



Sustainable UK – Nothing less than a revolution will do?

A strategy proposal

by
Dr Jonathan F. Moon

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Executive Summary

Current approaches to the development of integrated sustainability, as applied to the United Kingdom lack vision, specificity and fail to grasp the need to address key areas of our economy and society. There is little consideration given to the resource strengths and weaknesses of the UK and little to suggest that policies are being developed to encourage such thinking.

This paper identifies a number of vital elements that should be included in such an approach and some of the specific challenges that need to be coordinated and addressed in order for the UK to be resource efficient and for its population to retain a relatively high quality of life within a functioning society.

Specific areas of policy and activity that need to be addressed to ensure positive progress is made and maintained are: Models for delivering returns on projects that are attractive to the private sector; Investment that encourages truly innovative and disruptive technologies; the future of transportation using innovative technologies; a different approach to agriculture that balances productivity with sustainability and environmental management, yet maintains significant scale rather than reverting to a peasant agrarian economy; delivering an infrastructure that enables use and diffusion of the technologies and, domestic housing – how can technologies ensure that the UK's older housing stock can be usefully retained as sustainable dwellings?

Objective

The objective of this paper is to provide thought leadership by stimulating discussion concerning ways in which the United Kingdom can develop a sustainable future through an integrated approach to realising the potential of available resource and technological innovation.

The paper proposes critical areas of the United Kingdom's economy and society, including agriculture, transport, infrastructure and domestic living that need to be included in plans for improving

Sustainability. The paper also proposes two models relating to investment that can be applied to the integrated approach to stimulate private investment and help move this topic from concept to reality.

1. The sustainability imperative

Sustainability is a term that provokes a mixture of emotions in people. On the one hand, it conjures up visions of “eco-warriors” and those who would sacrifice their fellow citizens for the cause of saving a single tree or species of animal or plant. However, an alternative view is that sustainability is really about ensuring the long-term survival of Human society (and in the case of this paper, the United Kingdom) in a manner that ensures on the one hand, an acceptable quality of life and a society that is cohesive, whilst on the other hand the nation's resources are utilised wisely and in a manner that does not excessively deplete them for future generations.

1.1 Resources

The first question that needs to be answered is “what are the nation's resources?” The resources available to utilise in our society have been classified in terms of different forms of “Capital” by Dennis Moss during a recent paper given to the Eco-Innovation Forum. Specifically, Social (or Human) Capital; Monetary Capital; Infrastructural Capital; Intellectual Capital and Environmental Capital. Measurement of these is a real challenge, but work by Professor Kevin Lynch of MIT provides much insight into how that might be done.

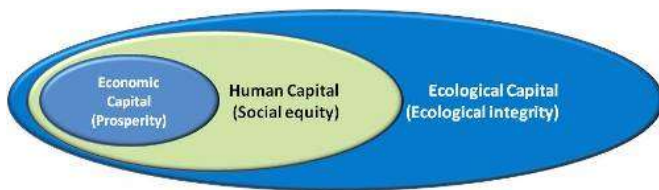


Figure 1: The triple bottom line model

1.2 The triple bottom line model

Dennis Moss proposed a “triple bottom line” model to illustrate the manner in which different forms of “capital” inter-relate (see figure 1 below). Along with this, it is vital to develop models in real life that offer some form of return in the short, medium and long-term; failure to do so will undoubtedly result in a lack of buy-in to sustainability.



Figure 2: Opportunity areas for sustainable business models

The model illustrates the areas that sustainable business models must address in order to deliver an integrated approach and a broad buy-in to projects to deliver a sustainable society.

In addition, David Rintoul of Forbury Investment Network identified a key area for future sustainability business models, stating that a key area of opportunity is in the area that illustrated in figure 2 below:

He also believes that, where technology is concerned, the need is for breakthrough thinking that will produce the types of “disruptive” technologies that will result in a “quantum” leap forward in progress, rather than an incremental improvement. However, one of the key challenges

with that is funding: These types of technologies will be unproven in terms of commercial viability or scalability and might even be the result of Heath Robinson style garden shed inventors – which financial institution is going to take a chance on them in the current economic climate?

1.3 Summary

In summary, there is an imperative to address the longer term issues of sustainability in the UK; that is to ensure that the nation’s resources are used in such a way that future generations can be assured of an acceptable quality of life. In order to achieve this, the UK’s natural resources have to be used efficiently and conserved. In order to develop business models that encourage this approach and that are widely adopted, an integrated approach is required as described in figures 1 and 2 above. These business models may help progress the development of new technologies and should stimulate initiatives or projects that address all of the areas of agriculture, transport, infrastructure and domestic living identified in the objectives of this paper. The idea of focusing business models and generating short and long-term returns across the different types of capital, if satisfactorily applied to each of the elements described below, can form a foundation for investment and delivery of innovative solutions.

