The Foundation for the Economics of Sustainability

Submission to the Department of the Taoiseach's Bioeconomy Discussion Document
September 14 2017

We welcome the opportunity to make this submission and more generally, the fact that an interdepartmental group is involved in preparing a high-level policy statement on the bioeconomy.

Below are our suggestions and comments, based on the questions raised in the discussion document.

1. Does the broad definition outlined adequately encompass the opportunities presented by the bioeconomy?

The discussion document defines 'bioeconomy' as follows:

"In broad terms the bioeconomy is perceived to comprise those parts of the economy that use renewable biological resources from land and sea to produce food, feed, biomaterials, chemicals, pulp and paper, energy and fuels. Biological resources include crops, forests, fish, animals and their by-products, micro-organisms and also industrial feedstock resources such as municipal solid waste and wastewater."

We feel that the question is somewhat oddly phrased, as is the definition.

The definition implies that the bioeconomy is simply one sector among many within the wider economy. One could even surmise from it that the bioeconomy is (at least potentially) interchangeable with other sectors of the economy. Moreover, there is an implication that primary emphasis should be placed on exploitation of resources, presumably in order to generate growth. As the very first line of the discussion document puts it, "developing Ireland's bioeconomy provides opportunities to advance a number of key Government priorities for smart and sustainable growth."

From the perspective of ecological economics, however, it would be more accurate to describe the bioeconomy, and the ecosystems that underlie it, as a

vital framework and support for the rest of the economy - and indeed, for all human activity. For example, food is not simply one product among many whose value and output ought to be adjusted in order to maximise profitability. The blunt fact is that we cannot survive without food. Forests are essential for regulating the climate, among other things. Wastewater and municipal solid waste furnish important nutrients to the soil that enable the cycle of life to continue.

To an extent, the precautionary and cascading principles address this point. However, they are not reflected in the current definition.

Part of the difficulty may lie in the term 'bioeconomy' itself as it can be easily misinterpreted; as mentioned above, one can assume that we are discussing just one inessential - perhaps even substitutable - component of a wider overall economy. We realise that it is a term used by the EU and other international bodies, so to an extent this choice of terminology is out of the Irish government's hands.

The OECD understanding of bioeconomy is intimately tied to the idea of biotechnological developments rather than the much broader European Commission definition outlined in the discussion document. We need to be clear on this point: Is the bioeconomy simply a new economic activity that comes from "the application of biotechnology to primary production, health and industry"[1] or is it "Europe's response to key environmental challenges the world is facing already today. ...meant to reduce the dependence on natural resources, transform manufacturing, promote sustainable production of renewable resources from land, fisheries and aquaculture and their conversion into food, feed, fibre, bio-based products and bio-energy, while growing new jobs and industries" as stated by the Commission[2]?

We believe the European Commission's objectives of the bioeconomy (as listed in bullet point form in the discussion document and the Horizon 2020 description above), need to be made explicit in the policy statement's definition, placing a greater emphasis on stabilisation, prioritising food security, fossil fuel emissions reduction and addressing resource scarcity. Far more emphasis also needs to be placed on the fundamental importance and vulnerability of the many and varied ecosystems that support the bioeconomy.

What the Commission outlines in its objectives is almost synonymous with the wise use of natural resources within healthy ecosystems. While there is a difference between wise ecosystems management and the bioeconomy, in that the latter refers to the *use* made of biological resources which can be harnessed for profit, in practice it is extremely difficult, and of dubious value, to separate the

[1] http://www.oecd.org/futures/long-termtechnologicalsocietalchallenges/thebioeconomyto2030designingapolicyagenda.htm
[2] http://ec.europa.eu/programmes/horizon2020/en/h2020-section/bioeconomy

role of the bioeconomy out from that of the wider element of ecosystems management because of its highly interconnected nature (in order to grow high-quality food there needs to also be high-quality water, clean air, healthy soil, etc).

However we need to be clear that there is a distinct difference between what exists and what use we choose to make of what exists. Ecosystems exist, whereas the bioeconomy (by the definition suggested in the European Commission's list of objectives) is the use we make of ecosystems and the natural resources within them. The two are separate, and are yet intimately interconnected. Make no mistake, however; while we can have healthy ecosystems without economies, we can certainly never have viable economies without healthy ecosystems.

