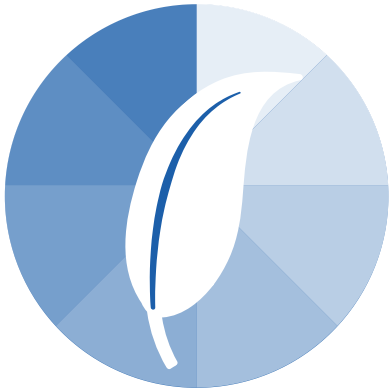

ECONOMICS AND SUSTAINABILITY

CURRICULUM GUIDE

Integrating sustainability concepts into the economics curriculum

Scotland eauc
The Alliance for Sustainability Leadership in Education

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INTRODUCTION

The global financial crisis of 2008-2009, where hundreds of thousands of jobs were being lost every month, caused shockwaves within the economic system and the predominant, neoliberal way of thinking (Fischer et al., 2017). While this system has largely gone back to a 'business as usual' approach, the impeding ecological and environmental crisis caused by climate change is predicted to again create economic catastrophe unless such systems change (Stern, 2006). The international 'Rethinking Economics' group made up of students, academics and professionals argue that economics teaching must become more real-world applicable and start incorporating ideas from fields such as ecology to better explain and design a new form of economics that will operate for the future that students will end up living and working in (Rethinking Economics, 2019).

Incorporating these ideas will likely be very worthwhile as the recent study by Bradley (2019) in the UK shows. Bradley found that economics students are:

- Firstly, dissatisfied that their courses do not contain enough real-world content, and
- Secondly, highly interested in learning about ideas relating economics to sustainable development.

Students are likely to be enthusiastic and engaged by learning how sustainability relates to their discipline as it is a very contemporary and relevant topic. Additionally, by incorporating sustainability, the economics degree will better meet certain graduate attributes, as employers are increasingly looking for students to be ethically and socially aware (Cade, 2008). Integrating sustainability into the curriculum will provide the skills for students to become both active thinkers and future global citizens. Moreover, many universities and colleges in the UK have made it part of their commitments to educate for sustainability as part of their mission to meet the UN's Sustainable Development Goals (Tilbury and Wortman, 2004).

However, embedding sustainability into the curriculum may be challenging to do, which is why the EAUC Scotland office are providing this resource to help aid teaching professionals with integrating sustainability concepts into the economics curriculum.

This guide is intended to be a first step to help generate ideas of how sustainability relates to economics. These ideas may be slotted into existing lectures or could be used for tutorial or seminar topics, which would allow students to discuss these ideas further and analyse how practically applying these ideas would alter the economic system as well as impact society and the environment itself.

LEARNING OUTCOMES

The concepts and curriculum ideas in this guide are aligned with and support the aims of economic degree programmes as determined by the QAA Subject Benchmark Statement for Economics, particularly focusing on:

Aims

- Fostering an understanding of alternative approaches to the analysis of economic phenomena such as circular economy models, assessing carbon credits and valuation of ecosystem services
- Equipping students with tools of analysis to tackle issues and problems of economic policy including critical analysis of carbon tax and offsetting
- Generating in students an appreciation of economic and welfare dimensions of wider social, political and environmental issues using case examples from a sustainability context

Skills Enhanced

- Analysis and abstraction of economic models, theory and ideas
- Gather evidence with the ability to enable manipulation, treatment and interpretation of the relevant quantitative and qualitative data
- Communicate, debate and present economic arguments
- Critical thinking and assessment of economic concepts and policies in a real-world context

Attributes Fostered

- Increased awareness and appreciation of social and environmental implications associated with economic policy and decision-making including ethical and political contexts
- Confidence to address and engage with real world economic problems particularly around climate change, poverty and inequality
- Critical and independent thinking taking into account alternative economic perspectives

This guide is also aimed at encouraging an alternative perspective to teaching economics and promotes the changes recommended by Rethinking Economics.

WHAT IS SUSTAINABILITY?

At its most basic essence, sustainability means that something can *last*. This something could be anything ranging from a natural resource, to a business, to a society, to an ecosystem. However, merely lasting may not be enough, as society's wishes may change and that *thing* may need to be improving to meet new standards (Mearman and Plumridge, 2012). To balance this, one aspect of sustainability is often traded for another, such as economic sustainability being designated as being more important than environmental sustainability.

The most common definition of sustainability exists from the 1987 Bruntland report:

> *'**Sustainable development** is development that meets the needs of the present without compromising the ability of future generations to meet their own needs' (1987, p.54).*

This definition is important as it emphasises the need to take into account future generations and their rights and needs, as well as making it clear that sustainability is about more than just the environment. Sustainability must coexist within other realms such as politics and society to ensure that the needs of the people of the future can be met.

