# Solutions to Tutorial Questions

**Chapter 7 Growth, the environment and sustainable development**

**7.1 How does investing in human capital help countries to grow over time? What does “human capital” consist of anyway?**

*Human capital is a measure of the skills, abilities and knowledge held by the population of a country at any point in time. One can think of it as a “stock of learning”, which can appreciate or depreciate according to how much resources a country devotes to education and training. Human capital is a key aspect of the productivity of the workforce: crudely speaking, the value of output which each person can produce (“output” here can mean a wide range of contributions to economic well-being, from making motorbikes to writing songs). Investing in human capital can raise economic well-being over time directly (because we can produce more stuff) and indirectly (as rising education levels over time have been associated with lower rates of crime and better health, amongst other desirable impacts).*

**7.2 What role does income growth play in the processes behind the Environmental Kuznets Curve?**

*There are two things to consider here. First, income growth is associated with rising GDP and rising material-energy throughput in an economy, which leads to a rise in wastes (pollution). This is the scale effect. Second, as people get richer, their relative demands for different kinds of goods change. Rising incomes may lead to rising willingness to pay for better environmental quality. This could result in (i) firms choosing to switch production to greener goods to attract richer customers over time (ii) policy makers bringing in tougher environmental policy measures since they believe these will be supported by voters whose incomes are rising. All these effects could underlie an association in the data between real GDP per capita and some measure of environmental quality.*

**7.3 What limits to growth did early economists like Mill and Malthus worry about?**

*We could summarise their main concerns as being the linkage between growing human populations and limited resources. For Malthus, the main concern was the absolute scarcity of agricultural land, and the tendency of population growth rates to increase with rising incomes (from very low levels). For Mill, increasing relative scarcity of natural resources such as coal was a concern, as was the un-desirability of the consequences of rising resource demands on well-being.*

**7.4 What is the difference between “weak” and “strong” sustainability?**

*The difference is usually thought of in terms of the degree to which it is possible to substitute different forms of capital for each other within the total capital stock without reducing the capacity to generate well-being in the future. If it is very hard (very costly) to substitute losses of natural capital with gains in other forms of capital, then we are in a world of strong sustainability. In such a world, sustainable development involves maintaining some measure of natural capital as non-declining over time. If weak sustainability more correctly describes how substituteable natural capital is, then all we require for sustainable development is non-declining total capital.*

**7.5 If a country has a level of Genuine Savings which is positive (greater than zero) but declining over a 10 year time period, what if anything does this signal about its future well-being?**

*If genuine saving is positive, then this sends a signal that consumption can be maintained over time: indeed, that it will grow over time. This is because a positive level of genuine savings means we are adding to the stock of total capital. The time trend (rate of growth or decline) in genuine savings might matter though: It has been argued that we do not want genuine savings to grow too quickly, since then we are in a sense saving too much. A declining value of genuine savings would be problematic if government does not respond to this signal by trying to make sure that, in some (near) future time period, genuine savings declines so much that it becomes negative.*