While formulatlng policy we could perhaps ignore the life-sustaining aspect of the ecosystems that support the bioeconomy and focus solely on exploring its economic potential, were it not for the fact that those ecosystems are actually under serious threat. As is well known, climate change, pollution and resource depletion are placing enormous pressure on the bioeconomy and risk compromising its 'vital signs'.

We would argue that a significant root cause of this threat is a misplaced emphasis on increasing productivity.

There is considerable controversy as to exactly what 'smart and sustainable growth' is, and indeed, whether it is achievable on an aggregate level. Despite recent claims that it is possible to decouple fossil fuel use from economic growth (thus achieving 'green growth' or 'sustainable growth')[3], a persistently strong connection remains between the two[4]. Transport is a big culprit as it plays a wildly disproportionate role in the economy, with much unnecessary and wasteful transportation of goods to faraway countries (including goods originating in the bioeconomy), and it is almost entirely oil-dependent[5]. In addition to the problems created by transport-derived emissions and other pollution, the long supply lines that are so endemic to the economy at present are highly vulnerable to environmental or geopolitical disturbances. A disruption in the transportation sector could quickly lead to an overall economic collapse[6].

Were the economy more localised, one could envision a switch to 100% renewable-powered transport, but given the sheer scale of the transport sector

[3] https://www.iea.org/newsroom/news/2016/march/decoupling-of-global-emissions-and-economic-growth-confirmed.html
[4] http://www.resilience.org/stories/2015-10-13/the-decoupling-debate-can-economic-growth-really-continue-without-emission-increases/
[5] https://www.eia.gov/outlooks/ieo/transportation.php
[6] http://www.feasta.org/2012/06/17/trade-off-financial-system-supply-chain-cross-contagion-a-study-in-global-systemic-collapse/

within our current highly-globalised economy, there simply is not enough suitable renewable energy available. As a recent publication on the global energy transition, *Our Renewable Future*, puts it, "a renewable future is likely to be characterized by less mobility, and this has significant implications for the entire economy."[7]

At present, despite some EU-level attempts to rectify the situation, there are insufficient measures in place that could prevent continuing runaway resource depletion and pollution, including increasing greenhouse gas emissions, from severely sabotaging the bioeconomy. To take an important example, the Paris Accord, while vaunted as a great breakthrough in climate action, is actually non-binding and is based on voluntary action proposed by individual governments. Given the level of subsidisation of the fossil fuel industry and the role played by oil in the transport sector (described above), it is extremely hard to see how the Paris Accord's targets can be achieved.

A major source of this systemic imbalance in the economy is the financial system, which in its current configuration[8] requires constant economic expansion in order to function. We have arrived at a world economy in which the financial system is the tail wagging the dog, and its short-term needs are being placed above our long-term need for survival[9].Thus, it is pressuring the economy to develop in a dangerously unstable way. This could (and at present, does) seriously undermine our efforts to transition to a green economy.

While many hope that, with increasing biotechnological and renewable energy innovation, this problem will simply be sorted out by the markets (as green products become more competitive in terms of price), in practice we are seeing a Jevons effect whereby increased efficiency risks being cancelled out by increased consumption[10]. Additionally, high-income countries which appear to be cutting down on CO2 emissions are in fact merely outsourcing them to countries with lower labour costs and less environmental regulation such as China[11].

Even if we disregard these major concerns, there is still the question as to whether infinite growth - green or not - is really what we want or need. One could imagine a completely circular economy in which all energy and transport is 100% renewable, all production originates in the bioeconomy and there is zero waste, and yet there are still traffic jams, long commutes and the many stresses associated with over-commercialisation. Moreover, there is nothing inherent to green growth that could protect quality of life from being compromised by long

[7] http://www.resilience.org/stories/2016-06-02/our-renewable-future-introduction/
[8] We are referring here to the way in which most money is created at present. An explanation can be found here: http://positivemoney.org/how-money-works/how-banks-create-money/
[9] http://www.workableeconomics.com/the-debt-based-economy/
[10] https://ideas.repec.org/a/eco/journ2/2015-01-06.html
[11] http://www.oecd.org/sti/ind/carbondioxideemissionsembodiedininternationaltrade.htm

working hours, poor work conditions, high unemployment, inadequate provision for children and the elderly, housing shortages and an extortionary financial system.

These points may seem irrelevant to a discussion of the bioeconomy, but it is important to be very clear on exactly what our overall goals are. In a nutshell, more is not always better, even if the 'more' in question is 100% sustainably produced and transported. We should not put growth ahead of the essential values of life.