Sustainability in Economics

Sustainability is an important topic to introduce to economics students in particular as economists' decisions centre around how resources are to be shared, allocated, produced and consumed (Bradley, 2019). These decisions fundamentally impact both society and the environment at a global scale. As Spash and Asara (2017) contend, for sustainability to be looked at within economics requires acknowledgement that economics is just one man-made system that is both inherently embedded and reliant on other ecological systems such as the geographical spread of natural resources.

Views on sustainability within economics can vary from positions that look to promote economic sustainability itself (such as the sustaining of economic growth without negatively harming other aspects of the planet, often relying on and requiring technological-advancement in order to maintain 'business as usual') to a more radical position that calls for economic growth to become disentwined with increasing consumption (such as an economic system that focuses on maximising ecological and human wellbeing).

This guide will give some examples of key concepts that integrate sustainability into economics that can be used for teaching purposes.

TRAGEDY OF THE COMMONS

The **tragedy of the commons** represents an economic problem that occurs when individuals act according to their own self-interest and exploit or overuse a shared resource, which then depletes it for everyone else. This lack of consideration of wider social-harm, and elevating individualistic versus collective thinking, makes it a primary example for embedding notions of sustainability into economics.

The original example was written by the British economist William Forster Lloyd in 1833, and posited the issue of multiple cattle owners grazing their herd on 'common' land, individually causing minor land degradation, but collectively depleting the vegetation and quality of the commons for everyone and each other (Franks, Hanscomb and Johnston, 2017). At least initially in economics, conservative economists used the 'tragedy of the commons' problem as an example to argue for the privatisation of common goods to manage the resource in question (Hardin, 1968). In a more modern context, the commons often represent shared and (at least somewhat) self-renewing resources such as fish stocks, air quality or the oceans.

CASE EXAMPLE: OVERFISHING

Take fish stocks for example: While individuals may wish to try to catch ever increasing amounts of fish to make more money, the collective overfishing before breeding season can cause fish numbers to deplete, leaving less fish for the next season which puts more pressure on a scarce resource. Some kinds of overfishing, including the overfishing of sharks, have led to an imbalance of some entire marine ecosystems (Baum et al., 2003). These fish stocks need to be managed carefully as dramatic changes can result in an ecosystem shift where an entire population may have difficulty in re-establishing itself as it has been taken over by another predator. This is a very real and pressing issue and the United Nation's Food and Agriculture Organisation estimates that around a third of the worlds fish stocks have been subjected to overfishing (FAO, 2018). This tragedy of the commons problem not only harms the fish and marine ecosystems, but also harms the workers and their communities that rely on the fishing for their livelihoods and culture.

One solution to manage the largest communal resources is to have governments impose regulations (such as through issuing fishing permits and quotas) or multi-national organisations like the UN creating treaties to ensure that a common resource and area is used fairly and equally. However, the oceans, like the atmosphere, are particularly difficult to manage as they exist outside of individual countries' economic zones thus the gains from conservation efforts of one region can be exploited by another.

CASE EXAMPLE: SCALLOP WARS

The 2018 'Scallop Wars' between France and the UK exemplify the difficulty in international conservation and economic exploits. While France has legislated against fishing for scallops during their breeding season, the UK has no such legislation permitting British ships to continue to harvest scallops in the English Channel during breeding season. This created a huge amount of tension and resulted in some French boats throwing rocks and smoke bombs at British boats in the region.

Alternatively, the Nobel Prize winning economist, Elinor Ostrom, argued that the communities themselves affected by a tragedy of the commons issue are often better at solving these problems on their own, as they have the most local knowledge of the extent of the problem and have the strongest incentive to get the solution right. For Ostrom, the real tragedy of the commons occurs when outside groups exert their power and use the 'managing' of the commons to gain some advantage (CGIAR, n.d.). Ostrom found that generally a 'bottom-up' approach to commons issues worked best as it could most fully involve the community, while a governmental (or a private-sector) intervention usually does not adequately involve the affected individuals in the decision making, often leaving community members feeling unsatisfied that the solution is fair.

CASE EXAMPLE: THE BEDOUIN

An example of transboundary, people-led commons use can be seen through the way the nomadic Bedouin people use common land for grazing, managing its resources and conservation independently for hundreds of years (Lamb, 1981).

FURTHER READING

Read more about Elinor Ostrom:

- Meinzen-Dick, R. (2012). Elinor Ostrom's trailblazing commons research can inspire Rio+20. *The Guardian*. [online] Available at: https://www.theguardian.com/global-development/poverty-matters/2012/jun/14/elinor-ostrom-commons-rio20 [Accessed 13 Jan. 2019].

Read more about the Bedouin:

- Pearce, F. (2012). *What Tragedy? Whose Commons? - Conservation*. [online] Conservation. Available at: https://www.conservationmagazine.org/2012/09/what-tragedy-whose-commons/ [Accessed 15 Jan. 2019].

