Green Asia country report: Myanmar

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1 Policy summary

Development planning in Myanmar would benefit from a strong focus on the principles of sustainable consumption and production to guide investments into institutions, policies and strategies to manage the country’s transition to a middle income economy in a way commensurate with the SDGs.

1) Myanmar still has very low material and energy inputs on a per capita basis, especially when adjusted to take account of where final consumption actually takes place. Myanmar's current level of material footprint per capita, at around 1.7 tonnes, is only around one ninth the level generally required to achieve a high level of human development. Given this, it is important that any general "messages" regarding the path to more sustainable development be tempered by the reality that Myanmar, in common with a number of SWITCH-Asia countries, is currently consuming much less than it will ultimately need to. While making efforts to improve the efficiency with which materials are used is always a central and appropriate recommendation to any government, in the case of countries like Myanmar this message should not be extended to suggest that it is also possible, or even desirable, for them to consider reducing or even stabilizing their absolute levels of consumption at this point or in the near future. Such goals probably only make sense for nations above a level of 15 tonnes of material footprint per capita. There needs to be convergence between current low-income and high-income countries in terms of their resource availability, albeit at a level much lower than current high-income countries rely upon.

2) The current level of urbanization in Myanmar is relatively low, and urban housing and transport infrastructure is lacking. Future growth of Myanmar’s cities can be expected and it will be important for the country to invest in built and transport infrastructure that, as far as possible, implements design principles and technologies that will create sustainable and liveable cities. There is a window of opportunity, if policies and standards are set appropriately, to achieve good urban outcomes that will have a lasting legacy for the attractiveness and competitive strength of Myanmar’s cities. Cities are also the places where changes in incomes, lifestyles and consumption occur first and embarking on policies, examples and practices that facilitate environmentally sustainable consumption behaviours early in the transition process would be beneficial for the country.

3) Myanmar’s very low per capita material and energy consumption combine with its relatively moderate population density to give low environmental impacts for a SWITCH-Asia country. This leaves Myanmar with considerable room to expand its extractive and production activities without reaching the intensities of deleterious environmental impacts which are commonplace elsewhere in its region. As the nation industrializes, the balance between the relative social and economic benefits achieved by simply expanding extractive industries, as opposed to the alternative of using the country’s natural resource as inputs to higher value added products, should be constantly re-assessed.
4) The earlier options for moving up value adding chains are considered, the better. This is because the physical and social infrastructure appropriate for continued expansion of primary industries for export will, in many cases, be different to that required for using those resources as inputs to local secondary industry. In addition to the possibility of being "locked in" to infrastructure inappropriate for further value adding, elements of institutional and contractual lock in will also occur. Land tenure arrangements most suitable to encourage expansion in forestry may disadvantage other primary industries (or an area’s value for tourism), and vice versa. Also, while the development of a new local extractive enterprise can provide opportunities for the development of other local industries, if the output is fully committed to export via long-term supply contracts it is effectively lost as a potential input to local industry.

5) If major expansion in extractive industries is to be central to Myanmar’s near- to medium-term development, it will be important to pay attention to governance issues directed at maximizing the benefits of the resultant income for the society as a whole. Major extractive industries in the modern setting tend to be very capital-intensive, while providing only limited employment opportunities, usually for highly-skilled workers. As a result, the benefits of such projects can flow to a very limited sector of a society, while deleterious impacts can end up falling disproportionately on a larger, and largely separate, group.

6) In common with many smaller developing countries, the state of statistics on physical and economic indicators for Myanmar in the main international databases is questionable. This makes forming meaningful comparisons with other countries, and monitoring progress against sustainable production and consumption goals, difficult and provisional. Options for upgrading Myanmar’s capacity to report these statistics in a standardized fashion should be explored.

7) Myanmar’s recent growth pattern is characteristic of a country entering the rapid acceleration phase of the socio-metabolic transition from an advanced agrarian to an industrial society. To help ensure that this transition takes place with a view to long-term sustainability, attention should be paid to building the capacity of the local tertiary education system to deliver expertise in disciplines relating to green growth. Perhaps more importantly, capacity to provide suitable vocational education programmes, able to produce sufficient numbers of local skilled workers with the technical expertise necessary to competently use modern materials and techniques, will need to be in place if new infrastructure is to be built in the most environmentally and socially sustainable way.
2 Introduction

Despite having embarked on a period of very rapid economic growth commencing in the late 1990s, Myanmar remains the second poorest of the SWITCH-Asia countries.

