

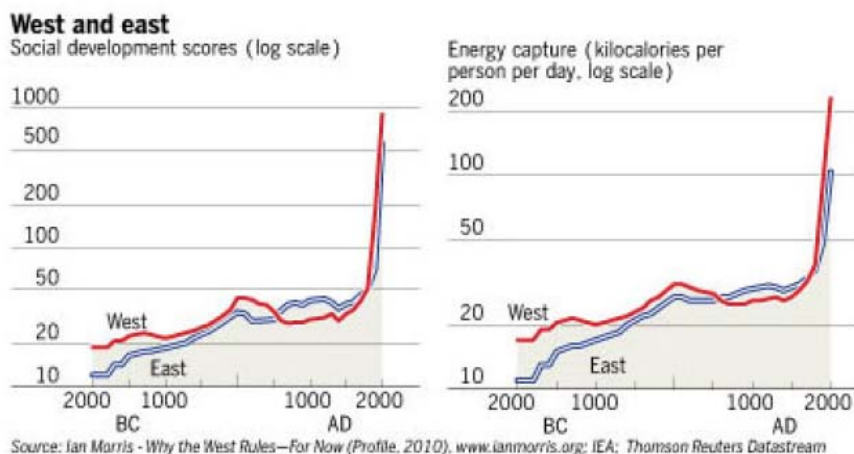
The “Five Horsemen of the Apocalypse” - Social Development & Energy Use

A recent book with interesting implications for investors in the global energy and commodities sector studies factors that have historically promoted social development and economic growth. Written by Stanford’s Ian Morris **‘Why the West Rules – For Now’** (2010), he traces the development of western and eastern societies. The book measures the pace of development in the Middle East versus development in what is now China, and discussing why each progressed and developed as they did.

Social Development. To measure the degree of social development Morris examined four factors: (1) energy use per capita, (2) urbanization, (3) military capacity, and (4) information technology. Investors in the energy sector have long been aware of the first factor and its influence on economic activity and social development - the capture of energy is a necessary condition for existence. The more complex and advanced the society the more energy it captures and the higher per capita energy use.

Financial columnist Martin Wolf of the Financial Times in a review of the book points out the “industrial revolution” is a “misnomer for what happened two centuries ago. *It was an energy revolution: we learnt how to exploit fossilized sunlight. Energy and ideas are the twin bases of our civilization.*”

Energy Capture. The charts in Professor Morris’s book, reproduced in the Financial Times, should be stunning for those who take energy for granted and are not aware of the strong historical correlation between energy use and development. Note the striking ‘energy capture’ versus time data in the chart below. Energy capture grew slowly over many centuries until it spikes sharply upward in the last 200 years.



Supporting this data and interpretation, the late Angus Maddison (author of **‘Contours of the World Economy’**) found in his studies of the global economy that global economic growth was very slow – around 0.1% to 0.2% per year for centuries. Life changed very little for many from generation to generation.

Only recently has the world seen the explosion of economic growth and development. The global economy has grown twenty times faster – or more - in the last two centuries than it did historically. This growth has allowed for major advances in social development, and provides the opportunity for skill specialization within global economies.

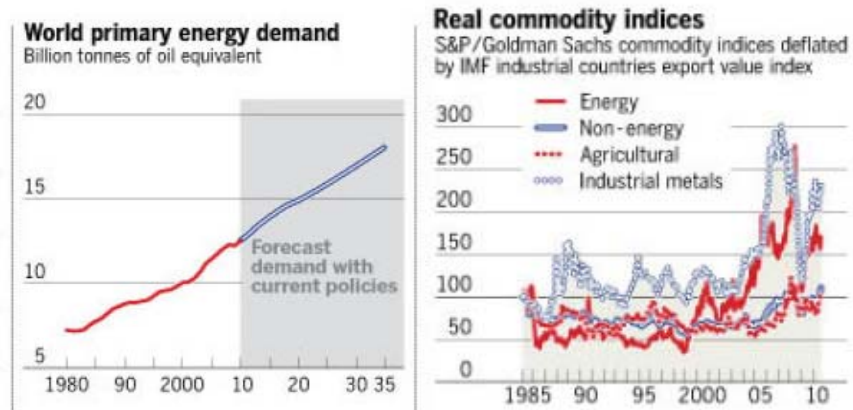
Martin Wolf in his discussion points out why energy has been so important to the global economy historically, and why it will be going forward:

Prof Morris's measures of social development and "energy capture" closely coincide with each other. We can notice three other things. First, western energy capture was the same in 1700 of the common era as it had been in 100 Second, energy capture and social development have exploded over the past two centuries. Finally, the east's use has been rising very rapidly.

An analysis, from the development centre of the Organization for Economic Co-operation and Development, argues that convergence has been changing the global balance of supply and demand for resources. This is shown in recent rises in the real prices of metals and energy.

The International Energy Agency points out that global primary energy demand could rise by another 50 per cent by 2035. Without a big change in the energy intensity of production, that is what the economic convergence we see has to mean: if all of humanity used the same energy per head as the rich countries do today, consumption of commercial energy would be three times what it is now

The Five Horsemen. The future of the global economy, both for the west and the east, is less dependent on skill levels or social structure according to author Morris, but highly dependent on the ability to expand availability and use of energy and related resources. And social development will be dependent on the ability to access those minerals. This is especially true of energy reserves, where 90% of global oil reserves now owned by national oil companies.



As easy-to-develop energy and mineral resources are depleted the challenge for all societies will be to develop advanced technology to recover more difficult to extract energy resources and ores. The failure to do so could result in what professor Morris calls the "**five horsemen of the apocalypse**" – climate change, famine, state failure, migration and disease.

Investment Implications. For investors in the energy and mineral/basic material sectors the message of the book is clear:

- (1) these global resources will be invaluable to social development in the future,
- (2) demand for these resources will increase substantially,
- (3) the fact that many of these resources have been nationalized could lead to scarcity and conflict, and
- (4) investors in the sector should do very well as global demand increases, producers struggle to grow output, and resource quality declines.