This is not to say that there is no possibility of, or reason to wish for, increased economic activity in rural Ireland or in certain parts of the agricultural sector, but rather, that the use of unsuitable metrics to try and measure progress is actually undermining it. To reiterate: emphasis should be placed on stability and resilience rather than on growth for its own sake.

To answer the first question, then, and with no glibness intended: an important opportunity that is furnished by the bioeconomy, and that is not alluded to in the definition given, is the opportunity to survive as a species - provided that we act judiciously.

2.How can a high-level policy statement on the bioeconomy assist in progressing the development of the priority value chains identified?

We will not go into the specifics of the needs of the value chains identified as we do not have sufficient background knowledge on them to be able to provide useful insights. However, we strongly suggest that the statement includes a reference to the cascading and precautionary principles as these will provide important general guidance with regard to the development of these streams (e.g. by ensuring that biofuel production does not crowd out staple food production).

3.What lessons can Ireland take from the European approach, including to the Circular Economy?

As mentioned above, we believe the European Commission's definition of the bioeconomy as described in the discussion document is a move in the right direction as it prioritises food security, greenhouse gas emissions reduction and the protection of depleting resources.

More specifically we welcome the EU's directives on waste, packaging and landfills. Innovative ideas have clearly arisen from the EU's move towards a circular economy-based mindset, including the practice of companies taking responsibility for the maintenance of their products, for example by renting out appliances such as washing machines and taking a cradle-to-grave approach to their upkeep. Such ideas are welcome and it will be interesting to see how they play out in the bioeconomy sector[12].

Unfortunately the overall thrust of EU policy is more ambiguous. We recognise that the Irish government's emphasis on GDP growth (which we criticised above) derives partially from pressure by the EU to achieve a 'healthy' debt-to-GDP ratio. This EU requirement stems in turn from the European Central Bank's concern that highly-indebted, low-growth countries will not attract sufficient investment from the bond markets. Misperceptions about stability and progress therefore go right up the EU hierarchy and are equally pervasive in the stock markets. They are unfortunately also cornerstones of the international trade agreements.

As we have described above, the financial system, including the ECB's mechanism for the issuance of euros, is in need of reform in order to prevent the transition to a fossil-fuel-free economy from triggering an economic collapse. This would be an important first step to achieving wider EU-level change.

4.Given the cross-sector nature of the bioeconomy, how can a national policy statement best support development?

The cross-sector nature of the bioeconomy stems from its pivotal role. The statement needs to take that role into account by making the government's ultimate values and goals extremely clear.

As described above, we believe major emphasis should be placed on resilience and the maintenance of the 'vital signs' of the bioeconomy. While it is certainly appropriate to list job creation as a goal, growth in itself should not be prioritised. Similarly, innovation is an appropriate goal but needs to be placed in a context of stabilisation and ecosystem maintenance.

5.Can we identify a common set of principles, including in particular the application of the cascading principle, which will assist in the development of both the bioeconomy and circular economy?

[12] http://ec.europa.eu/environment/circular-economy/

To quote the discussion document, “established international principles include food first, the precautionary principle and a cascading approach to the extraction of value from biomass and reuse of materials.”

We strongly agree that these three principles should be emphasised as they are vital to ensuring that essential needs such as food security and ecosystem protection are addressed.

Below are some other useful principles which are applicable to any development policy (the text is taken from John Jopling’s chapter of the 2012 Feasta publication *Sharing for Survival*[13]):

- ***The principle of subsidiarity***
This is the principle that all functions should be carried out at the lowest level at which that function can be carried out satisfactorily[14]. In the context of the bioeconomy it would mean, for example, giving farmers and other producers the maximum decision-making power and encouraging collaborative initiatives on the local and regional level.

- Stafford Beer’s Viable Systems Model

This model envisages that, instead of responsibility and power being in one entity called the government, autonomy and responsibility are shared out throughout the organisation with the aim of ensuring that it can survive in a changing environment. The VSM offers a language to help people work out how to do this[15].

- Ashby’s law

This states that only variety can absorb variety. It is one of the laws of the science of self-regulation known as cybernetics, which has been developed as a tool to help organisations manage themselves effectively. For Beer and other cyberneticians this law explains why top-down government, where decisions affecting many are taken by a few, is so ineffective: the few decision-makers do not have the variety to match the variety of the world they are up against, so they are overwhelmed by the complexity of the system[16].