EMBED THIS CONCEPT INTO TEACHING

- This section could be slotted into a lecture (or on its own) about how natural resources are used, shared and distributed
- The 'Scallop Wars' in particular make a nice example to use because there is a lot of evidence for students to review, including some incredible videos showing the extent of the violence used to defend the scallops, emphasising how important this commons issue is to those affected by it, and the impact on financial and cultural livelihoods as fisherpeople
- For a tutorial or seminar, students could be asked to bring in their own example of a commons dispute, its related economic concerns and how it is/was managed

CARBON EMISSIONS AND ECONOMICS

Carbon Pricing

Adequate pricing for carbon has been a key demand for climate activists for several decades. This is because fossil fuels are cheap.

- It is often cheaper to fly or drive from Edinburgh to London than take the train
- It is cheaper to live outside of a city and drive in to work than live in the centre where walking or cycling can be an option
- It is also often cheaper to buy goods from abroad and have them transported than buying something locally made/sourced

All of these decisions. require the burning of carbon so economic incentives need to be in place to encourage people, as well as corporations, to change their habits.

Carbon pricing is a widely utilised economic response to the fact that greenhouse gas emissions are a *negative externality* that is not priced for by the market. Other greenhouse gas emissions are also similarly priced in 'multiples of carbon dioxide' with respect to their global warming potential. The aim is to charge a price equal to the value of damage caused by the carbon emissions. Carbon pricing measures can either take the form of a carbon tax or in the form of buying and selling carbon permits, which can also include measures as offsetting. Carbon offsetting is compensating for one's carbon or other greenhouse gas emissions by funding an equivalent carbon saving elsewhere, such as tree planting or clean energy projects.

By pricing carbon, it is also expected that renewable energy sources may be put on a more competitive footing potentially stimulating the renewable energy sector's growth. However, there is also the possibility that as carbon pricing is not applied universally, carbon-producing activities may shift to another part of the world.

Carbon Tax

A **carbon tax** is price-based as the regulator (such as the government) sets the price directly and can tax different fuels at different rates according to how much carbon they produce. This system is advantageous in that it is simple to put into practice, but it may result in 'leakage'. Carbon leakage is when carbon emissions increase in one country as a result of a stricter carbon policy in another as production is outsourced to where it is cheapest.

A carbon tax may be applied to either businesses, such as Norway taxing both the oil and gas industries themselves, or be applied at the point of sale, such as in the Fuel Tax in the UK which charges 20% for fuels used by vehicles. However, carbon taxes tend to be politically unpopular (Jenkins, 2014) as the costs tend to disproportionally affect the

poorest. A 20% tax rate on petrol has a greater negative impact on a low-income family than a high-income family, while also tending to penalise those who live in rural areas who rely on their vehicles more frequently, often because of a lack of good public transport options (Grainger and Kolstad, 2010).

> **CASE EXAMPLE: THE *GILET JAUNES* PROTESTS**
>
> The French President, Emmanuel Macron, withdrew his proposed fuel tax rise due to huge public protests (the *Gilet Jaunes* protests in 2018), as people were angry that the tax would disproportionately affect working-class people[1].

Nevertheless, as Goulder (1998) points out, the revenue from a carbon tax could be spent in a way that maximises overall social welfare or gives back to the consumer for cutting their emissions. This may help to balance out the fact that the climate-change mitigation costs are felt most strongly in the short-term, while the benefits are mostly felt in the long-term, by future generations.

Cap-and-Trade Schemes

Cap-and-Trade Schemes are a quantity-based carbon pricing measure where a governing-body decides how much carbon can be emitted each year and then provides permits that allow companies to emit this much carbon. These permits can be privately sold and traded so that companies who emit less are able to sell off their excess permits at a higher price which more accurately reflects the cost of carbon. Industries and businesses that exceed their permitted carbon are fined.

Cap-and-trade schemes began after the 1997 Kyoto Protocol which set legally binding targets for the wealthiest countries to reduce their emissions of six major greenhouse gases, firmly acknowledging that it is the wealthiest countries that historically have produced the most carbon emissions and thus primary responsibility for reductions falls on their shoulders[2]. Notably, the US was the only Annex I (most developed) country not to have

[1] Note that Macron previously removed a 'solidarity' tax that taxed those whose worth was over £1.2 million, leading to his nickname as 'President of the rich' which fuelled much of the Gilet Jaunes resentment, along with austerity cuts to public services (Willsher, 2018).

[2] It is frequently argued that the poorer countries in the Global South should not be penalised for going through the carbon-intensive process of industrialisation and in essence 'catching up' with the wealthier Global North countries that have already reaped the economic benefits from industrialising. If poorer

signed, leaving 37 countries in this initial agreement. This international treaty resulted in the European Union's Emission Trading Scheme, which is the largest cap-and-trade system for pricing carbon emissions. This system has the mechanism to slowly decrease the amount of carbon permits given out to meet the targets set in the Kyoto Protocol. However, little trading of permits has actually occurred, as the EU has tended to overestimate the number of permits needed. This overestimation is partly due to difficulty in measuring previous emissions data and partly due to political pressure from interest groups who lobby for more permits (Borghesi, 2011).

