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Green Asia country report: Mongolia

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1 Policy summary

Development planning in Mongolia 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) Mongolia has relatively high inputs of energy and (especially) materials on a per capita basis, with materials usage higher than most of the World's richest countries. Even when adjusted to take account of materials actually used for final consumption in other countries, Mongolia's materials consumption is at a level which is generally thought sufficient to support a high level of human development. Despite this, Mongolia has only attained a medium level of development as measured on the HDI index. This indicates that Mongolia may not be using its relative abundance of natural resources in a manner which most efficiently benefits its average citizen. There is potential for public policy in Mongolia to support processes by which the primary natural resources endowment of Mongolia is used in secondary industries and for institutions that support gain sharing and avoid an unequitable development pathway.

2) Mongolia's high per capita material and energy consumption does not translate to high average environmental loadings on a spatial basis. This is due to Mongolia's very low population density. Mongolia's emissions and long-term waste legacy are very low per unit area of land, over an order of magnitude lower than the average loadings commonly seen elsewhere in Asia. Mongolia as a whole remains under relatively light pollution loadings, and could expand extractive industries greatly without approaching the average waste loadings commonly seen elsewhere, however this is not true for the entire country. Rapid urbanization and concentration of a formerly nomadic population in Ulaanbaatar has led to major localized problems with both air and water pollution, which need to be addressed. Policy frameworks for tackling urban air pollution and investment in urban built and transport infrastructure need be directed to low carbon resource efficient infrastructure that also benefits lower income groups in the city.

3) Mongolia's development in the new millennium has been oriented towards becoming a high volume exporter of relatively low unit value bulk commodities. While extractive industries can provide much needed income for development, 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 may also occur. Land tenure and water access arrangements most suitable to encourage expansion in mining may disadvantage other primary industries (or devalue areas that have a high amenity 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. Managing a transition from a primary industry and export focus to secondary industries is a difficult policy issue and may be hampered by capacity gaps in the institutional and governance capacity of Mongolia. The country would profit from policy support and capacity development including human and financial capacity development activities to manage an economic development path that is based on a broad portfolio of economic activities. If this was achieved, the Mongolian Government’s budget would be less vulnerable to price fluctuations on global commodity markets.

4) As a major expansion in extractive industries seems set to continue as a key plank in Mongolia's longer-term development, it will be very 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 direct 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. Avoiding or ameliorating this situation would seem a logical priority to be addressed by government policies. This may include skills development of local workers enabled by a trust fund that could manage a share of the proceeds of mining to support secondary industries and training.

5) Mongolia's recent economic history and geographical situation make it an unusual case among the SWITCH-Asia countries. The combination of extremely low population densities and low total population, rich mineral endowment, low intensity / extensive nomadic grazing-based agricultural systems, strong societal and economic connections to the USSR until the collapse of that economic and political system, and the need to totally reorientate its trading relationships and economic system subsequent to that event, have left Mongolia with a unique legacy of relative advantages and disadvantages. As a consequence, the extent to which Mongolia can learn from the experiences and strategies of other nations in the region will be limited, certainly with regard to adopting any "off the shelf" blueprint for development. It seems likely that Mongolia will need to be unusually pragmatic, flexible and innovative in finding the pattern of development which best serves its people.

2 Introduction

Mongolia ranked slightly below the middle of the SWITCH-Asia group in terms of GDP and population growth over the study period. While GDP per capita increased fourfold, Mongolia ended the study period ranking lower among the SWITCH-Asia group on this basis, 7th of 17 in 2015 compared to 5th of 17 in 1970.

Mongolia was in the medium human development category (as measured by UNDP) in 2013, with an HDI of 0.70, a life expectancy of 67.5 years and a mean of 8.3 years of schooling (UNDP 2014). GDP per capita was $1796 (US$ constant 2005 exchange rate basis).

The growth of three key economic indicators for Mongolia since 1970 is shown in Figure 1. There was a major economic shock in 1989 which carried over into the early 1990s, coincident with the dissolution of the Soviet Union, with which Mongolia had close economic ties. The recovery from this shock was slow, with GDP not regaining 1989 levels until 2001, and GDP per capita not recovering until 2004, by which point Mongolia's formerly slow recovery transformed into a period of very rapid growth, as part of the sustained growth throughout the region driven by the rise of China. The growth rate from 1970 to 2001 averaged 3.6% p.a. compounding, a rate which increased to 8.6% between 2001 and 2013. In contrast, the rate of population growth slowed from 2.1% p.a. to 1.3% p.a., so that the contrast between the earlier and later periods with regard to affluence was even greater, with GDP per capita growth of 1.5% p.a. over the earlier period increasing to 7.2% p.a. in the new millennium.

The rapid growth since the early 1990s was accompanied by some 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 28% of GDP in 1990 to 15% in 2013, with the total value added in these sectors increasing by half over that period. Mining and utilities, manufacturing, and combined transport, storage and communications all decreased as a percentage of GDP, with growth in share limited to wholesale, retail trade, restaurants and hotels (from 8% in 1990 to 14% by 2013), and "Other Activities", which increased by 4 percentage points. Another structural change was total value added, which was smaller as a percentage of GDP in 2013 than it had been in 1990.

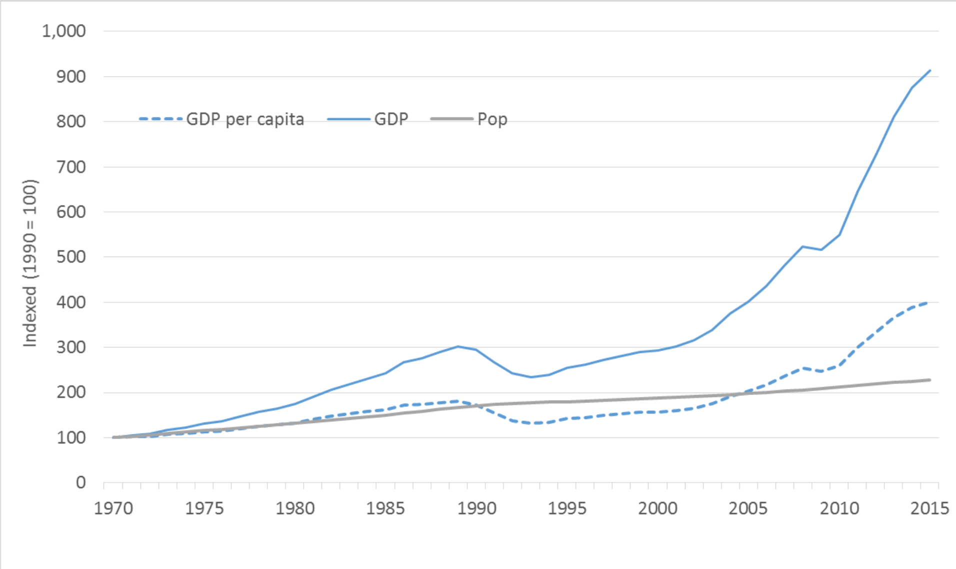

Figure 1 GDP, population and affluence (GDP per capita) for Mongolia, indexed (1970=100)