Myanmar remained in the low human development category (as measured by UNDP) in 2013, and had a per capita income of $465 in 2013 (constant 2005 exchange rate basis), a life expectancy of 65.2 years and a mean of 4.0 years of schooling (UNDP, 2014).

The growth of three key economic indicators for Myanmar since 1970 is shown in Figure 1. The first two decades appear to have been a period where growth in the economy was often less than that required to raise per capita living standards at all, with steady population growth of over 2% per year compounding, and volatile economic growth, which included an initial growth spurt followed by a protracted contraction in the mid to late 1980s, averaged around the same overall. The resumption of growth in the late 1980s coincided with the initiation of market-based reforms in the agricultural sector from 1987. Over the 23 years from 1990 to 2013, GDP grew at 4.6% per annum compounding, while the corresponding growth rate for population slowed to around 1% p.a., yielding a very rapid increase in affluence averaged over the nation as a whole, with GDP per capita increasing sixfold.

The rapid growth since 1990 was accompanied by major changes in the underlying structure of the economy. From data in UNSD (2015) it can be ascertained that the importance of the value added in the combined agriculture, hunting, forestry, and fishing sectors decreased greatly, from 60% of GDP in 1990 to 36% in 2013, despite the total value added in these sectors increasing by over 350%. Manufacturing grew very strongly in both share and absolute terms over the same period, from 7% to 20% of GDP, as did the combined transport, storage and communications sector, from 5% to 15% of GDP. Mining and utilities combined remained insignificant, equal to approximately 1% of GDP in 2013.
Household consumption's share of domestic final demand\(^1\) decreased from 80% in 1990 to 57% in 2013, while capital investment increased from 5% to 30% over the same period. Government consumption decreased somewhat (in share terms) from 18% to 15% of domestic final demand, but increased almost 450% in absolute terms.

The trends described above imply that while the material standard of living should, on average, have improved markedly in Myanmar, some of the short term gains in living standards that could have been realized by higher consumption in the present have instead been deferred and channelled into a disproportionately strong growth in investment. While lowering present day living standards in what is already a very poor country, this dynamic should act to strengthen Myanmar's growth and ongoing improvements in productivity into the future. It is notable that the value of both exports and imports of goods and services recorded in UNSD (2015) for 1990 and 2013 show the ratio of exports to imports moved strongly towards greater exports. Where Myanmar earned only $0.32 for every dollar spent on imports in 1990, by 2013 it earned $0.70 for each dollar spent on imports of goods and services.

Exchange rate based GDP per capita values tend to greatly understate local purchasing ability for low-income countries, so a purchasing power parity (PPP) basis has been provided as well, in Figure 2. Here we see that Myanmar's exchange rate based GDP per capita of US$464 in 2014 actually had a local purchasing power over ten times that, equivalent to $4706 spent in the US\(^2\). This is important in establishing a more realistic idea of the real material living standards achievable locally.

\(^1\) Domestic final demand is defined as Final consumption + Gross capital formation. It excludes demand required to produce exports, and the complex webs of intermediate demand which are required among industries to produce goods and services at stages prior to their final consumption or investment.

\(^2\) The PPP basis used for Myanmar is different to that quoted for most of the SWITCH-Asia countries, as there was no UNSD PPP figure available for Myanmar. The PPP figure used for Myanmar was sourced from IMF World Outlook data.
Any assessment of how the structure of Myanmar’s economy has evolved over the past four decades needs to remain cognisant of the fact that, in common with many poorer nations, the country’s capacity to record complete statistics may have been more or less limited over time. This means that some apparent changes may in fact be partly a result of changes in the scope and quality of the statistics kept. For example, activities which were not previously well recorded, as part of an informal, barter, or "black" economy, may increasingly be regularized and recorded over time, increasing the apparent growth of an economy over that which really took place.
3 Material use, waste, material efficiency, trade dependency and extractive pressure

Material inputs rose sharply from the mid to late 1990s, in tandem with the commencement of the period of rapid growth in GDP noted previously. Rather than compounding, the rate at which material use increased actually slowed from the mid-2000s, despite ongoing rapid economic growth. This is very positive in that it indicates substantial, rapid improvements in resource efficiency.

