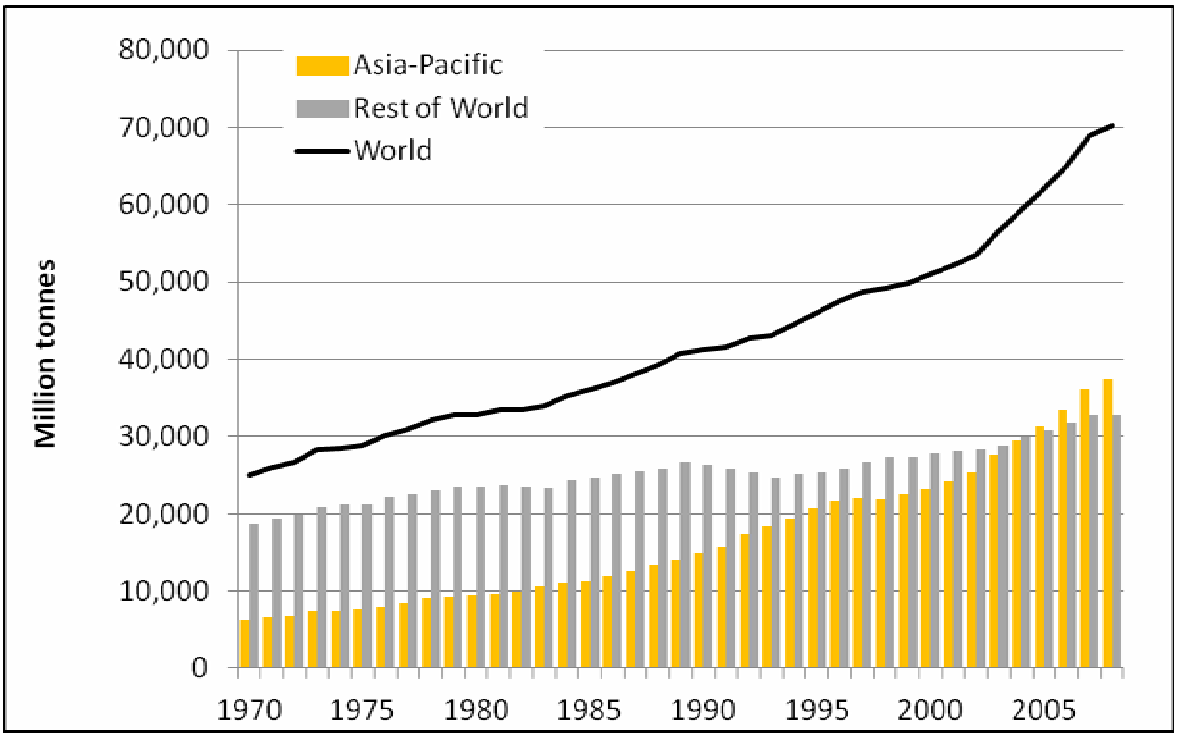
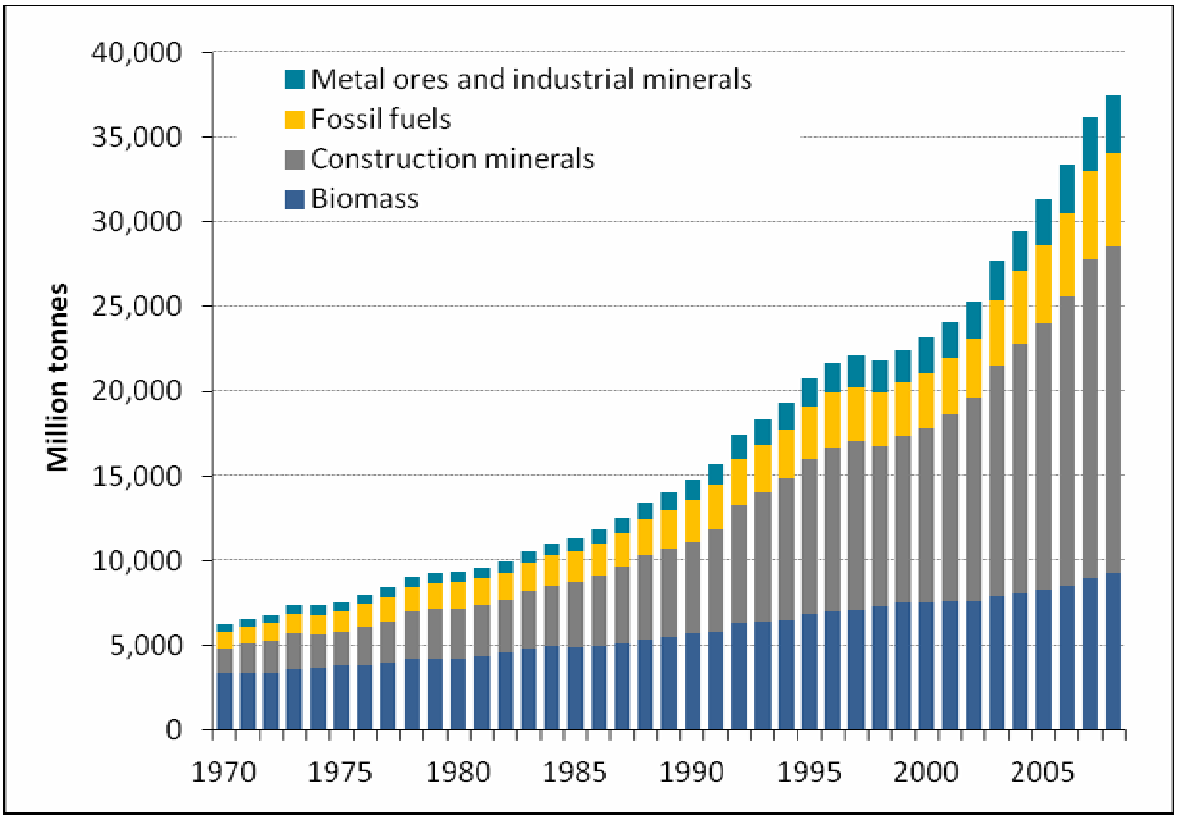
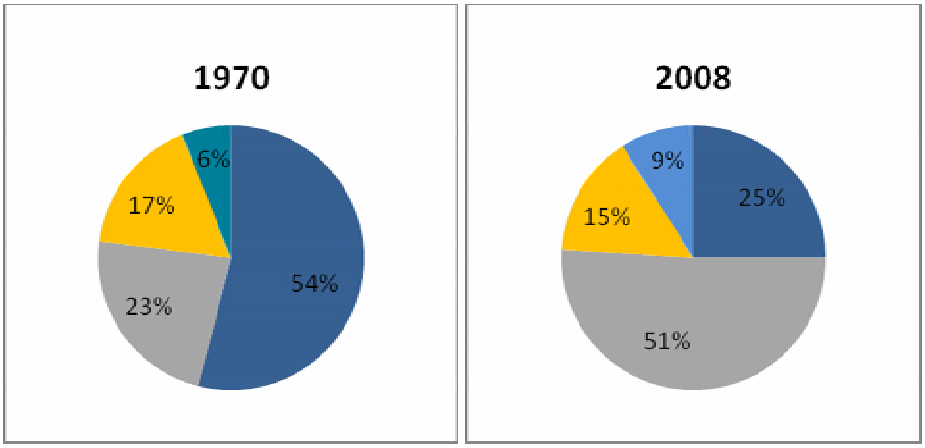
Domestic Material Consumption (DMC) in Asia-Pacific and the World, 1970 – 2008, in million tonnes