Far more significant changes relate to the changing balance between final consumption and capital investment, where the former decreased from 89% to 58% of their total, while gross capital formation increased almost fourfold in share terms (from 11% to 42%), and more than twelvefold in absolute terms, between 1990 and 2013. Government final consumption in particular decreased radically, from 33% to just 5% in share terms, and halving in absolute terms (from $762 million in 1990 to $381 million in 2013).

The trends described above imply that much of the short term gains in living standards that could have been realized by higher consumption in the present are being deferred and channelled into investment for the future. While retarding improvements in material living standards in the short term, the bias towards investment should strengthen Mongolia's growth and improve productivity over the longer term.

Mongolia's exposure to trade grew very strongly between 1990 and 2013, with exports of goods and services increasing by a factor of over 10, and imports by a factor of almost 8. This rapid proportional increase made the role of international trade much more significant in the Mongolian economy. Where in 1990 combined imports and exports had been equivalent to approximately 60% of GDP, by 2013 this had increased to 184%[1]. The ratio of exports to imports, at 0.41 in 1990, moved further towards exports, with Mongolia earning $0.56 from exports for every dollar spent on imports by 2013, however this still leaves a large apparent trade deficit. The degree to which this imbalance is linked to current productive investments, which could ultimately rebalance exports and imports, is unclear but will be an important consideration over the longer term.

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 Mongolia's exchange rate based GDP per capita of US$1170 in 2013 actually had a local purchasing power almost ten times that, equivalent to $10757 spent in the US.

[1] An important qualification here is that, for poorer countries, using an exchange rate currency units will tend to exaggerate the real economic activity associated with exports/imports compared to that for domestic consumption. While an exchange rate basis is appropriate for quantifying international trade, the level of economic activity which underpins the domestic economic activity would perhaps be better reflected by purchasing power parity (PPP) measures.

This is important in establishing a more realistic idea of the real material living standards achievable locally.

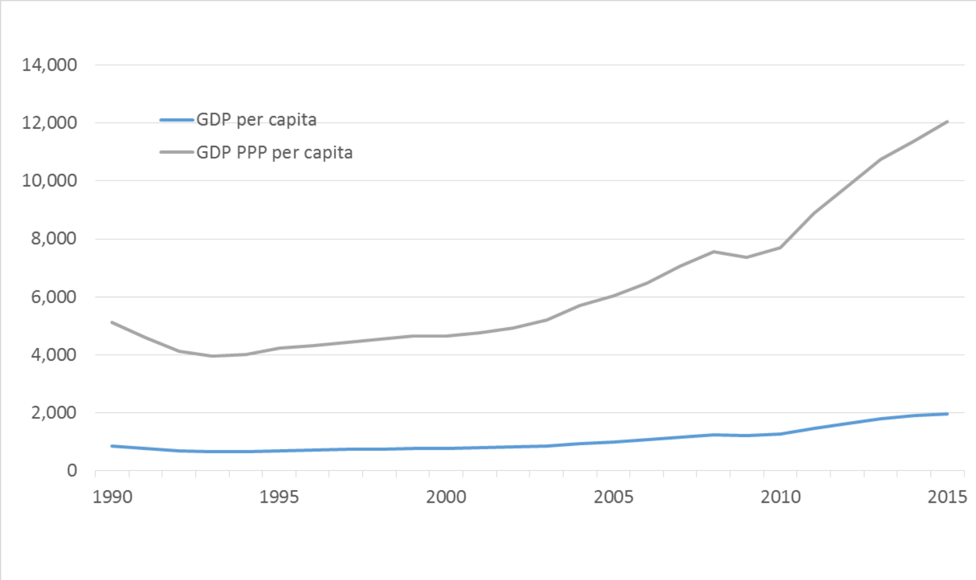

Figure 2 Affluence compared on constant 2005 exchange rate versus purchasing power parity basis for Mongolia

3 Material use, waste, material efficiency, trade dependency and extractive pressure

Material inputs remained at or below the levels of the late 1980s for the first two decades studied, only exceeding these levels from 2007, led by major growth in extraction of fossil fuels. As Mongolia began the period with relatively high mineral to biomass inputs, and much of the fossil fuels are destined for export, the share changes in materials cannot really be said to indicate a strong shift in the structure of the economy. Rather than a socio-metabolic transition away from the biomass-based domestic materials and energy systems of an agrarian society, the profile seems more indicative of a move to greater reliance on primary mineral exports.

Material inputs to Mongolia's economy were, in aggregate, dominated by domestic extraction for the entire period 1985 to 2015, with imports beginning and ending the period at 1.6% of the total. Biomass is the category in which Mongolia is most dependent on imports, however even here they only accounted for 3.2% of DMI in 2013, up from 0.8% in 1985. Where Mongolia had imported almost 10% of its fossil fuels DMI in 1985, by the end of the study period this was only 3.1%, however this apparent near independence in aggregate tonnage terms masks the fact that Mongolia is 100% dependent on imports for petroleum products (and so transport fuels), so cannot be said to have a high degree of energy security. In both the metallic ores and non-metallic minerals categories, imports apparently accounted for <0.1% of DMI.

Figure 3 illustrates the largely static level of DMI in all categories after the slump occasioned by the dissolution of the Soviet Union, which had been Mongolia's most important trading partner and source of direct economic assistance. This prolonged period of static material inputs ended after 2005, when Chinese demand for minerals and energy saw Mongolia's domestic extraction of fossil fuels in particular (specifically coal) begin to increase strongly. China has come to totally dominate Mongolia's export market, with China's estimated share of the total over 95% by 2014 (CIA 2015). Biomass' share of DMI decreased the most, more than halving from 31% in 1985 to 15% by 2013. The respective shares of fossil fuels, metal ores, and non-metallic minerals changed by 168%, –14%, and 9% respectively.