Material inputs to Myanmar’s economy were dominated by domestic extraction for the entire period 1970 to 2015, with imports constituting less than 3% in total tonnage terms for all years. This is not the case for all individual materials categories however, with imports constituting as much as 30% of Myanmar's metal ore requirements in the past (1979) and still constituting 22%, while reliance on imports of fossil fuels was 36% of DMI in 1970, although it is currently less than 3%. Imports of biomass remained less than 1% of DMI in this category for the entire study period, and Figure 3 shows that biomass continues to dominate DMI. The fact that the relative shares of the different categories of material in DMI did not really begin to change much until the late 1990s indicates that Myanmar has only recently begun to embark on the socio-metabolic transition from agrarian to industrial society, with the main signature of increasing industrialization being near doubling in the share of fossil fuels since 1998 (from 3.8% to 7.2%), although the share of biomass has hardly changed at all, still at 79% in 2013, from what it was in 1970.

![Figure 3 Direct material input to Myanmar’s economy, by four material categories, 1970–2015, thousand tonnes](image)

Comparing Figure 4 to Figure 3 shows that Myanmar’s material footprint was much lower than DMI by the end of the study period, having started only slightly higher than DMI in 1990. This indicates that a large and increasing portion of the country’s DMI is being input to products which are ultimately consumed elsewhere, with considerably less materials of foreign origin embodied in Myanmar’s imports.
Figure 4 Material footprint of consumption of Myanmar by four material categories, 1970–2015, thousand tonnes

Figure 5 shows the manufacturing sector dominating the MF of industrial sectors in Myanmar’s economy, followed by services then agriculture. This is somewhat unexpected, given the prominence of biomass flows in the national economy, and the usual association of large service sectors with more developed economies. The magnitude of manufacturing’s input is perhaps unexpected, and might be associated with classification of some fairly basic primary resource beneficiation activities as manufacturing.

Figure 5 Material footprint of consumption of Myanmar by six main economic sectors, 1990–2015, thousand tonnes

Per capita, the economy of Myanmar uses much less materials than the regional average. The material footprint of consumption would need to increase eightfold to come up to the levels usually associated with a high level of human development.

The material inputs to Myanmar’s economy, compared to the average across SWITCH-Asia countries, is still relatively low, estimated to be only 3.6 tonnes per capita in 2015, less than one third of the SWITCH-Asia average of 11.8 tonnes per capita (see Figure 6). The gap between the
The material footprint is a proxy for the material standard of living in a country, and measures the amount of primary resources attributable to final demand in a country (consumption and capital investment), including those materials indirectly embodied in trade. To illustrate the idea of embodiment as used here, material footprint attributes materials used “upstream” to the nation where final consumption takes place. For example, the iron ore, coal, and other inputs used to produce a steel beam which is then exported will mainly be attributed to the nation where that beam is finally used, rather than to the country where the iron ore and coal were mined and/or used to produce the beam.

A “high level of human development” for a country is here delineated as an average life expectancy of 75 years, 10 years of schooling, and a per capita national income of $28,000 in PPP terms. In 2010, the average level of material footprint required to achieve those three goals was approximately 15 tonnes per capita.
period. Also, the increases in world primary commodity prices which have characterized much of the new millennium to date should also have acted to decrease Myanmar’s material intensity. The trend for (trade) adjusted material intensity\(^5\) is broadly similar to that described for material intensity, except that the convergence towards the SWITCH-Asia average commences almost a decade earlier, and is effectively completed by the year 2000, since which time Myanmar’s adjusted material intensity has continued to improve, and is now marginally lower than the regional average.

\[\text{Figure 7 Material intensity of production and consumption in Myanmar and SWITCH-Asia, 1970–2015, kg per US$}\]

In Figure 8, the domestic material consumption (DMC) indicator is used to illustrate the long-term waste potential of Myanmar. DMC shows territorial consumption of materials, some of which may pass through the economy from input to waste quickly (e.g. metal ores processed to produce saleable metal), while others may reside as a part of the active economy for years (e.g. construction materials invested in infrastructure). In all cases, that which is consumed territorially will generally need to be sunk back into the local environment as some form of waste at some point, thus the idea of long-term waste potential. Two measures have been used to illustrate different aspects of the long-term waste potential issue, one which uses a per capita basis, and a second that measures intensity per unit of land area, or spatial intensity. Figure 8 shows that Myanmar’s long-term waste potential doubled on a per capita basis, and quadrupled in spatial intensity, over the study period. Nevertheless, relative to SWITCH-Asia averages, both the individual contribution per capita, and the spatial intensity of waste stocks and flows in Myanmar are very low, and declining in relative terms when compared to SWITCH-Asia averages. The spatial intensity measure indicates that Myanmar should have considerable room to increase material