These pricing measures can also be implemented alongside non-price policies such as renewable energy subsidies. However, under a cap-and-trade scheme, having subsidies to encourage a switch to renewable energy may give other polluting businesses more allowances to emit carbon as they then are able to purchase extra permits that have not been used, giving businesses a 'free pass' to actually pollute more as the overall carbon limit has not been reached.

CASE EXAMPLE: ENVIRONMENTAL JUSTICE

Environmental justice groups in America argue that cap-and-trade schemes aren't effective and contend that these free market environmental policies allow industries to pay for the right to dump pollution and contaminants into the water and air, once again directly harming the health of already disadvantaged groups as these dirty industries are more likely to be located near low-income neighbourhoods and communities of colour (Greenaction, 2017)[3].

Carbon Offsets

Countries or individuals are also able to sponsor carbon reduction projects in their own or other countries and use greenhouse gas removals from these projects, such as reforestation, to meet their Kyoto Protocol commitments, in a process that is called **carbon offsetting**.

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countries had to cut their emissions at the same rate as wealthier countries, then that would hinder their developmental progress and harm their chances at improving citizens' standards of living (Baer, 2000).

[3] It is important to note that the direct effects from pollution, such as water contamination or localised air pollution, tends to affect the lowest income communities no matter the country in the world. This is due to factors such as property prices being lower near heavy industries, NIMBYism ('Not in My Back Yard' style campaigning), and low-income communities having less political power than wealthier constituents.

Carbon offsetting measures are controversial as they are often unreliably measured (as it is difficult to quantify the emissions that are saved from individual projects, and for some who offer offsets there is an incentive in selling the same reductions to multiple people or organisations), and a study produced by the Carbon Retirement Project has found that less than 30 pence in every pound spent on carbon offsets goes directly to the project that is designed to reduce the emissions (Kahya, 2009). It has also been argued that carbon offsets are an excuse for a 'business-as-usual' approach with regards to pollution as they do not actually encourage the most damaging industries to reduce their carbon emissions (Monbiot, 2006). Lastly, tree-planting offsets have been frequently called out for causing conflict with indigenous land rights by evicting thousands of villagers from their land and have even been accused of being complicit in 'genocidal land grabs' (No REDD in Africa, 2014).

FURTHER READING

Read more about the conflict between indigenous land rights and tree-planting offsetting projects:

- Redd-monitor.org. (2011). *REDD: An Introduction | REDD-Monitor*. [online] Available at: https://redd-monitor.org/redd-an-introduction/ [Accessed 27 Jan. 2019].

EMBED THIS CONCEPT INTO TEACHING

- Carbon Pricing could be used as example for how markets and governmental regulations deal with negative externalities
- Economic carbon-reduction measures are good examples of analysing the effects and complications of implementing a theoretically simple economic policy
- Split students into two groups to discuss the merits of implementing a carbon tax versus a cap-and-trade system — this would make for an interesting tutorial topic
- Mearman and Plumridge (2012) suggest that the Stern Review, which looks at the costs of not mitigating against climate change, would be an excellent example for economics students to research. The Review advocates for setting carbon pricing measures globally as it concludes that the costs for not acting against climate change would be far greater than the costs for taking early action (using carbon pricing as an example). The tutorial could discuss the methodology used by the Stern Review (essentially a cost-benefit analysis), and whether it could be considered appropriate to be used for a study on global climate change, which inherently has problems such as intergenerational equity, global poverty, huge uncertainty and risk. The students would also learn about some of the effects of climate change and its global impacts while also considering the merits of using a traditional method to calculate the cost caused by inaction. Students would have the opportunity to gather evidence, assess and draw economic policy inferences regarding to what extent carbon pricing measures are required, and whether,at the current level, they are enough.

CIRCULAR ECONOMY

The current, linear, economy relies upon a 'take, make, dispose' model, requiring large quantities of cheap materials and energy to maintain (Ness, 2008). A **circular economy** instead aims to keep these materials at their highest *utility* and *value* at all times, and ultimately aims to decouple economic growth from the consumption of finite materials (Ghisellini, Cialani and Ulgiati, 2016). This makes it a 'cradle to cradle' economy, rather than a 'cradle to grave' one.

