The relevance of the phenomenon of Peak-Oil for the Degrowth paradigm

Abstract

This paper is part of an effort to compile a vocabulary for Degrowth. Such a collection of concepts for the paradigm is important for the creation of a common language and knowledge base. This article is the first one, which tries to offer a universal definition of resource peaks and explains de main basics behind such phenomena. Peak-Oil is one of the most central elements in the biophysical arguments against the possibilities of future economic growth. After crossing the peak oil (and other resource peaks) the physical expansion of the economy is no longer possible and a managed socially sustainable decent has to be designed, even if complex and difficult.

Collin Campbell and Aleklett Kjell developed the concept of “peak oil” when they founded ASPO (the Association for the Study of Peak Oil) in 2002. All too often observers misinterpret Peak-Oil as the depletion or “running out” of oil and therefore often equate the term to the biophysical (resource) limits debates of the 1970s and 80s. That debate missed the fact that non-renewable resources are not only limited in stock (the economically extractable physical quantity of deposits) but, like renewables, also in flow (rate). Hence the concept can be equally applied to renewable resources, which has already happened in the literature e.g. Peak-Water, Peak-Fertile-Land, etc.

A ‘resource flow’ is the physical amount that can be extracted per unit of time (usually days) given external constraints, which may be geologic, economic, environmental or social. The peak can therefore be defined as “*the maximum possible flow rate of a resource (i.e. production and consumption) given external constraints*”. According to Peak-Oil literature, this rate is about 85 million barrels per day (mb/d), in the case of oil. Peaks are the crucial moment in terms of resource scarcities and their resulting impact on society. In contrast, the often-quoted time left until resource depletion (calculated by dividing the estimated remaining resource by current yearly consumption flows) is highly misleading. British Petroleum, for example, estimates these numbers to be about 40 years for oil, 60 for gas and 120 for coal. Such numbers create the wrong impression that the remaining time for action to respond to resource limitations is still far off.

Hence the first key message of Peak-Oil is that supply constraints are much closer in time than commonly assumed. When this will happen is the subject of the “below ground” Peak-Oil literature dominated by geologists whose main concern is with the quantity dimension of the phenomenon, i.e. possible flow rates and recoverable stocks. Petroleum geologist King Hubbert developed a curve fitting methodology that mirrors production and discovery trends in order to show ultimate crude-oil production. He almost exactly predicted Peak-Oil for the US (Hubbert predicted a 1971 peak, the real peak happened in fall 1970) and estimated a world peak of oil production for the year 2000. updated Hubbert’s work. They placed the peak at 2006. This prediction was further refined for ASPO’s first press release in 2002, which predicted 2010 for the peak at a flow rate of 85 mb/d. For now this estimate appears to hold, as production has currently plateaued at about that level. The most extensive meta-analysis of “below ground” Peak-Oil studies so far concluded that a production peak of conventional oil for geological reasons was likely before 2030, with a significant risk for this to occur before 2020 (Sorrell, Miller et al. 2010).

The URR (ultimately recoverable resource) focuses debate regarding the timing of Peak-Oil. This is the estimated total amount (historic and future) of a given resource ever to be produced. ASPO uses 1900 Gigabarrels (Gb) of conventional and 525 Gb of unconventional oil (i.e. deep sea, heavy oils e.g. tar sands, shale oil and gas, oil shale and polar oil) for its calculations. Given total historic consumption of oil to date of around 1160 Gb, this means we are about half way through the resource. URR estimates of those denying an imminent peak of world oil production are much higher. The IEA (International Energy Agency) produces its forecasts on the basis of 1300 Gb for conventional and 2700 Gb for unconventional oil. Recent advances in fracking technology for extracting shale oil and gas has given new ‘fuel’ to such optimistic outlooks. However a significant part of the IEA figures relies on “yet to be found” oil, without stating where this oil could possibly be located and according to many analysts the ‘shale hype’ is a bubble that is to burst at any moment.