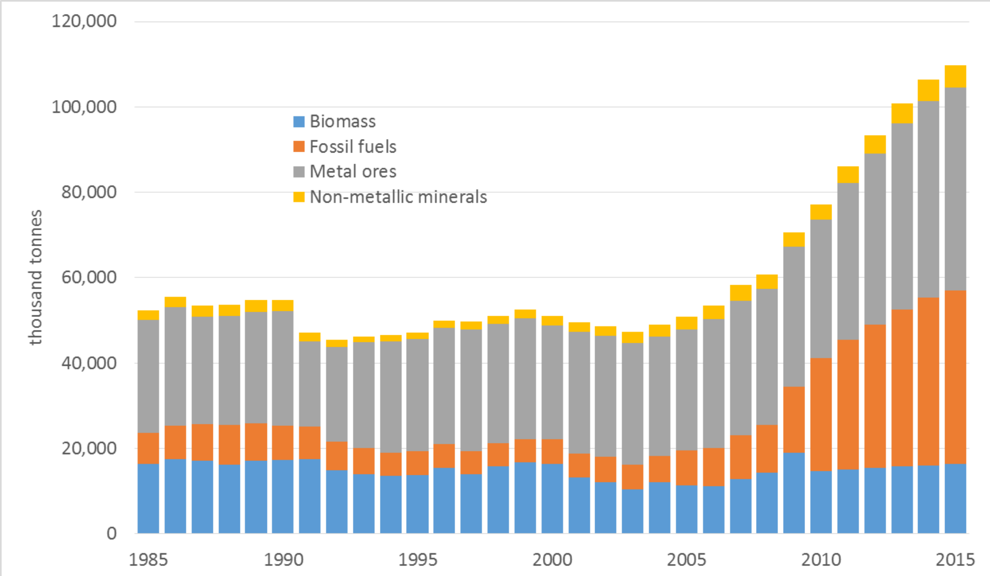

Figure 3 Direct material input to Mongolia's economy, by four material categories, 1970–2015, thousand tonnes

Comparing Figure 4 to Figure 3 indicates that Mongolia's material footprint is much lower than its DMI, and the relative shares between different categories are also quite different. The impact of the dissolution of the USSR is profound in the MF profile, indicating a radical reduction in that portion of material consumption being attributable to domestic final consumption in all material categories. MF apparently never recovered to 1990 levels in aggregate, although MF in both non-metallic minerals and fossil fuels is much higher, the former consistent with the major increase in capital investment discussed in section 2.

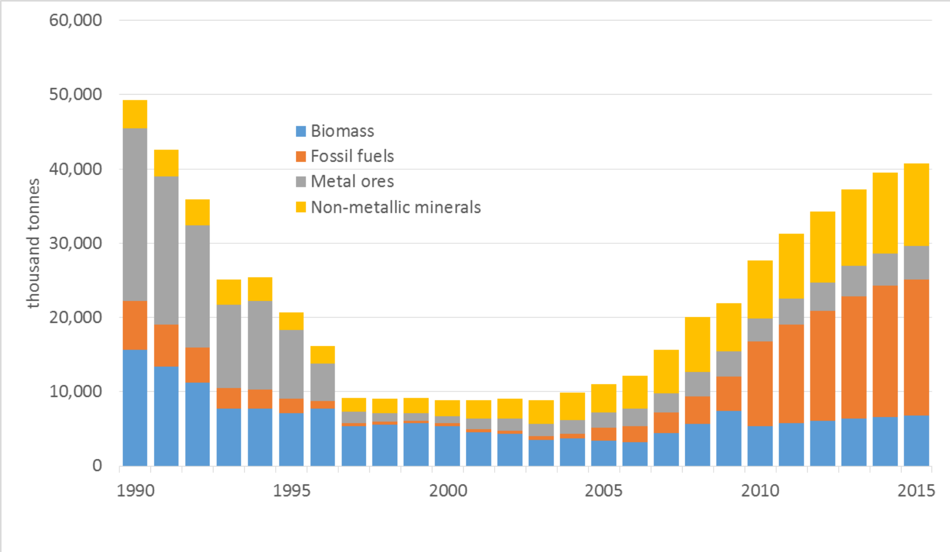

Figure 4 Material footprint of consumption of Mongolia by four material categories, 1970–2015, thousand tonnes

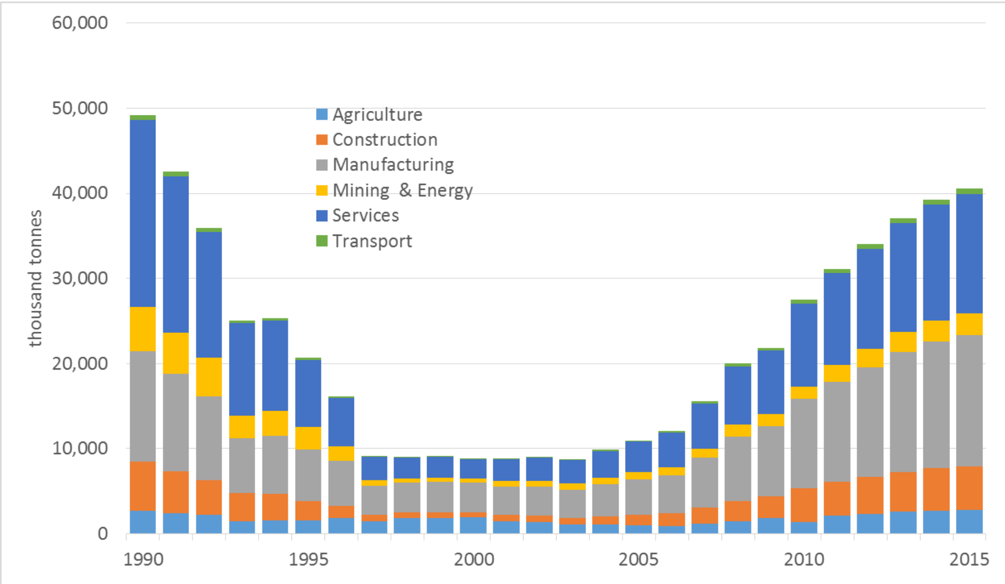

Figure 5 Material footprint of consumption of Mongolia by six main economic sectors, 1990–2015, thousand tonnes

Per capita, the economy of Mongolia has high material inputs, around three times the regional average. While Mongolia's DMI per capita is more than double the minimum levels associated with a high level of human development, its material footprint is only slightly higher than the regional average, and better reflects the material standards of living experienced.