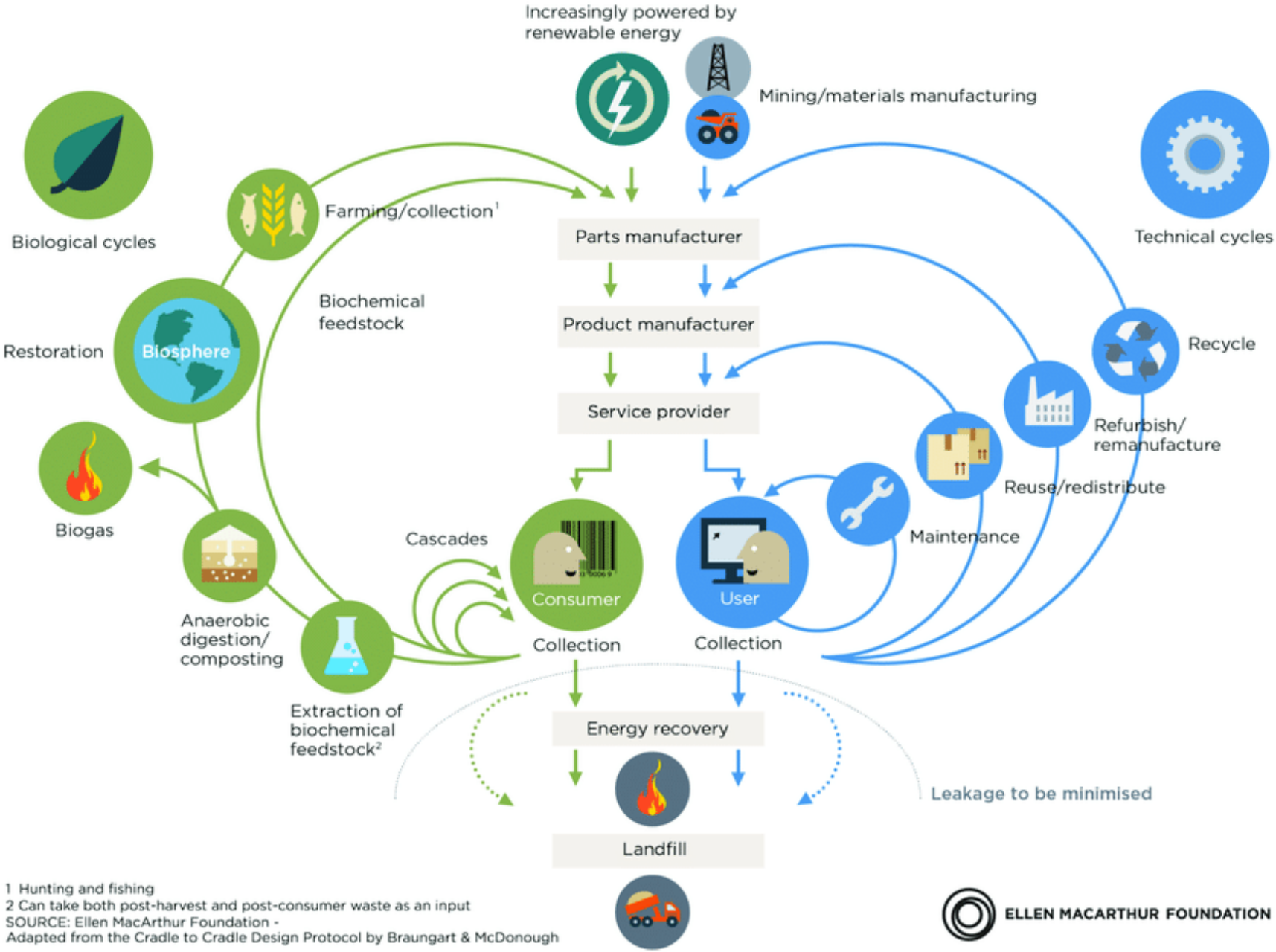
Proponents of a circular economy approach believe that we would be able to continue with our current quality of life while still enjoying similar products and services that we do now, and with similar (or even increased) revenues for manufacturers, but by using far fewer natural resources (Stahel, 2016). This model has value as part of the response to the end of cheap oil and materials as well as contributing to the transition to a low-carbon economy. Interest in the idea has been peaked by the 'Blue Planet' effect whereby the public is much more aware of and interested in how materials are used and disposed of, particularly taking action against single-use plastics and 'fast fashion'.

Design of the Circular Economy

The design of the circular economy takes inspiration from natural systems and ecosystems that inherently reuse, recycle and repurpose different parts of themselves in order to regenerate and recreate new life and life supporting services. It is split up into biological and technological cycles *(see Figure 1: Biological and Technological Cycles in the Circular Economy)*.

- An example of a **circular biological cycle approach** is the promotion of the regeneration of soil by not over-cropping, having rest periods and encouraging wildlife activity such as worms and beetles that aid the health of the soil. At the same time, the soil could be supplemented with compost generated from food waste, minimising the need for adding in chemical fertilisers.

- A **circular technological cycle** may include the maintaining, repair and upgrading of existing products such as computers to prolong their lifespan and relevancy. A product such as the iPhone is not part of this approach as it cannot easily be repaired, old handsets cannot be upgraded, and older modules are 'locked out' of updating to the latest software.