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\(^5\) Adjusted material intensity uses material footprint rather than domestic material consumption as the measure of material consumption, and so takes account of materials embodied in trade.
flows before it encounters anything like the environmental pressures which are increasingly widespread in some SWITCH-Asia countries\(^6\).

\[\text{Figure 8 Long-term waste potential of Myanmar (DMC/ha and DMC/cap), 1970–2015, tonnes per ha and per capita}\]

\(^6\) While spatial loadings of waste are relatively light in Myanmar, this is an average taken over the whole country. As such, it takes no account of local concentrations, and so does not discount the likelihood that high waste loadings will occur in localized areas.
4 Energy use, energy security, renewable energy and energy efficiency

Myanmar is notable for the degree to which its per capita energy consumption has remained almost static since the 1970s, in a region that has seen massive growth in per capita energy use. Myanmar's society remains remarkably energy poor, indicating that there has been very little substitution of capital for labour in the economy, and also highlighting a continuing low material standard of living for most households. Where Myanmar's TPES in 1970 of 11.9 GJ per capita was around three quarters of the SWITCH-Asia average, by 2013 it had increased to only 13.1 GJ per capita, less than one quarter of the corresponding regional average (see Figure 9). The difference between Myanmar and the region as a whole is even greater for the energy footprint, i.e. the amount of energy that is utilized for final consumption and building infrastructure in the country. Energy footprint in 2013 was 2.6 GJ per capita, 7% of the SWITCH-Asia average of 36.2 GJ per capita.

![Graph showing per capita TPES and energy footprint of Myanmar and SWITCH-Asia, 1970–2015, GJ per capita]

In Figure 10 we see that the energy systems of Myanmar are still dominated by those typical of an agrarian society, underpinned by biomass (here grouped into the non-hydro renewables category). Non-hydro renewables still constituted 70% of TPES in 2013, down from 80% in 1970. The TPES of fossil fuels, especially natural gas, has nevertheless grown both in absolute terms, and as a share of the overall energy supply, so that by 2013 coal, petroleum, and natural gas together accounted for 27% of TPES, up from 19% in 1970. Significantly from both balance-of-payments and energy security perspectives, Myanmar became much more self-sufficient in fossil fuels over the period, with imports decreasing from 36% in total tonnage terms in 1970, to less than 3% by 2013.
While the shift away from traditional, biomass-based energy systems appears to have been slow over the period, the efficiency with which Myanmar is converting TPES to GDP increased rapidly. Figure 11 shows Myanmar's energy intensity effectively converging to the SWITCH-Asia average by 2010, after a period in the early 1990s where its energy intensity was over three times the regional average. Myanmar's adjusted energy intensity (using EF rather than TPES as the metric) also improved strongly, however in contrast to TPES, Myanmar's adjusted energy intensity had only been slightly higher than the SWITCH-Asia average in 1990, and by 2013 was only one third the regional average, indicating an extraordinary apparent improvement in energy efficiency.
5 Emissions, air pollution and climate change

Before any real conclusions can be reached regarding Myanmar's GHG emissions performance, current data on the GHG emissions attributed to the country should be reviewed and checked against any national statistics held at the national statistical office.

The statistics used for GHG emissions for Myanmar are sourced from the European Commission's EDGAR database. Reasonable data on both the breakdown of GHGs by gas type, and by economic sector, exist for most countries for the period up to 2008, although it appears even within this timescale there have been some changes in accounting methods and the scope of gases included. From 2008 on, a detailed sectoral breakout is missing, while data on actual GHG component gases ends in 2012. In assembling the database for the SWITCH-Asia countries, a number of assumptions and scaling options were adopted to derive both the sectoral and component gas compositions of each country's emissions, while data from 2012 onward used a simple technique of forecasting based on forecast future growth in GDP and population, and the elasticity of increasing energy use with regard to both population and affluence (GDP/capita). This method appears to provide reasonable results for larger and more stable economies with broad-based and steadily-growing economies. It does not work well for countries where annual GHG emissions can be profoundly affected by forest fires, and works even less well if such effects were strong immediately prior to the period of forecasting (2013 to 2015 for GHGs). Myanmar is definitely affected by the forest fires factor. Working through the existing statistics with any relevant local authorities should be done prior to defining detailed breakouts of GHGs by either gas type or economic sector.