Other principles whose inclusion we would request (in order to provide clarity) include human rights and gender equality.

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[13] http://www.sharingforsurvival.org/index.php/chapter-5-institutional-and-legal-structures-by-john-jopling/
[14] EF Schumacher *Small is Beautiful* p 228.
[15] Stafford Beer *Designing Freedom* Wiley 1974, *Diagnosing the System* Malik 2008 and *The Heart of Enterprise* Malik 2008; for Jon Walker’s VSM Guide see http://www.esrad.org.uk/resources/vsmg_3/screen.php?page=preface
[16] Stafford Beer, *Designing Freedom* Wiley 1974

6. How can a national policy statement support local and regional cooperation around the use of renewable biological resources?

As mentioned in our answer to question 5 above, the principle of subsidiarity would be important in this regard. Decision-making about exactly which investments to make should be highly localised, and where they considered it useful, communities could pool resources on a regional level also[17].

7. How can waste policy, including an examination of the definition of waste, best support developments in the bio and wider circular economy?

Again, we welcome this question. Waste can and should be redefined.

As the discussion document mentions, much of what is now considered as waste within the bioeconomy could in fact be used in innovative ways. It could also - and, arguably, more importantly - promote stability and resilience. For example, to cite a Feasta report from April 2016 on closed-loop agriculture:

"Closed loop agriculture is farming practice that recycles all nutrients and organic matter material back to the soil that it grew in. This forms part of an agricultural practice that preserves the nutrient and carbon levels within the soil and allows farming to be carried out on a sustainable basis." By contrast, to classify animal manures as wastes is to seriously underestimate the valuable role that compost and humus play in cycling carbon and nitrogen within the farm and soil ecosystems; in holding moisture and providing drainage; in water filtration and a host of other ecosystem services that healthy soils offer.

"Current farming practice relies heavily on imported nutrients to sustain high production. We eat the food; and then the nutrients and biomass from faeces and urine are flushed away via our toilets. The sewage is treated, to a greater or lesser extent, to limit its potential to cause water pollution, and then discarded to groundwater, rivers or the sea. This practice requires high fossil energy inputs for fertiliser manufacture, causes pollution to our waterways, and strips organic matter from the soil which in turn reduces productivity, overall soil health and structure." Thus, even our own human wastes, so called, need to be redefined in order to avoid the current disposal attitude towards potentially valuable biomass and nutrients; and the pollution that ensues.

[17] The mechanism that we describe in our answer to question 9, Cap and Share, would help to ensure that this principle was upheld by providing a clear framework within which planning could be effectively carried out, along with essential funding on the local level.

It must be said that a good start has been made on this area already and that most of the sludge arising within the EU is agricultural in origin and is already returned for use on the land. In addition, biosolids (treated sewage sludge) are also increasingly returned to the land. However simply recycling liquid slurries and sludges is not the optimum method of building soils, and this is an area where the focus on a bioeconomy could help to build a scientific basis for agricultural and sewage policy and practice. As outlined in the 2016 Feasta report, "By composting humanure (and farmyard manures) and converting it to humus before application to the fields, the soil can hold more moisture and withstand erosion more effectively than when artificial nutrients or even uncomposted slurry or manure are used. Also, by incorporating humus into the fields the filtering capacity of the soil is maximised."

"From a climate change perspective, agriculture is the greatest single source of greenhouse gasses in Ireland. In order to meet our international greenhouse gas reduction targets we need to explore every angle possible, and adopt every measure that works to lower Irish greenhouse gas emissions. Closed loop agriculture not only stops the waste of nutrients to watercourses as pollution, it can also reduce the high energy inputs needed for artificial nitrogen production and could go a significant way towards reducing overall agricultural greenhouse gas emissions."[18]

Similar changes can be made in the area of municipal wastes. Meaningful reductions in such waste can only be made by tackling limitations and challenges at every level of waste generation, specifically during manufacture, retail, household use and recycling/disposal, as well as at societal, legislative levels[19].By utilising the full potential of the bioeconomy we can overhaul how we design and manufacture all products in order to make their use, recycling and end-use as constructive as possible. A zero waste economy becomes possible by utilising the opportunities inherent in redefining the term waste and then working with biological resources to meet our needs.