1 Hunting and fishing
2 Can take both post-harvest and post-consumer waste as an input
SOURCE: Ellen MacArthur Foundation -
Adapted from the Cradle to Cradle Design Protocol by Braungart & McDonough

ELLEN MACARTHUR FOUNDATION

The Ellen MacArthur Foundation (2015), who are one of the largest research organisations on the circular economy, consider that there are five main principles of a circular economy system:

1) Waste is designed out: biological materials are non-toxic so can either be returned to the soil or consumed in anaerobic digestion (which itself produces energy which can be harnessed) and technical materials are designed to be recovered, reused and upgraded which retains both their economic and resource value
2) Diversity is key: biological diversity helps to mitigate against environmental crisis while economic diversity through having both large and small-scale businesses help to provide alternatives when economic crisis hits
3) Renewable energy sources fuel the circular economy
4) Systems thinking is applied broadly, emphasising the links between society, politics, the economy and the environment
5) Prices reflect the real costs; the cost of externalities is properly accounted for in pricing

The system values reusing, repurposing and upgrading existing items as a priority, with recycling being much closer to a last resort. This is because the recycling system is not as efficient as most people may imagine. Even when a product does get recycled, only about 5% of that material's *raw value* gets recovered (Neufeld et al., 2016). This can be extended to other items which are not used efficiently, as Ellen MacArthur Foundation (2015) evidences:

> *'For example, in Europe, the average car is parked 92% of the time, 31% of food is wasted along the value chain, and the average office is used only 35–50% of the time, even during working hours' (p.3).*

The Ellen MacArthur Foundation argues that a move towards a circular economy is now possible due to the advancement of technology (including online systems) making new business approaches viable. We also now have, for the first time, reached a stage where over half of the world's population lives in large urban areas, which makes sharing services more accessible. By sharing items each item gets used by many people, making it a more efficient use of resources.

Benefits of the Circular Economy

A move towards the circular economy is considered to be *essential* to cope with the predicted boom in the number of middle-class in the world, which is likely to reach 5 billion people worldwide by 2030 (Kharas, 2017). Otherwise, the negative externalities of consumption such as pollution and carbon emissions will be exacerbated by having this many additional wealthy people in the world. The effects of a take-make-dispose economy are not only environmental, in that an excessive use of resources and energy is used to

make a product that ends up in landfill, but also social in that the production of these low-value items often relies upon cheap labour, usually from abroad, in poor conditions. The West's demand for fast fashion for instance has been accused of fuelling atrocities such as the Bangladeshi garment factory collapse (Motlagh, 2013).

Proponents also argue that the circular economy can bypass problems that exist within a linear system, such as risks due to supply chain and price volatility, which dampens economic growth by introducing uncertainty and limiting investment. It can also help to mitigate against the effects of uneven resource spread in which countries are reliant on other countries and regions to meet their energy and resource needs, such as Japan needing to import the majority of its oil and gas to meet its energy needs. This reliance on other countries for energy needs can create risks to not only supply but to security, which can be seen through the conflicts between Russia and Ukraine over its gas pipeline, which further threatened other European nations' energy security through these geopolitical shut downs[4].

Claims made about the Circular Economy by the Ellen MacArthur Foundation:

- The circular economy can create huge opportunities for economic growth including the revival of old industries, creating opportunities for skilled employment
- It can radically reduce carbon emissions as required to keep levels within the Paris Agreement and the IPCC report, as well as reduce other negative externalities from pollution
- It can also increase food production, helping to meet the future food needs for the expanding global population
- It can make energy supplies safer as energy is based upon decentralised and renewable sources, lessening the geopolitical imbalances
- There should be more specialised relationships with consumers, as by having products last and be used for the long-term businesses get to know what their consumers' needs and wants are so can better adapt products to suit them
- Citizens will benefit by having more choice, lower prices, and lower total cost of ownership

[4] See Buck, T. (2018). Nord Stream 2: Gas pipeline from Russia that's dividing Europe. *Irish Times*. [online] Available at: https://www.irishtimes.com/news/world/europe/nord-stream-2-gas-pipeline-from-russia-that-s-dividing-europe-1.3571552 [Accessed 3 Feb. 2019] for a good overview of some of the geopolitical issues surrounding the building of a new gas pipeline between Russia and Europe

Criticisms of the Circular Economy

However, the idea of the circular economy has also received a fair amount of criticism from those within the environmental movement. Narberhaus and Mitschke-Collande (2017) argue that the circular economy is presented as a 'magical fix' for environmental problems, when in reality, the circular economy still encourages production which will need to decrease for a realistic chance of sticking to the IPCC's current 1.5 degrees of warming scenario (Zinc and Geyer, 2017). They also question some of the ethics surrounding the 'sharing economy'. While tool libraries (operates like a book library, but members borrow tools instead) are increasingly being set up and managed by members of a local community, other sharing economy companies such as Uber and Deliveroo are dominated by large corporations and have created precarious 'gig economy' working conditions which do not guarantee basic rights such as minimum wage and sick pay.

To counteract this, the circular economy would need to be underpinned by cooperative mechanisms that would not encourage an overall increase in consumption and share the benefits between everyone, rather than being controlled by the same large corporations such as Coca Cola or Google (Ellen MacArthur Foundation, 2019a; Ellen MacArthur Foundation, 2019b).

