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Declining net oil exports--a temporary decline or a long term trend?

Posted by Sam Foucher on September 27, 2007 - 10:00am
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This is a post coauthored by myself and by Friend of TOD Jeffrey J. Brown (westexas), an independent petroleum geologist in the Dallas, Texas area.

To answer the question in the title of this paper, we believe, for reasons outlined below, that the current decline in world net oil exports is probably the start of a long term trend, as a result of declining production and/or increasing consumption in key exporting countries.

EIA data show a small decline in world net oil exports from 2005 to 2006, led by a 3.3% per year decline rate in net exports from the top three net oil exporters--Saudi Arabia, Russia and Norway. Furthermore, recent data suggest that the net export decline is continuing, and probably accelerating.

The Export Land Model and Two Case Histories

In previous articles posted on The Oil Drum we outlined a simplistic export model for a hypothetical country with Ultimate Recoverable Reserves (URR) of about 38 billion barrels (Gb), labeled the Export Land Model (ELM). The model showed the effect on net exports of a country that hit peak production and started declining at 5% per year. The exporting country consumes 50% of its production, and that consumption is increasing by 2.5% per year. The 5% decline rate is loosely based on the post-peak Texas decline rate of about 4% per year. The ELM is shown graphically below, Figure One.

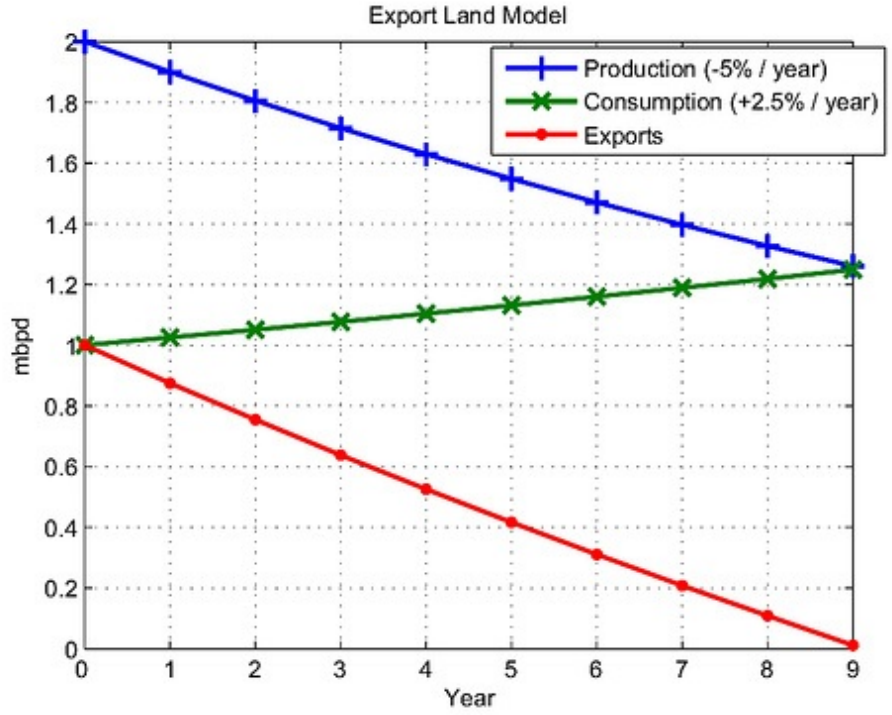

Figure 1

While this is a simplistic model, it has some important lessons for us.

First, assuming ultimate recoverable reserves of 38 Gb, and assuming that Export Land peaked when it was about 55% depleted, Export Land would have about 17 Gb of remaining recoverable reserves, after peaking. The model shows that only about 1.7 Gb, or 10%, of remaining post-peak recoverable reserves would be exported.

Second, the overall exponential net export decline rate, about 29% per year over the eight year net export decline period, is much more rapid than the production decline rate of 5% per year, because net exports in a given year are the net difference between two exponential functions: exponentially declining production and (generally) exponentially increasing consumption.

Third, the net export decline rate in a given year accelerates with time, from an initial year over year change in net exports of -12.5% to a final year over year change in net exports of -47.6% (last year of net exports).

So, how does the simplistic ELM compare to real world case histories? Actually, two recent case histories, Indonesia and the UK, showed sharper net export declines than the ELM. Figure Two, shows the year-over-year changes in net exports, from the start of the most recent production declines to the (apparent) final year of net exports (EIA, Total Liquids).