8. How can we stimulate market demand for bioeconomy products? What is in it for the consumer?

Given the unique structural role played by the bioeconomy with regard to the wider economy, a certain level of consumer demand is a given (barring a catastrophic fall in the human population). However, the specifics of exactly which products are in the most demand will obviously change. In this regard it is interesting to note that demand for organic produce in the EU far outstrips supply

[18] http://www.feasta.org/2016/04/26/closed-loop-agriculture-for-environmental-enhancement-returning-biomass-nutrients-from-humanure-and-urine-to-agriculture/
[19] Harty F (2009) *Get Rid of Your Bin*. Mercier Press, Cork.

at present[20]. Additionally, it seems clear from the BioÉire report that there is enormous potential for the development of the forestry sector in Ireland.

It would be helpful to make it known that consumer support for a well-managed bioeconomy would demonstrate solidarity and provide concrete financial backing for a wide range of important contributors to our social and economic wellbeing, ranging from small Irish farms and businesses to the global climate justice movement.

If all goes well, there will doubtless also be many ingenious new products deriving from the bioeconomy that could stimulate consumer demand.

However, we also need to bear in mind that increased consumer demand is not actually an end in itself. As we have seen, there are more important goals. In the same vein as our answer to Question 1, therefore (and again, with no glibness or sarcasm intended): the protection and judicious development of the bioeconomy will help to ensure that we can survive with a reasonably decent quality of life in the medium to long term. It will also help to promote climate justice and enable future generations to survive and prosper.

9. What is the most appropriate mechanism to coordinate development and monitor progress?

Given the current circumstances, it is clear that direct government action on the bioeconomy must go well beyond a policy statement - although a clearly-expressed high-level statement will certainly help.

The statement needs regulatory backing. Top-down regulation has already helped with many environmental challenges such the ozone hole and plastic bag pollution, and is badly needed here too. Needed reforms will include changes in tax policy, as will be explained below.

Firstly, the climate crisis and the threat of fossil fuels undermining the bioeconomy need to be directly addressed. As explained above, we cannot rely solely on the market to sort these problems out. In order to ward off the risk of triggering the Jevons effect (described above) and the outsourcing of greenhouse gas emissions, we strongly recommend that a Cap and Share emissions reduction programme be introduced in Ireland. This will send a clear signal to actors at all levels and will ensure that the bioeconomy gets the protection and stimulation it needs.

[20] http://www.ifoam-eu.org/en/news/2016/04/05/new-publication-organic-europe-increased-demand-organic-food-production-not-moving

Under Cap and Share, the government would introduce a legally binding cap on fossil fuel production and imports, with the amount of fossil fuel available being gradually phased out over the coming three decades.

Revenues generated from the sale of production or import permits to fossil fuel producers would be distributed on a per-capita basis (reflecting the fact that the atmosphere is a common-pool resource). This revenue could then be pooled by households or communities in order to generate funds for green investment, among other things[21].

It is worth noting that a state-wide Cap and Share programme (known as Cap and Dividend) was under serious consideration by the Californian government in the earlier part of 2017 (the proposal ultimately did not pass however, following lobbying from the oil industry[22]).

The bioeconomy and renewable energy sectors would stand to gain enormously from such a programme as their status as both structural foundation and engine for the economy would be confirmed into the future. Innovators and other actors would be able to make confident investment decisions, and they would also have considerable freedom to take initiatives and to collaborate when appropriate.

However, as mentioned above, regulation that effectively limits fossil fuel consumption risks collapsing the financial system unless measures are taken to reform it in tandem. We therefore also urge the government to lobby at the EU level for changes in the way in which Euros are issued. Issuing currency on a debt-free basis is imperative to enable a smooth transition to a zero-fossil-fuel economy.

It should be noted that Cap and Share would put a price on carbon (via the fees for fossil fuel production and import permits), and this would affect fertiliser prices, transportation costs and, most directly, energy consumption costs on Irish farms.

It is well known that many Irish farmers are already in a precarious state financially. The BioÉire report mentions that 40% of Irish farmers earned income of less than 10000 euros in 2014, along with many other worrying statistics. It states, “such statistics highlight the intense vulnerability of those engaged in an agricultural career in Ireland, despite the importance and prestige awarded to

[21] A group of Feasta climate group members have launched a global initiative, CapGlobalCarbon, which seeks to implement Cap and Share on a global level. This would represent a significant step towards climate justice and would reduce poverty and inequality worldwide. It would also ease the migration crisis. http://www.capglobalcarbon.org .