The material inputs to Mongolia's economy, at over 37 tonnes per capita, are more than three times the SWITCH-Asia average of 11.8 tonnes per capita (see Figure 6). The relative gap between the per capita material footprint[2] of Mongolia and the SWITCH-Asia countries as a whole is much

[2] 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.

smaller, with Mongolia's 14 tonnes per capita just over 40% higher than the regional average. The disparity between Mongolia's DMI and MF was much less prior to the economic disruption caused by the dissolution of the Soviet Union, with a DMI of 25 tonnes per capita in 1990 being just 11% higher than MF in 1990. The rapid drop in MF from 1990, which decreased at 22% p.a. compounding from 1990 to 1997, then plateaued for another seven years, reflects Mongolia's greatly reduced capacity to support local consumption after its major trading and development partner entered a prolonged economic downturn.

Mongolia's MF of almost 13 tonnes per capita by 2013, was back near the aggregate levels generally associated with a high level of human development[3].

[3] 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.

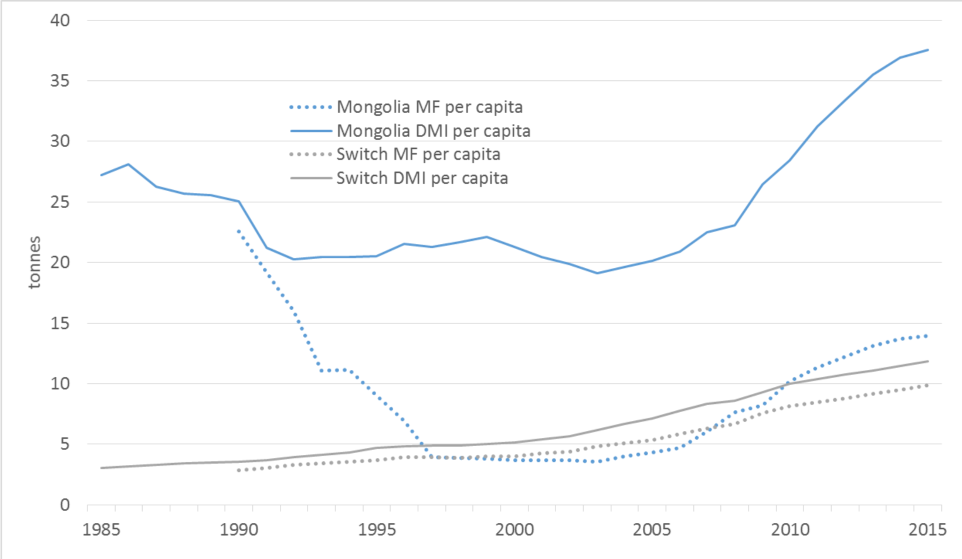

Figure 6 Per capita material input and material footprint Mongolia and SWITCH-Asia, 1985–2015, tonnes

The economy of Mongolia was much less efficient at converting materials to GDP than the SWITCH-Asia group average for the entire period 1970 to 2015, when using the DMI metric, and its efficiency relative to the region actually deteriorated over time, although Mongolia's absolute MI did decrease. Whereas in 1970 Mongolia had required 138% more materials per US$ of GDP earned than the regional average, by 2013 this difference had increased to 206%. Figure 7 shows that where Mongolia's decrease in material intensity was reasonably consistent over the whole period, the trend for (trade) adjusted material intensity[4] moved rapidly lower between 1990 and 1997, at which point it was almost exactly equal to the regional average. Mongolia's adjusted material intensity then paralleled the regional average for most of the subsequent decade, before again diverging as domestic extraction of coal increased rapidly, so that by 2010 it was 80% higher than the regional average.

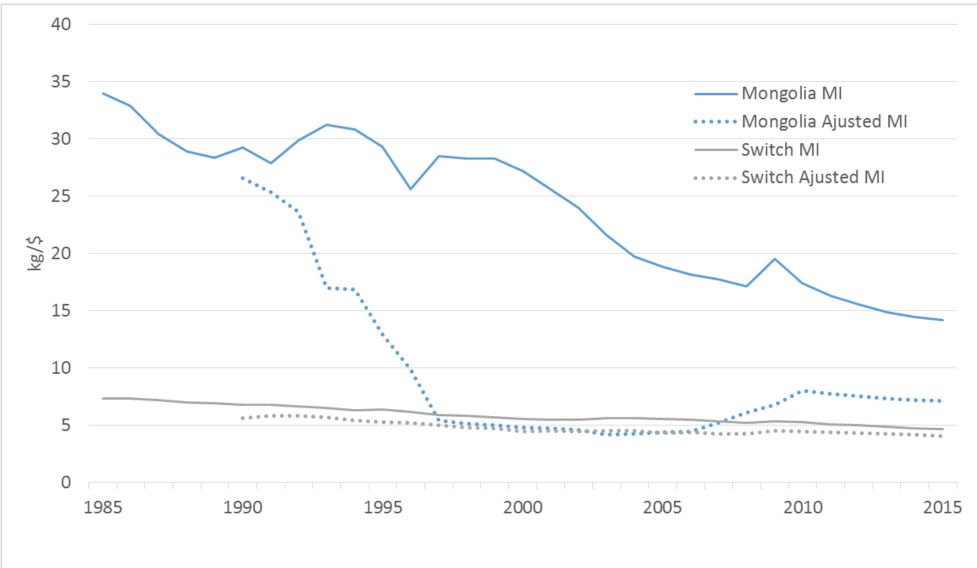

Figure 7 Material intensity of production and consumption in Mongolia and SWITCH-Asia, 1970–2015, kg per US$

In Figure 8, the domestic material consumption (DMC) indicator is used to illustrate the long-term waste potential of Mongolia. DMC measures territorial consumption of materials. Some DMC passes through the economy, going from input to waste, rapidly (e.g. metal ores processed to produce saleable metal). Other DMC can reside as a part of the active economy for years (e.g. the construction materials invested in infrastructure). In all cases, materials 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 using DMC as an indicator 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 Mongolia's long-term waste potential on a per capita basis finished the period at roughly the same level it began, while for the region it quintupled. Despite this, Mongolia's DMC per capita was still two and a half times the regional average in 2013. While Mongolia's DMC per capita remains high, the nation's population density is so low that the spatial intensity of waste stocks and flows is less than 3% of the regional average. This spatial intensity measure indicates that Mongolia should have considerable room to increase material flows before it encounters anything like the environmental pressures which are increasingly widespread in some SWITCH-Asia countries[5]. Given this, the expansion of DE in Mongolia associated with increasing exports to China can be seen from one perspective as redistributing environmental loadings away from a country which is already operating under intense environmental loadings to one where overall environmental burdens remain relatively low.