Aggregated GHG territorial emissions and GHG footprints are presented in Figure 13. The distinct spikes seen for years such as 1983 and 1992 are likely associated with major forest fire events. Interestingly, since the early 1980s there has been an overall downward trend in GHG emissions. As the use of fossil fuels first rose then stabilized over this period, the cause of this downward trend is likely to be associated with ongoing land-use changes over the period which had lower GHG signatures.

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7 The apparent consistent increases towards the end of the time series is largely a direct result of the final three years being projections from economic growth data, rather than actual measured GHG data. Steady economic growth over these final three years will necessarily project steady GHG increases.
In Figure 13 we see the effect of the steady downward trend in GHG emissions from the 1980s combining with strong economic growth in the new millennium to jointly produce a profound reduction in GHG intensity, with the 2013 GHG intensity being less than 8% of 1990 levels, however even after this improvement, GHG intensity remained very high, almost nine times the SWITCH-Asia average in 2013. Using the GHG footprint metric instead, the adjusted GHG intensity of Myanmar was much closer to the regional average, less than double.
6 Water and wastewater

It is important to note that any analysis relying on the available international statistics on water should be regarded as highly tentative. Data on water extraction and use is the sparsest and least frequently updated basic data of all used for this report.⁸

Figure 14 shows Myanmar's level of water withdrawals per capita as 40% higher than the SWITCH-Asia average in 1970, then improving over time to be 40% lower in absolute terms by 2013, although the regional average also improved so that Myanmar's relative use was still 16% above the regional average but by around 2008 water consumption had converged to the average and remains there. Part of the apparent decline in per capita water withdrawals is a direct result of a steady increase in population, while the figure recorded for total water withdrawals was only updated at two points over the entire period. The degree to which this improvement reflects reality would ideally need to be verified against any information on water withdrawals which might be held by the national statistical office.

Reflecting a pattern common among many poorer countries, Myanmar's water footprint was lower than its direct extractions, and was lower than the SWITCH-Asia average over the full period, by a margin ranging from 20% to 70%.

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⁸The FAO’s Aquastat database has been selected as the standard here. An alternative source would be the World Bank’s WDI statistics. The two have different categorizations, and can diverge quite widely from each other even after aggregation. For most countries there are three or fewer data points available for any full time series. Furthermore, unlike materials, energy and GHGs, it is not reasonable to assume a consistent growth trend over time, as withdrawal levels in any particular year can be much higher or lower according to whether the year the data were acquired was wet or dry. As a result, the values for water extraction recorded for most years have usually been obtained by simply filling with the nearest real data point. Also, water availability is to some extent naturally capped for a country, and not subject to arbitrary, large scale expansion by investing more in extraction infrastructure.
The relatively consistent improvement in Myanmar’s water intensity (water extracted per US$ of GDP) seen in Figure 15 partly reflects recorded water withdrawals being updated only twice over the full study period, while annually recorded GDP generally increased. Water intensities based on total withdrawals improved very rapidly for the SWITCH-Asia group as a whole, with the result that despite rapid improvements in absolute terms, Myanmar’s intensity remained around five times the regional average over the whole period. A similar situation existed with regard to water footprint per US$, where Myanmar's intensity relative to the SWITCH-Asia average changed only marginally, from just over 4.1 times the regional average in 1990 to 3.7 times by 2013.
In Figure 16 we see that the HDI for Myanmar improved steadily from 1990 through to 2010, then slowed through to 2013. The improvement in HDI averaged 1.8% p.a. compounding. Per capita material footprint increased at a marginally slower rate, 1.5% p.a. over the same period, while EF and GHGF both increased at a much slower rate, 0.2% and 0.8% p.a. respectively. This indicates that Myanmar is becoming more efficient at achieving increases in human development for a given input of materials and energy, or emission of GHGs.

Figure 16 HDI, per capita material and energy use, per capita GHG footprints for Myanmar, 1990–2015, indexed (1990=100)
References


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