CASE EXAMPLE: AIRBNB

Airbnb (one of the largest 'sharing economy' corporations) would be radically different if it was indeed a sharing platform by and for its users, rather than its current rental-based model that has resulted in a system where increasing numbers of rental properties are owned by large corporations.

EMBED THIS CONCEPT INTO TEACHING

- The multimillion-dollar US company TerraCycle and their latest service '*Loop*' is a good case example to get students to begin to question whether the circular economy is really a radically different economic model. *Loop* aims to provide a sort of 'milkman' service where customers order products online and they would be delivered in reusable packaging, such as glass bottles, with an additional cost for a deposit. The items, once finished, would then be collected by a delivery truck and cleaned ready for purchase again on their online platform. There are, however, concerns that the only products available are from multi-national (and ethically questionable) corporations such as Unilever, Nestle and PepsiCo, which creates a 'brand lock-in' and forces users into giving money to these major companies rather than to local producers where the money is more likely to remain in the community. This video resource: *https://www.bloomberg.com/news/videos/2019-01-26/terracycle-ceo-explains-loop-video* is easy to use within a lecture setting. The students can discuss what they notice about the promotional video and their assessment of whether this application of the circular economy is truly revolutionary, or whether it instead could be seen as an attempt at corporate 'greenwashing'[5].
- A fun tutorial idea: Students identify an example of an individually owned product or service that could be replaced by the sharing economy. International students can be encouraged to bring in an example from their home country to show how different cultures have different practices of ownership over certain goods. Discussions could be held on implementation of the sharing service, if the shift from individual to communal ownership would actually be wanted by most people, and whether they think that the claims made by groups such as the Ellen MacArthur Foundation in their 2015 report are realistic.

[5] 'Greenwashing' is where companies make misleading claims about their product or service, making them to appear more environmentally friendly than they actually are

ECOSYSTEM SERVICES

More than Human Consideration

Ecosystem services refer to the goods and benefits that nature, biodiversity and ecosystems provide to humans on a daily basis that are vital to humanity's existence. As these are vital to the functioning of our everyday lives, economists have begun to consider the monetary valuation of the services nature provides.

Ecosystems can range from forests to marshlands to aquatic ecosystems, which all provide a range of essential services to humans, from producing food and medicine to providing oxygen and clean water. The monetary value helps provide guidelines for decision makers of the worth of such environments to help make planning decisions. For example, a city park may be assigned an economic value for the ecosystem services it provides such as a space for recreation, a habitat for wildlife and as a drainage zone for flood prevention. This monetary value could then be used by the local council to weigh up the costs of granting planning permission for a new housing development that wants to use the park space.

Millennium Ecosystem Assessment

The United Nations, in 2005, commissioned a report titled the Millennium Ecosystem Assessment which aimed to make 'nature's values visible' (United Nations, 2005). It divided up these ecosystem services into four main groups:

- *Provisioning services* which directly provide goods to be used by humans such as food, energy sources or raw materials
- *Regulating services* which help to regulate the planet by, for example, helping to control climate emissions by capturing carbon or controlling against disease through having landscapes that encourage natural predators of pests that harm crops
- *Supporting services* that help support other life sources such as ecosystems that provide living spaces for a variety of different plants and animals
- *Cultural services* that provide benefits for society such as parks providing an open and public space for recreation or an ecosystem that provides in spiritual ways such as Uluru rock in Australia being spiritually and culturally important for indigenous Australians

This report emphasised that there are many competing demands upon landscapes: from wanting landscapes that are beautiful and conserve wildlife species, to landscapes that provide foods and fuels, to landscapes that provide infrastructure, living spaces and workplaces.

The report also emphasised the need for all ecosystem services to be used with sustainability in mind — although nature tends to be self-regulating and self-propagating, ecosystems can easily become damaged and out of balance if too much of one resource is taken. So, while we as humans can freely receive the benefits from bees as pollinators for crops as an incredible ecosystem service, we must also respect the landscapes that allow bees to thrive and use them in a sustainable manner to keep receiving the vital services that bees provide. Generally, across all landscapes there is a general sense of undervaluation of the services that nature provides us in sustaining human life (United Nations, 2005).

Pricing for these services

There are two main ways that economists have framed ecosystem services for their valuation: one that frames natural capital as *utility* and another that frames it as *assets.*

A **utility-based framework** values natural capital as the value of the sum of the stream of services minus the costs of generating them. So, the ecosystem service of fish for instance would be the cost of the fish to be consumed minus the cost to produce them with no value placed upon an inherent worth of the fish itself.

- This kind of approach can cause problems in terms of biodiversity conservation as, for example, a pristine patch of Amazonian rainforest valued for its carbon sequestration services would be valued as equal to a monoculture planation that sequesters the same amount of carbon as there is no direct value to humans placed upon protecting biodiversity itself (Willis, 2018).

An **asset-based framework** views natural capital as a universal right that citizens have as it underpins many societal outcomes that we desire both now and in the future such as in health, education and welfare. The asset-based approach focuses on environmental stewardship and looks at enhancing the ecosystem asset in question to try to maintain or even grow its value.