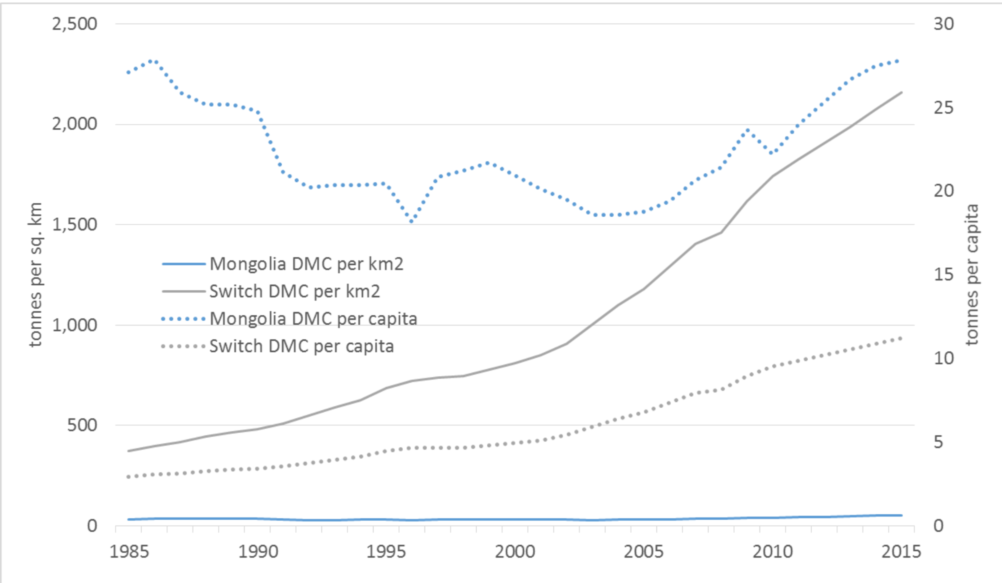

Figure 8 Long-term waste potential of Mongolia (DMC/ha and DMC/cap), 1985–2015, tonnes per ha and per capita

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[4] 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.

[5] While spatial loadings of waste are very light in Mongolia, 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

In Figure 9 we see that Mongolia's total energy consumption contracted much more in the wake of the dissolution of the Soviet Union than seen previously for DMI. Total energy consumption did not begin to recover until the new millennium, and had only returned to late Soviet era levels by 2009. Growth over the period 1985 to 2013 was only 1.8% p.a. compounding, very slow by regional standards, although growth from 2000 to 2013 was much faster, at 6.1% p.a. Despite the major contraction in energy use during the 1990s, Mongolia's per capita energy consumption remained higher than the SWITCH-Asia averages at all times, on both total primary energy supply (TPES) and Energy Footprint (EF)[6] bases (see Figure 9). Mongolia's energy consumption trajectory roughly parallels that of the region since 2000, which is consistent with the increasing dominance of the trading relationship with China in Mongolia's development (given that China's energy consumption comes to dominate the SWITCH-Asia group total over the later period).

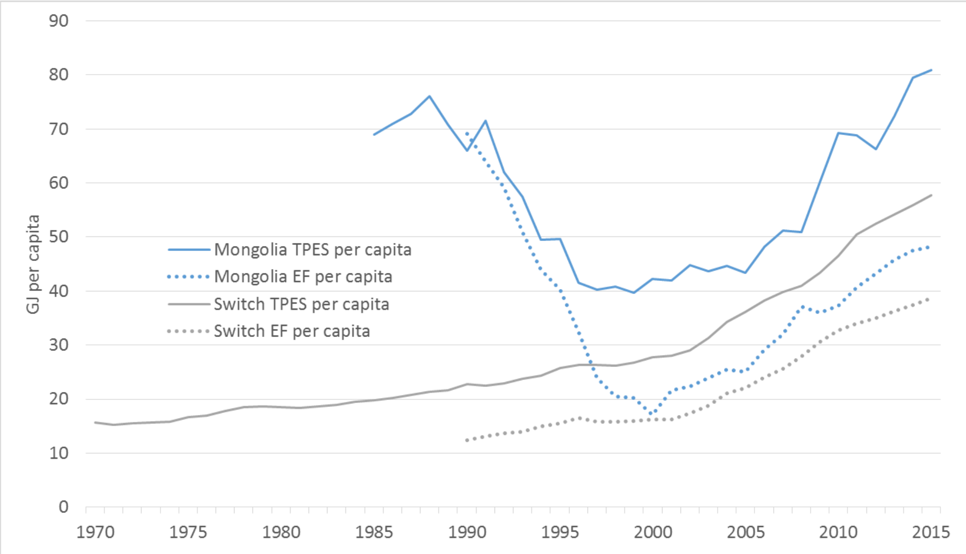

Figure 9 Per capita TPES and energy footprint of Mongolia and SWITCH-Asia, 1970–2015, GJ per capita

The ongoing dominance of coal in Mongolia's energy mix is clear in Figure 10. Mongolia's reliance on coal was most pronounced at the height of its contractionary phase, in the mid-1990s. This reflects Mongolia's reduced ability to afford imports of petroleum during this time, and its forced reliance on those energy supplies which could be sourced locally. As the economy recovered, and Mongolia's ability to fund imports improved with it, the share of petroleum in its energy mix grew back from a low of 13.5% in 1994, to over 23% by 2013, a level similar to that seen for the period prior to the dissolution of the Soviet Union. Total dependence on fossil fuels for energy remained very high and changed little over the entire period, at 97% in 1985 and 95% in 2013. As noted in the materials section, a large portion of the increase in extraction of coal in recent years has been

[6] As energy footprint is analogous to material footprint, in that it takes account of the energy embodied in the full production chains of goods and services for local final consumption. This means that EF adds the offshore energy inputs of imported goods and services to local inputs of energy consumption, and subtracts energy inputs to goods and services which are exported.

for export purposes, so in a sense Mongolia was "upgrading" a portion of its plentiful supplies of coal, into the petroleum it lacks but needs for liquid transport fuels, via the medium of trade. Given this, Mongolia's energy security may be somewhat vulnerable to volatility in the relative international prices paid to it for its dominant grades of coal, and what it must pay for petroleum products. Further diversifying the range of primary and other products exported is one strategy which should improve Mongolia's resilience here. Developing non-primary exports could offer added insurance here, as primary commodity prices often move in large and prolonged cycles, closely correlated with each other.