When they argue about URR, Peak-Oil deniers often omit reference to the possible flow rate, which is the determining variable for this matter. found that, given the current trend in decline rates of existing oil fields (4% annually), the world would have to discover daily production capacities equal to that of Saudi Arabia every three years in order to keep up with current demand. Saudi Arabia holds approx. 264.2 Gb, which is why Canadian tar sands with 170.4 Gb are often seen as a possible successor. However, Saudi oil fields release about 10.85 mb/d onto world markets while Albertan tar sands struggle to increase its current production level of 1.32 mb/d.

Apart from geology, the possible oil flow rate is determined by many other constraints. For example, many oil-producing countries have substantially decreased exports due to increases in (often subsidised) domestic demand. Geopolitics could be another such constraint. Most importantly, however, the quality dimension of Peak-Oil, which belongs to the ‘above ground’ Peak-Oil literature, may determine flow rates.

The second key Peak-Oil message is that the phenomenon will prove significantly harmful to the present socio-economic system. This is mainly due to the fact that higher quality oil has been extracted first (best first principle). Lower quality oil not only translates directly into greater economic costs per unit of resource obtained, but into social and environmental costs, as well. We can distinguish the quality of the resource itself and the quality of the location. In resource terms, we are now more and more dependent on heavy oils (e.g. tar sands) or oil with high levels of contaminants (mostly sulphur). In location terms, we are increasingly faced with difficult geological (e.g. deep sea, impregnated rocks, liquid salt layers, scattered pockets/shale), geopolitical (e.g. hostile regimes, political instability) and geographic (e.g. polar oil, extreme weather, open sea, etc.) conditions. What we face is an expansion of oil's **commodity frontiers**.

These increasing exploration, extraction and production costs inevitably reduce our energy return on investment (EROI), which has already been decreasing for most energy resources over the years. The EROI is the net energy remaining after subtracting the amount necessary to explore, extract and refine an energy resource. In the 1970s, this used to be about 30:1 for domestic oil in the US. In 2005 it was already down to about half that. In comparison, tar sands are situated between 2 and 4:1 (Murphy and Hall 2010). It's still too early to know exactly the EROI for shale oil and gas produced with hydraulic fracturing (fracking). Experts already point to the fact that shale wells are very expensive and tend to peak fast (not to mentions its seismic and environmental impacts). Most renewable forms of energy (except hydropower) also have very low EROI's.

According to Energy Analysts the change in the quality of our main energy resource is bound to have significant consequences for economies. Adherents of the 'Olduvai theory' even predict an imminent societal collapse. Some argue that the economic crisis of 2008 was due mainly to high oil prices caused by scarcities and that Peak-Oil is in fact behind the current global economic crisis. Orthodox economists on the other hand continue to deny any such relation, as they believe that with the help of technological innovation any resource can be substituted. One problem with this belief is that, apart from the lower EROIs of most substitutes, the same dynamics described above for oil are evident in other resources. Ever-lower ore grades drive up the prices of minerals (e.g. Peak-Phosphorous) and metals (e.g. Peak-Copper), some of which are desperately needed for renewable energy technology, in particular the so-called rare earth minerals (e.g. terbium, yttrium, and neodymium).

In other words, resource peaks highlight the fact that human society has reached important biophysical limitations. Economic degrowth from this perspective is no longer an option, but a reality. The challenge for the degrowth movement is to help develop a path towards a post-carbon society that is socially sustainable. Some energy analysts argue that such a managed or prosperous descent is not possible because the economic system is too complex and specialized and thus very hard to change smoothly. To them, tweaking the wheels is likely to cause more harm than good. For this reason it is important to study economic vulnerabilities to Peak-Oil in order to design adaptation policies carefully (e.g. Kerschner, Prell et al. 2013). A first starting point would be the voluntary advancement of biophysical limits via resource caps in order to reduce the decline curve and give more time for adaptation. However, the goal of the degrowth movement should not only be to "survive" Peak-Oil with the least social cost, but to use this crisis to stimulate the creation of a more equitable and sustainable world that questions the current modes of socio-economic organization and a civilization based on the careless over-exploitation of non-renewable resources.

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