- This type of approach is the one that is favoured within the UK Government's 25 year plan to 'leave the environment in a better state than it is at present' which aims for citizens to have clear air; clean water; thriving wildlife; enhanced beauty; heritage and engagement with the natural environment; mitigation of, and adaption to, climate change; and a reduced risk of harm from environmental hazards (Department for Environment, Food and Rural Affairs, 2018).

An asset-based approach values the whole system better than a utility-based approach which tends to ignore parts of nature that have less direct utility, which may result in the further fragmentation of a natural landscape. The simplest, and most pragmatic, way to undertake an economic valuation of ecosystem services as public goods may be to work out

the cost of *maintaining* assets (Willis, 2018). For example, this could be based upon paying costs to the landowner to maintain the current landscape, which allows for a focus on the ecosystem as a whole rather than slicing the services up into individual benefits and working out a cost each service is worth, and also helps to address errors and discrepancies within valuations (as there are often large ranges of values being given to similar environmental assets).

Challenges with Ecosystem Valuation

Understandably, as mentioned above, there are some challenges with pricing the worth of ecosystem services as it is hard to fully comprehend the value that the environment brings. Nevertheless, there was a large study conducted that valued the world's biodiversity at a minimum of $33 trillion US Dollars per year (Constanza, 1997). This total value dwarfed the values of any other inputs into economic systems, showing just how critical the services provided by ecological systems are. However, this figure could also be seen as being somewhat arbitrary as life itself depends upon all of these ecosystems working in conjunction with each other. Without these ecosystem services we would not survive as a species and therefore there would be no need for economics at all, making the services that nature provides us, in many ways, priceless.

Another challenge when working out this valuation is balancing out both what the current needs are versus the potential future needs. For example, forests may become more of a valuable resource in the future for their ability to store carbon as global emissions are predicted to rise and carbon storage can help to combat the global rising temperatures. Similarly, there are problems due to our limited knowledge of ecosystems and the range of services they provide, thus an economic valuation of them would likely ignore or miss parts of the ecosystem that we know less about. These aspects may have increased value in the future, such as dense jungle landscapes potentially sourcing future medicines, but currently will often not be valued on this potentiality (Chinedu, 2017).

There is also a need to recognise that we know very little about the complexity of ecosystems and their states of balance, and thus should try to incorporate the *precautionary principle*[6] into economic calculations to set a safe minimum standard for evaluating ecosystems (Kriebel et al., 2001).

[6] The precautionary principle is commonly used within the environmental sciences to advocate for caution when making decisions relating to the environment as these systems are often delicately balanced and little is known about the effects of tampering with them. The principle is to be used as a matter of social responsibility to protect the public (and the environment) from unknown harms.

An additional problem with this type of evaluation that tries to separate out ecosystems, is that it ignores the fact that all ecosystems are, to varying degrees, interdependent on each other. Any changes to one ecosystem may impact on another and give unintended consequences. There may also be thresholds crossed that rapidly cause an ecosystem's health, and its benefits, to suddenly decline due to the sensitivity of these landscapes which are in a delicate balance (Department for Environment, Food and Rural Affairs, 2007).

A further critique from more radical ecologists argues that an economic valuation of ecosystem services makes environmentalism a 'practical problem-solving activity, not a fundamental critique of the dominant structure of political economy and its treatment of human relationships with nature' (Spash and Asara, 2017.p.127), due to it perpetuating ideas that nature is only there for humanity's use, purely and solely as a resource. Erik Gómez-Baggethun and Manuel Ruiz-Pérez (2011) also suggest that the increasing use of these types of environmental valuation may lead the way to a commodification of ecosystems as well as affect the equity of access to their public services benefits.

EMBED THIS CONCEPT INTO TEACHING

- The valuation of ecosystem services could be included as part of a module section on cost-benefits analysis to show some of the difficulties and problems of applying this methodology in real life and highly complex situations which could have huge repercussions if the valuation is not done with an adequate amount of environmental sensitivity.
- A fun tutorial idea: Groups of students select or are assigned an ecosystem to try to value. They will work together to develop a methodology for evaluation. This will get the students to contextually think about the diverse range of benefits we receive from nature, and to consider the problems and challenges of evaluating something as complex as environmental benefits. Mearman and Plumridge (2012) sketch out an outline for such a tutorial in a bit more depth, as well as provide different methodologies for evaluating ecosystem services.
- The Joint Nature Conservation Committee (n.d.) and DEFRA (the Department for Environment, Food and Rural Affairs) (2007) both have excellent guides online which shows the range of valuation methods used by economists (links to these resources are in the references list)
- Encourage students to attend events, local meetings, or review resources by other organisations such Natural Capital or the Wellbeing Economy Alliance

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CIRCULAR ECONOMY

Figure 1: Biological and Technological Cycles in the Circular Economy.
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