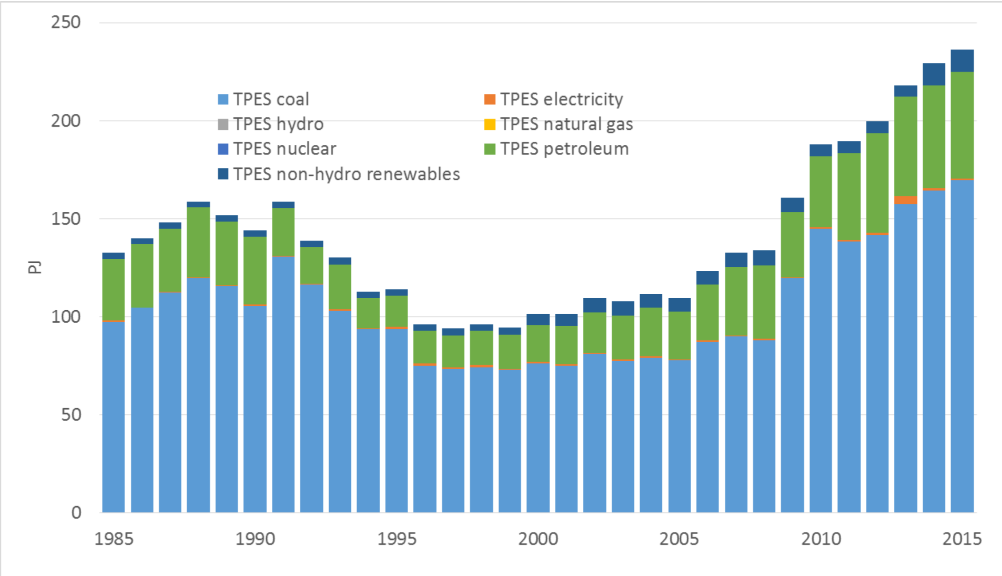

Figure 10 Total primary energy supply of Mongolia by energy sources, 1985 – 2015, in petajoules

Figure 11 shows that Mongolia's energy intensity on a TPES basis was 50% or more higher than the SWITCH-Asia average for 90% of the study period, and averaged 75% higher. On an energy footprint basis the result was similar, with Mongolia's adjusted energy intensity averaging almost twice the regional level over the full period for which data were available. One notable difference between the TPES and EF based intensities was that the improvement in EF based intensity during the economic contraction phase was much faster, falling by almost three quarters in the decade after 1990. The corresponding improvement in TPES based energy intensity was less than one third. This again indicates a large decrease in Mongolia's ability to support domestic consumption over this period.

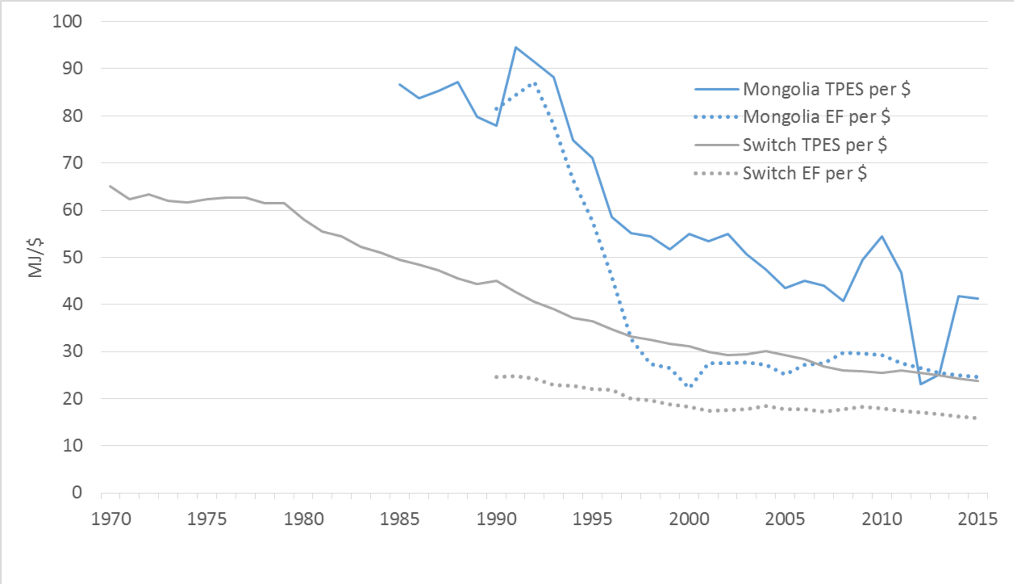

Figure 11 Energy intensity of production and consumption in Mongolia and SWITCH-Asia, 1970–2015, MJ per US$

5 Emissions, air pollution and climate change

The statistics used for GHG emissions for Mongolia are sourced from the European Commission's EDGAR database[7]. Aggregated GHG territorial emissions and GHG footprints are presented in Figure 13, from which it is evident that Mongolia's GHG emissions per capita remained much higher than the SWITCH-Asia average, fluctuating between 260% and 910% of the regional average, (the lower values come after 2009, and appear likely to reflect a change in accounting practice in the base data rather than fundamental physical changes in the economy). Mongolia's GHG emissions using a GHG footprint basis begin the period much higher than the regional average, but rapidly converge to this average and parallel it in the wake of the economic contraction beginning in 1990.

