Turkey: Balancing the G20’s Global Impact

Barney Foran$^{1,2}$
Manfred Lenzen$^2$
Daniel Moran$^{2,3}$
Ali Alsamawi$^2$
Arne Geschke$^2$
Keiichiro Kanemoto$^4$

1. Institute of Land Water and Society, Charles Sturt University, Albury, Australia
2. ISA, School of Physics, University of Sydney, Australia
3. Norwegian University of Science and Technology, Trondheim, Norway
4. Institute of Decision Science for a Sustainable Society, Kyushu University, Fukuoka, Japan
‘Anatolian Tigers’ escaping the middle income trap

A strategic cross-roads for oil and gas transit: Built in 1271, The Gok Medrese in Sivas central Turkey is an enduring reminder of a long history and civilisation. When Mustafa Kemal founded modern Turkey in 1923, the population was 14 million. That has grown to 76 million today with a median age of 30 years and one quarter are still rural. By 2050 the population will reach 95 million with a median age of 42 years, not accounting for the 1.5 million mostly Syrian refugees now in the country.

A working age population of more than 50 million will extend to 2100. Official unemployment rates are 10% (youth 17%) but participation rates are low, especially for women. One third of the population are poor or needy, and the informal part of the economy and workforce is also one third, double the EU and OECD levels, and constraining taxation revenue and the social security net.

Geographically, Turkey is a choke point for Europe’s oil and gas transit. Its electricity needs have risen twofold and natural gas fourfold in the last decade. Domestic coal stocks could meet 90 years of today’s consumption, but oil and gas reserves barely cover one year. Good prospects for oil discoveries exist in the Aegean and Black seas while onshore shale gas could cover 5-12 years of current consumption. Electricity is mostly fossil fuelled with one half gas turbines and one quarter each for coal and hydro. Two large nuclear plants are planned, fuelled by domestic uranium, to be ready by 2023, the centenary of the republic.

Physical impacts reflect poverty and low consumption levels:
The greenhouse emissions consumed have doubled since 1990, are one half the G20 average on a per capita basis and reflect high levels of poverty and low consumption levels (see radar diagram above and table to right). One third of emissions are imported as electricity, chemicals and transport services embodied in goods with leading suppliers being Russia, China, Germany, India and Ghana.

Scarce water use equals the G20 average and has risen by one fifth in the past two decades. Most of this is from domestic cropping but one fifth is imported from Turkmenistan, Syria, Uzbekistan and Pakistan and is almost entirely from raw cotton and cotton textiles. The land footprint is relatively stable over four decades and is one half the G20 average on a per capita basis. About one quarter of the land categories of crops, forests and grazing are imported, but one half of the fish footprint is imported mostly from Bulgaria, Norway and China.

Animal species threats are the lowest in the G20 on a per capita and absolute basis, reflecting low consumption and low embodiment of land products in consumption. About one fifth of animal threats are imported mostly from Russia, United Kingdom and the USA. Drivers of animal species threats are dominated by wild harvesting and grazing, climate change and pollution.

The material flow indicator is two thirds the G20 average reflecting the size and structure of the economy. However half is imported and has risen by one third since the year 2000 driven mainly by the ore and fossil fuel components.

Further rises will be driven by basic processing of metals, chemicals, plastics and rubbers.

Impressive gains grind against the poverty trap: The past decades economic liberalisation and inflation control have allowed business interests (the Anatolian Tigers) to underpin development to a GDP per capita about half the G20 average.

However net international debt is about two thirds of GDP leaving the economy exposed to sudden flights of capital.

Expressing GDP in purchasing parity terms doubles the nominal value, but does not alter the relative ranking within the G20. Inequality measures have declined in the last 20 years, the largest decrease in the OECD, but inequality is above the G20 average with Turkey ranking seventh. The richest one fifth of income earners receive nearly one half of national income. One third of people feel they cannot afford food and social security cash transfers are the lowest in the OECD and are now a central policy focus for government.

Delivering goods and services requires four tenths of a full time equivalent worker per capita (rank 16) and one third of the total workforce are in external countries.
An ongoing need for more ‘good jobs’: More than one third or eight million full time workers supplying Turkish consumption are external and some job re-shoring may be feasible (see pie diagram on left). A recent World Bank report emphasised the need for ‘good jobs’ and the complex interactions between proximity, trade barriers, investment climate, job formality and public service jobs where the market fails. Priorities are jobs with a higher services content, are open to all ages and genders, come from larger firms, are generally not in traditional agriculture.

Renewable electricity targets will reduce fossil dependency: Policy aspirations are for one third of electricity to be renewable by 2023 with 20,000 MW of wind the cornerstone and 3,000 MW in place now. Policy incentives include feed-in tariffs and a requirement for domestically made content. Turkey has a good solar resource and business attractiveness as well as high geothermal potential.

Climate change threatens food security regionally: Current climate change projections show distinct changes in rainfall patterns spatially and seasonally, combined with significant increases in temperatures. Turkey shares the Maritsa, Asi, Euphrates, Tigris, Aras and Coruh rivers with many neighbours. Water availability and rain-fed agriculture will become more limited in the latter half of this century requiring increased trans-boundary dispute resolution. Developing the full irrigation potential in Turkey’s Southeastern Anatolia Project (Güneydogu Anadolu Projesi) would reduce Euphrates river flows by 40% to Syria and Iraq by 80%, before the anticipated impacts of climate change begin to bite.