[22] https://climateprotection.org/californias-cap-trade-program-extended-means-supporters-climate-dividends

agriculture in national policy and economic circles."[23]

In order to ease financial difficulties and help provide stability to farmers (and others) who find themselves in volatile economic circumstances, we advocate the introduction of a universal basic income along with a land value tax (the latter would be necessary in order to ward off potential inflation in land prices that might be triggered by the basic income)[24] The basic income would be paid for by revenue from the land value tax, along with (initially at least) the revenue from Cap and Share and from existing revenue streams where appropriate. A "Robin Hood' tax on financial speculation could also provide a useful revenue stream.

It seems likely, judging from evaluations of existing cash transfer programmes, that a basic income scheme would help to stimulate a multiplier effect in local and regional economies by distributing purchasing power more evenly than at present, and would enable farmers and other local actors to have sufficient financial security to be able to take initiatives and plan more effectively for the future[25].

Since several of these suggested reforms and programmes involve changes in taxation policy, we request that the government also include the Department of Finance in its policy development concerning the bioeconomy.

Monitoring progress

On the macro level, we suggest that the government employ a well-being index such as the one currently being developed by Feasta's 'Beyond GDP' group, in order to more effectively monitor the overall economic situation[26].

The Stockholm Research Institute's valuable research on planetary boundaries should also be helpful in this context[27].

On a more specific level, monitoring of the transition to renewables and to fossil-fuel-free production within the bioeconomy would effectively be built into the Cap and Share system, as fossil fuel production and imports would be subject to the purchase of permits and would be gradually (and predictably) phased out.

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[23] https://www.teagasc.ie/media/website/publications/2017/WP1-Deliverable---Final-Jan-2017.pdf p19

[24] Land Value Tax is the most socially progressive type of tax, and it cannot be dodged (since land cannot be moved). It is currently used in a number of states and regions worldwide including Taiwan, parts of Australia, Russia, Estonia, Lithuania, Hong Kong and several cities in Pennsylvania. It is under consideration in China also. In recent years it has been promoted by Paul Krugman, Joseph Stiglitz and Michael Hudson, and by the Greens, Labour and Liberal Democratic parties in the UK.

[25] See for example http://www.fao.org/3/a-i5157e.pdf

[26] http://www.feasta.org/beyond-gdp-new-approaches-to-measuring-well-being/.

[27] http://www.stockholmresilience.org/research/planetary-boundaries.html

With regard to agriculture, we refer policymakers to the work of the Sustainable Food Trust, in particular its True Costs Initiative, which takes many different kinds of values, including impacts on health, into consideration when calculating the 'true price' of food. For example, "the European Nitrogen Assessment has estimated that collectively, the costs of nitrogen-related damage range is as high as €320 billion, or up to €750 per person every year throughout the EU, about two-thirds of which relates to agriculture"[28]. The statistics revealed by Dr Pete Myers[29] should also be useful.

10. Are there any other issues to be addressed through a national policy statement?

The BioÉire report draws attention to the fact that the age profile of farmers in Ireland is quite high. It would therefore be helpful if the statement mentioned the need to attract younger people to farming. Likewise, we would request that it emphasise the importance of gender diversity within the farming profession and the wider bioeconomy.

While many opportunities exist within the bioeconomy, not all of these fit within the existing legislative or economic models. Thus it may be helpful in stimulating innovation and development in the area of the bioeconomy to establish a working group to examine and address specific existing policy issues, however well intentioned, that currently block constructive developments towards greater utilisation of the rich biological resource base that we often take for granted.

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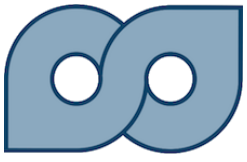

***Feasta (the Foundation for the Economics of Sustainability**) is an open- membership think tank. Its aims are to identify the characteristics (economic, cultural and environmental) of a truly sustainable society, articulate how the necessary transition can be effected and promote the implementation of the measures required for this purpose. It is a member of the Irish Environmental Network, the Environmental Pillar and Stop Climate Chaos Ireland.*

[28] http://sustainablefoodtrust.org/key-issues/true-cost-accounting/
[29] http://sustainablefoodtrust.org/articles/agricultural-chemicals-impacts/