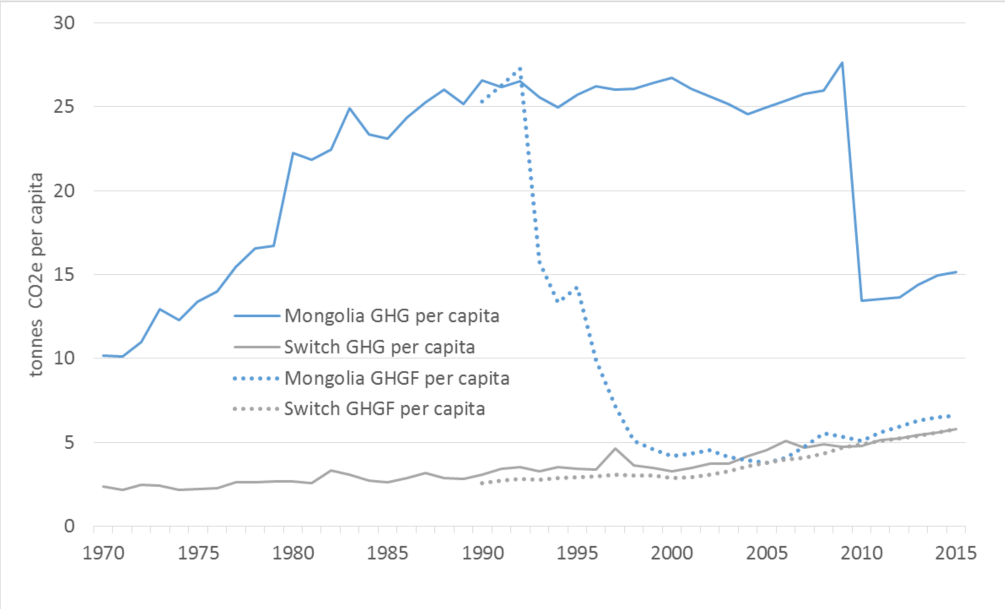

Figure 12 Per capita GHG emissions and carbon footprint of Mongolia and SWITCH-Asia, 1970–2015, tonnes

In Figure 13 we see that Mongolia's GHG emission intensities on both territorial and footprint bases reflect the same major features as seen for the GHG emissions per capita in Figure 12, i.e. on a territorial basis the emissions intensities are much higher than the regional average, while on a footprint basis, Mongolia's GHG intensity rapidly converges towards the regional average after beginning the period much (up to eight times) higher. Unlike with the pattern for per capita emissions, however, emissions intensities on both territorial and footprint bases continue to decrease from 1990.

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[7] 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. 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 on 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, which show up as major spikes.

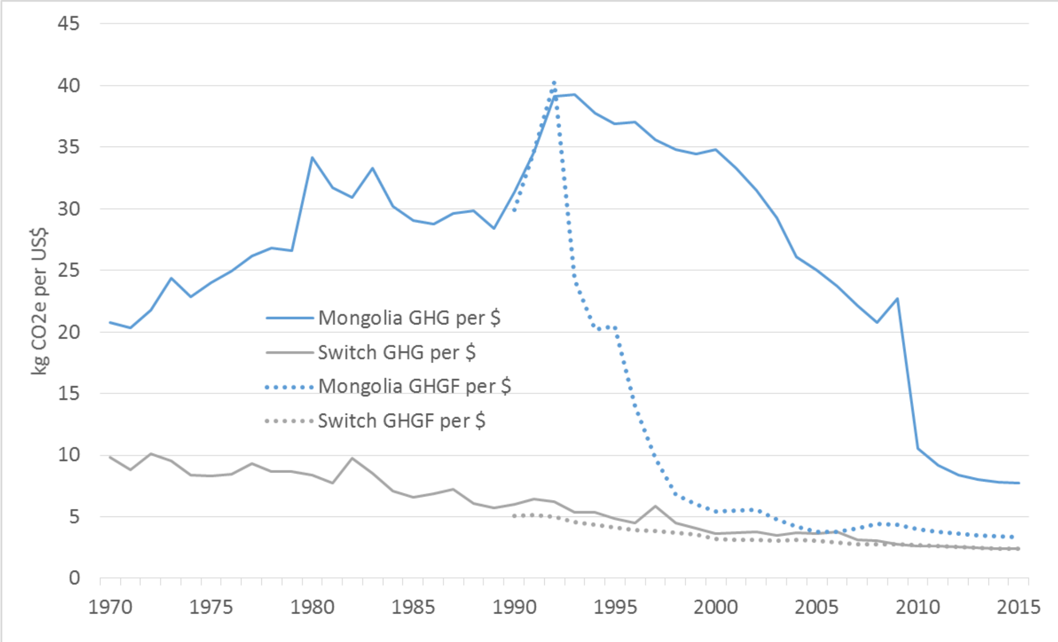

Figure 13 Carbon intensity of production and consumption in Mongolia, 1970–2015, kg per US$

6 Water and wastewater

It is important to note data on water extraction and use is the sparsest and least frequently updated basic data of all used for this report.[8]

Figure 14 presents an apparently contradictory picture of Mongolia's level of water consumption, however this is explained by the different scope of the water withdrawals and water footprint metrics. On a physical water withdrawals basis, Mongolia exhibits very low per capita water usage, typically one half to one third the SWITCH-Asia average. In contrast to this, Mongolia's water footprint is very high, typically two to three times the regional average, even after the rapid decline seen in the wake of the post-1990 economic contraction. The reason Mongolia's WF is so high relative to water withdrawals is the dominance of rain-fed agriculture (and grazing) over irrigation. Directly rain-fed agriculture is outside of the scope of water withdrawals, but is captured for water footprint (the world total water footprint is around twice water withdrawals).

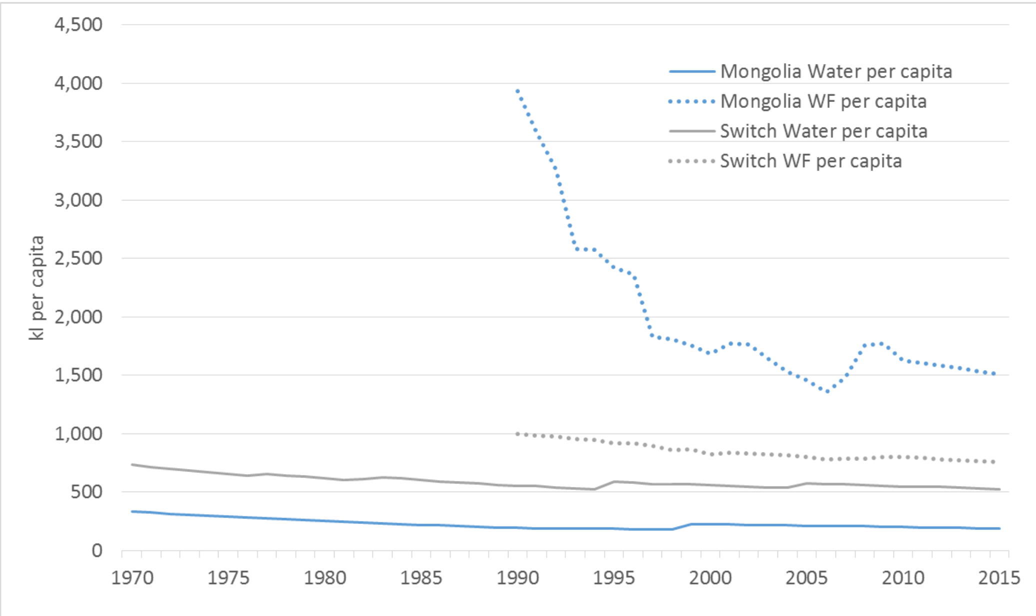

Figure 14 Per capita water use and water footprint in Mongolia and SWITCH-Asia, 1970–2015, kl per capita