High species endemism and the start of sedentary agriculture: Sedentary agriculture and animal domestication began in Turkey in the former northern Mesopotamia at the intersection of the Mediterranean and Near Eastern gene centres. Conservation efforts focus the genetic diversity of more than 450 cereal, vegetable and fruit species and many races of domestic animals. Five ‘micro gene centres’ form a specific focus, where 100 species of food plants show wide genetic variation and hold the genes essential to future resilient food systems. Nearly one third of Turkey’s plants and invertebrates are endemic. One eighth of plants and one twentieth of vertebrate animals are endangered.

Escaping the ‘middle income trap’ will require conventional growth policies while reducing dependence on fossil fuel and material imports. Potentially, this will stimulate the ‘good jobs’ pipeline that Turkey needs for stability and resilience. Wind and solar electricity may lessen gas dependence but growth will increase physical impacts while water tensions become more acute.
Rationale for Indicators

Greenhouse Emissions (CO2-e): The emissions footprint for each person’s consumption leading to heat gain in the atmosphere and oceans and thus increasing climate disruption due to accounting uncertainties, the indicator excludes land use, land use change and biomass burning. Measure: Tonnes of CO2 equivalents per capita excluding land use change, forestry and biomass burning Year 2011, Source- Eora Global Database http://worldmrio.com/

Scarce Water Use: The scarce water use footprint. Over- extraction increases threats to human water security and river biodiversity in 30 of the globe’s 47 most volumetric river basins. This scarce water is eventually consumed as clothes, food and beverages. Measure: litres of scarcity-weighted water use per capita. Year 2011, Source-Eora Global Database http://worldmrio.com/

Endangered Animal Species (Species threats): Land clearing and over-fishing are two of 15 or more drivers of accelerated rates of biodiversity endangerment. This species threat footprint traces endangered animal species from the IUCNs ‘Red List’ to complex trade networks of threatening production activities. Measure: number of endangered animal species (species threats) per one million of human population, Year 2000, Source- Eora Global Database http://worldmrio.com/

Land Footprint (Land): The land footprint in trade corrected terms or consumption terms required for built infrastructure, crops, forest, fishing and grazing. Same accounting principle as the ‘ecological footprint’ but excludes energy/carbon land as the emissions indicator specifically accounts for that impact. Expressed in ‘globally-average hectares’ adjusted for productivity potential. Measure: Land area in globally-average hectares required to underpin consumption footprint. Year 2011 Source- Eora Global Database http://worldmrio.com/

Material Footprint (Material usage): The material use footprint. Increasing material use by developed and developing economies poses long term threats to sustainability at both ends. Limits to resource quality of virgin materials and a faster consumption lifecycle suggest issues for disposal and recycling. Measure: total material flow in tonnes per capita. Year 2008, Source- Eora Global Database http://worldmrio.com/

Inequality (Gini coefficient): The footprint or production chain measure of the distribution or spread of wages within a country, across the population. A smaller rich elite and a larger working poor gives a higher Gini coefficient while a more equal country has a lower value (e.g. South Africa 0.59, USA 0.38, Japan 0.29). Measure: Time series of Gini footprints computed as part of Eora employment studies. Data not yet available as part of Eora Database. Year 2011

Employment Footprint (Jobs): A social indicator measuring the domestic and outside workforce required to maintain domestic consumption and lifestyle. A cascade of lower paid workers delivers goods and services through complex production chains to more affluent consumers. Measure: Full time equivalent workers (domestically and out-of-country) per capita of domestic population, Year 2011 Source- Eora Global Database http://worldmrio.com/


Key References


A radar (or spider-web) diagram is used to display data from a wide range of sources and allow complex interactions to be simply displayed. This G20 study explores the tension between of economic production, social returns and environmental impact through reporting on global value chains and personal consumption (i.e. what a country’s citizens actually consume rather than its territorial production). There are five environmental indicators (emissions, water, endangered species, land footprint and material flow). These are balanced by two economic indicators (gross domestic product and net international debt) and two social indicators (employment footprint and the Gini coefficient or inequality footprint). All data are on a per-capita basis apart from the Gini coefficient which reports on income distribution nationally.

Two phases of data normalisation are used in this G20 study. Firstly, a ‘simple mean’ or average for all G20 countries is computed for each of the nine indicators. Secondly, each country’s value is divided by that mean to give a ratio number. In the radar diagram the G20 average (equals 1.0 by definition) is shown by the red dashed line equidistant from the centre of the web. The blue solid line shows how much each country’s indicator is bigger or smaller than the G20 average. The overall pattern or signature of each country is important. There is no inherent right or wrong in being inside or outside the G20 average as each country has its own set of special circumstances.

Thus for the Turkish example above, the indicators map mostly below the G20 average. These outcomes report beneficial and less-beneficial outcomes. The above average indicator for inequality is the most pressing for governments and industry. A low measure of species threats reflect low levels of consumption overall, but there is little room for complacency. Other below average environmental indicators will increase with job growth. Lower net debt is a positive, but low GDP per capita reflects an economy and social system operating well below what its citizens require.