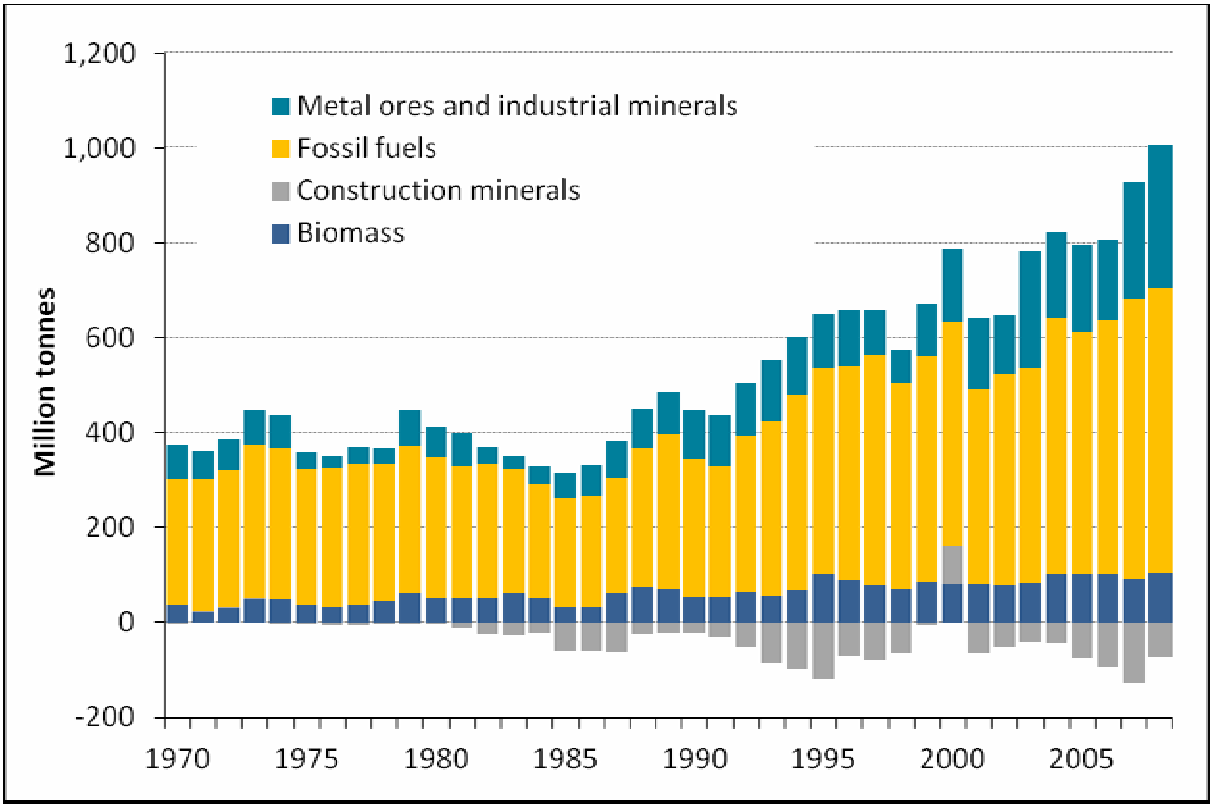
Domestic Material Consumption (DMC) in Asia-Pacific by main material categories, 1970 – 2008, in million tonnes



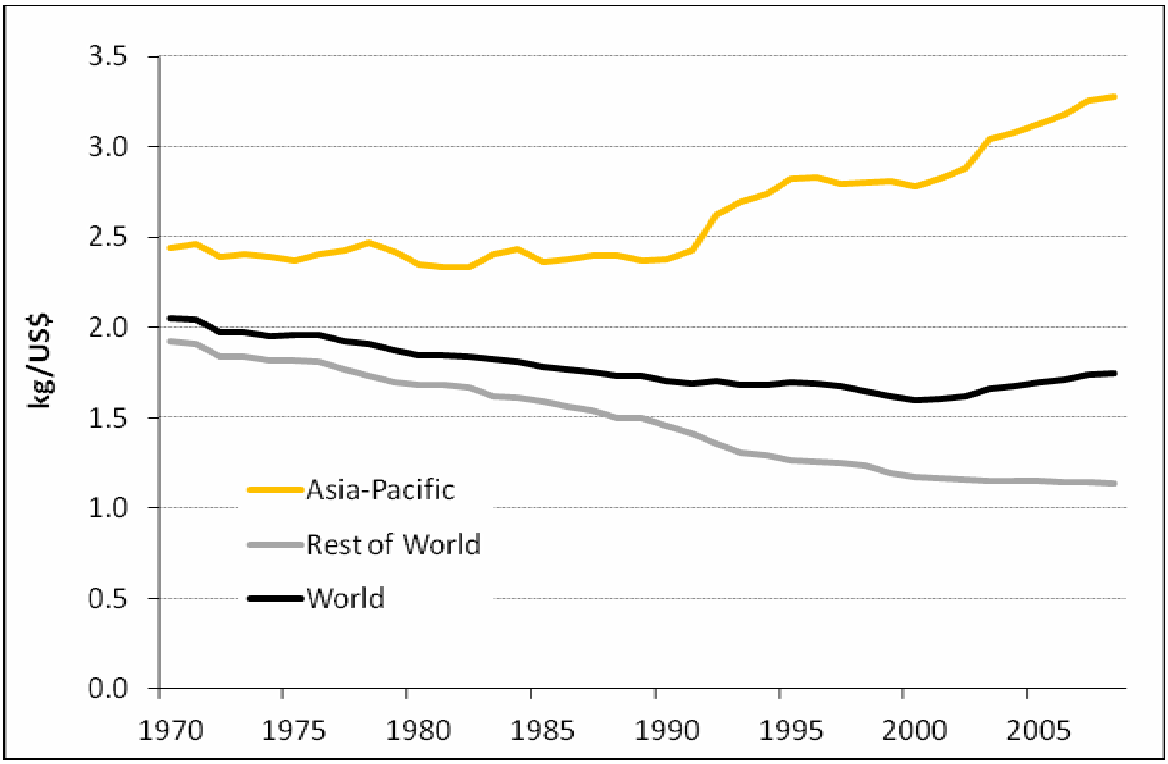
Domestic Material Consumption (DMC) in Asia-Pacific by main material