Mongolia's water intensity (water extracted per US$ of GDP) decreased by 86% over the full study period. In Figure 15 we see that this rapid improvement, while not as great as that seen for the SWITCH-Asia group overall, was sufficient to keep Mongolia's water intensity below half the regional average. This situation is not reflected for water intensity using the water footprint

[8] The 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.

metric, which shows Mongolia using over twice the regional average for the full period 1990 to 2015.

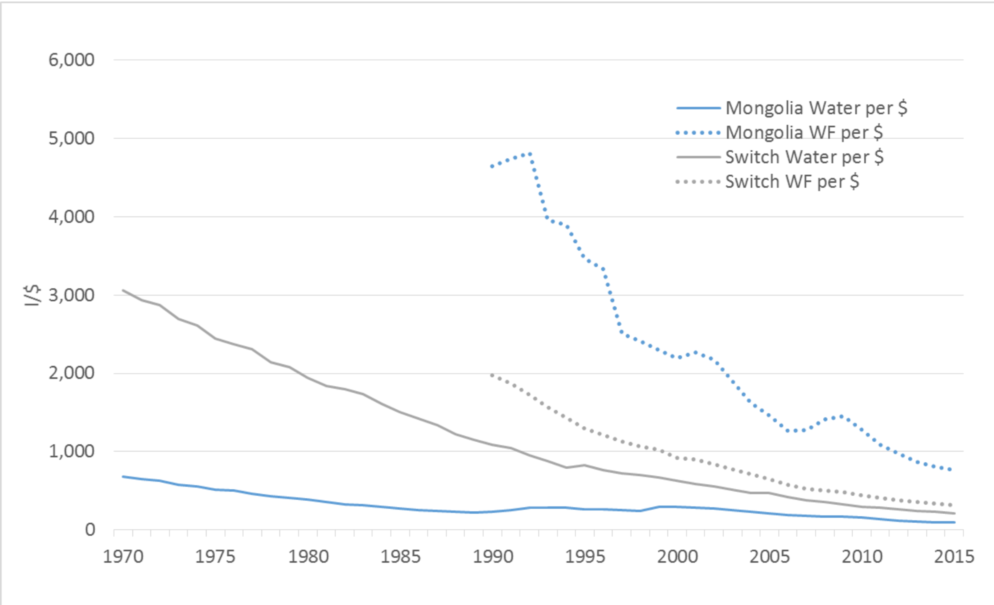

Figure 15 Water intensity of production and consumption in Mongolia and SWITCH-Asia countries, 1970–2015, litres per US$

7 Natural resource use, emissions and human development

In Figure 16 we see that Mongolia's HDI apparently continued to improve steadily through most of the great economic dislocation which followed the dissolution of the USSR (from 1990), with one short-lived reversal at the turn of the millennium. This contrasts starkly with the major reductions seen in the material and energy footprints of consumption, which are indicators of the material standards of living upon which HDI ultimately depends. This apparent contradiction can probably be explained by a combination of two main factors. Firstly, the calculation of material and energy footprints is ultimately heavily influenced by variations in GDP, and that portion of GDP accounted for by trade. This is unlike direct territorial (or production) based indicators of material and energy flow. We see back in Figure 3 and Figure 9 that the reduction in the direct DMI and TPES indicators over the post-Soviet period was much less pronounced, indicating a much more modest reduction in material living standards. Secondly, the non-GDP components of HDI (such as life expectancies and education levels), are variables which have considerable inertia and which respond much more slowly to economic and societal change. An economy which has been making major progress in improving the education and health of its citizens, via building up educational and health infrastructure and training the requisite workforce, will not suddenly cease making those improvements due to temporary financial hardships, especially in a system which is not strongly market-based. The expanded stock of schools, hospitals etc. can continue to "produce" for years, until longer-term underspending and the need for maintenance and re-equipment eventually begin to erode the stock of such infrastructure.

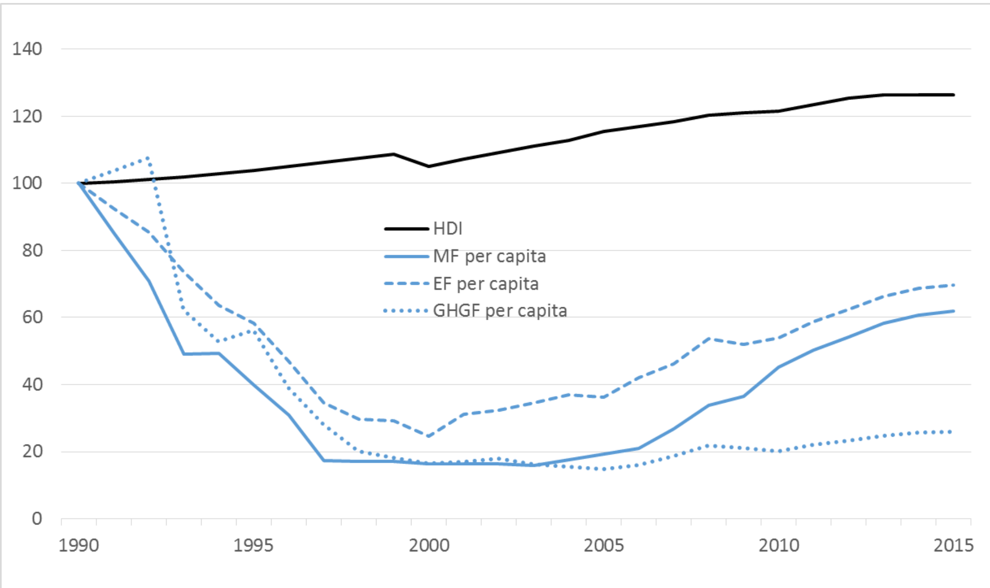

Figure 16 HDI, per capita material and energy use, per capita GHG footprints for Mongolia, 1990–2015, indexed (1990=100)

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