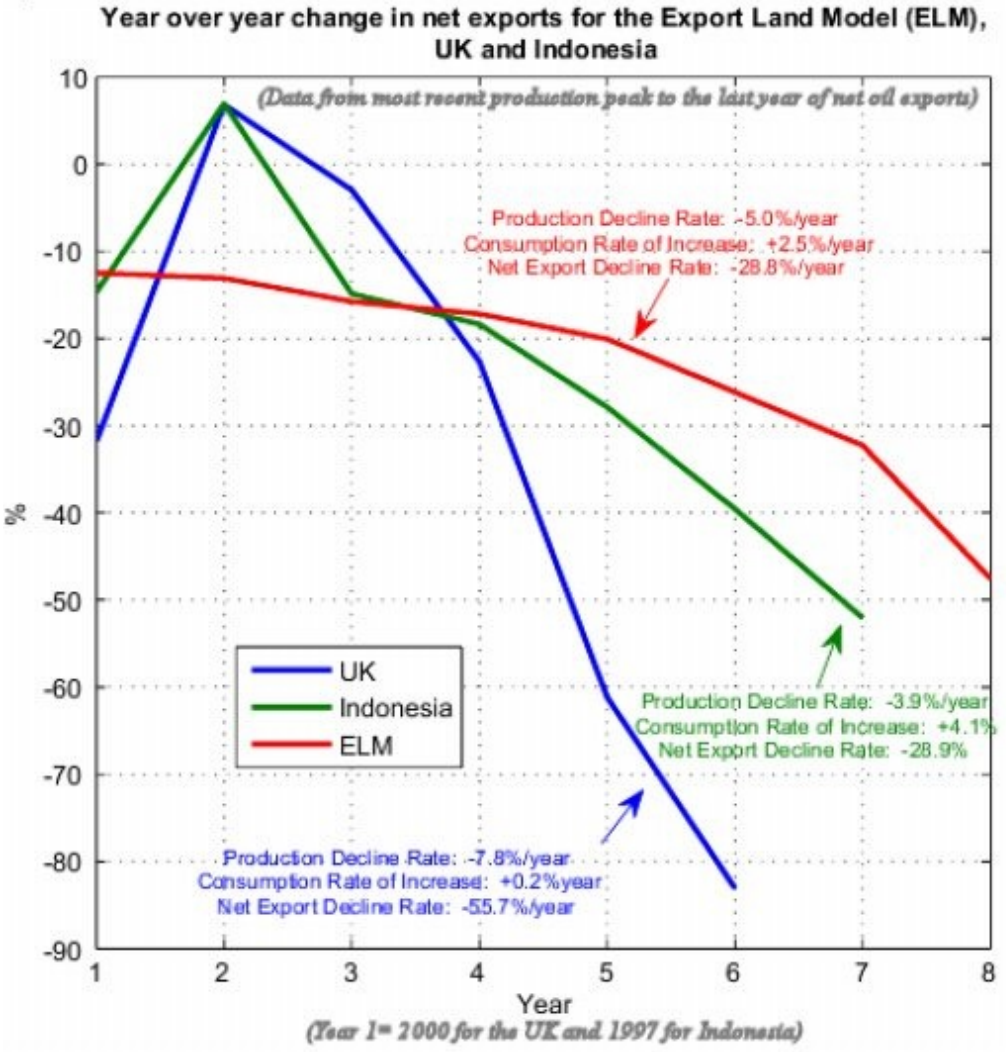

Figure 2

Note the differences between the overall production decline rates and net export decline rates for the three regions:

Region	Production Decline	Net Exports Decline Rate
ELM	- 5%/year	- 28.8%/year
Indonesia	- 3.9%/year	- 28.9%/year
UK	- 7.8%/year	-55.7%/year

It's also interesting that the UK and Indonesian net export declines were so similar, given the radical differences between the two regions. The UK is characterized by high per capita income, high energy taxes and a minimal increase in consumption (+0.2%/year over the net export decline period). In contrast, Indonesia is characterized by low per capita income, energy consumption subsidies and a fairly rapid increase in consumption (+4.1%/year over the net export decline period).

Note that once production in a given exporting country starts declining, the net export decline rate is a function of: (1) consumption as a percentage of production at peak production; (2) The production decline rate and (3) The rate of change in domestic consumption.

The UK and Indonesia net export declines were similar to the ELM because of their relatively high consumption as a percentage of production at the most recent peak, in the 50% to 60% range. However, regions with lower percentages of consumption, relative to production, will almost certainly also show accelerating net export decline rates, once production starts declining.

The Top Five Net Oil Exporters

The current top five net oil exporters--Saudi Arabia, Russia, Norway, Iran and the UAE--account for about half of world net oil exports. From 2000 to 2005, they showed a combined 3.7% per year increase in consumption.

From 2005 to 2006, their combined consumption showed an accelerating rate of increase, to +5.3% per year. From 2005 to 2006, the top five showed a net export decline rate of -3.3% per year. Based on year to date data, it is a near certainty that this net export decline rate will accelerate from 2006 to 2007.

We are presently working on generating a range of projected future production curves for the top five, using the logistic method, and consumption curves, using a Monte Carlo analysis based on observed growth rates. This will result in a range of nine points at which production = consumption for each country, in terms of time and production rate, with eight points centered on the middle cases for both production and consumption. We will then plot predicted total net exports for the top five, showing the worst case, middle case and best case in terms of the time at which production = consumption. We also plan to show, for the sake of argument, a plot showing indefinite flat production, versus increasing consumption.

In aggregate, the net export decline rates will not be as severe as the UK and Indonesian case histories discussed above; however, the models will show that the net export decline rate accelerates with time. While some smaller exporters are increasing their production and their net exports, once the large net exporters start showing an accelerating rate of decline net exports, it is very doubtful that smaller exporters can offset the decline from the larger exporters.

While overall world oil production is important, oil importers are focused on two things: their domestic production and world net oil export capacity. In our opinion, we should base our plans on the very real possibility of a rapid decline in world net oil exports.