categories, 1970 and 2008, in million tonnes



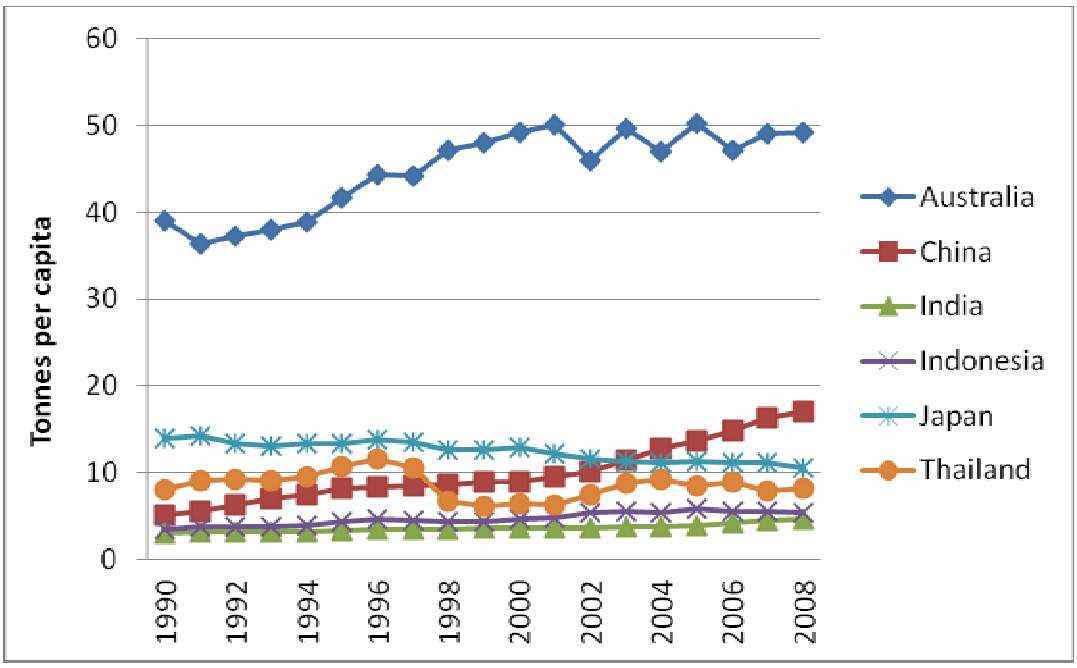
Physical Trade Balance (PTB) in Asia-Pacific by main material categories, 1970 – 2008, in million tonnes



Material intensity in Asia-Pacific and the World, 1970 – 2008, in kg per US$



Per-capita Domestic Material Consumption (DMC) for selected countries in Asia-Pacific, 1990 – 2008, in tonnes



Per-capita Material Footprint (MF) for selected countries in Asia-Pacific, 1990 – 2008, in tonnes