2. An integrated approach – the proposition

The UK government’s Sustainable Development Strategy of 2005 includes the “one planet economy” concept. The concept focuses on resource efficiency and the drive to reduce pollution whilst encouraging innovative solutions. However, it fails to look at the UK specifically in a broad sense and to integrate the vital elements of the country’s economic and social fabric. This paper aims to provide a strategic context with which to integrate those elements.

Integrated or holistic approaches for finding solutions to issues impacting the environment are frequently exhorted in both the private and public sector (for example urban planning). However, such solutions are often too narrow, global or just do not offer any practical level of investment opportunity by being unspecific or so long term that they are completely unattractive to non-governmental investors. In this paper, the term “integrated approach” is used to describe a means of applying practical, investible ideas to some of the key facets of our society and economy.

Technology is often proposed as a solution for improving sustainability and many technological advances have been made: for example, more

efficient Photo Voltaic cells, wind turbines, increasingly useable electric vehicles and bio-fuels. However, two challenges still need to be resolved as far as these technologies are concerned:

- Cost: Adoption will increase when costs fall and ease of use improves. Currently, the resulting products are expensive and less efficient than currently available 'non-sustainable' alternatives;
- The "law of unintended consequences" must be addressed. For example, more biofuel crops means fewer food crops; More battery driven vehicles means more waste batteries; more wind turbines results in more visual pollution and noise. What is the "acceptable" compromise?

The aim of this section is to provide some simple ideas for integrated sustainable approaches that can be turned into practical, investible projects with high impact, backed by business to bring a mixture of short, medium and long-term returns.

Does this mean that the private sector will take care of everything by investing in sustainability projects? Well, no – if the short term returns are there they might, much as they do now. However, many will still view "green" or "sustainable" projects and products as being outside of their usual investment portfolios and so will not drive investment in that direction, so additional help may be required.

2.1. A "green" investment bank

First mooted by Alistair Darling and still under discussion today, the UK government has been working on setting up a "green investment" bank to stimulate investment in low carbon technologies. Many different ideas have been voiced concerning the purpose and brief of such a bank; perhaps one of the clearest hints as to what the proposed agenda might be comes from James Cameron, who is hotly tipped to lead such an institution:

"It is crucial that this institution is set-up rapidly, has a clear low carbon mandate, and is funded at a level commensurate with the scale of the financing challenge we face. It should be set up to catalyse private sector investment and transcend political cycles. Given Britain's fiscal situation, it should sit off the government's balance sheet and have the task of delivering our low carbon transition in a cost-effective way for consumers and business. One of its key objectives should be enabling pension funds to deploy capital in low carbon infrastructure.

*It could do this by issuing asset-backed green bonds, for example, to improve Britain's energy efficiency or build offshore wind farms. However, there is no need to build a huge physical institution. The institution could be capitalised by existing banks, including the state-owned ones. Government expenditure via the Carbon Trust and other relevant quangos could be used as well. Funds raised by selling government assets, as suggested by the chancellor, might be used successfully, but this could take more time than we have."*¹

Such an approach to and source of funding is of vital importance when talking about "disruptive" technological developments being essential to delivering the progress required. These types of technology, by their very nature are likely to be unproven and therefore unable to access funding from the usual sources. The green investment bank would have a key role to play in stimulating the development of technology and the integrated approach proposed here.

2.2 The elements of integration

In order to bring together a holistic approach to developing a sustainable economy, there are a number of elements that are vital to consider in unison:

2.2.1. Transportation

There has been a large amount of research into non-fossil fuel transportation. This includes electric cars based on Lead-Acid technology, electric cars based on Lithium ion batteries, Hybrid drive vehicles, Hydrogen powered Fuel Cell vehicles and most recently, electric cars that use petrol to drive a generator that powers an electric motor.

Given even the global research resources of some of the largest automotive companies in the world, there are few non-fossil fuel using vehicles (if any) that can perform as well as a standard petrol engine automobile. Therefore, perhaps the answer is "none of the above"; or a combination of the above.

For example: Why not approach the problem from the point of view of what the best idea would theoretically be, and work from there? This might result in a view that says that electric powered vehicles without excessively large battery packs that run down, have to be replaced regularly and in so doing create huge waste problems would be

¹ guardian.co.uk, Tuesday 23 March 2010

ideal. Experience from the rail industry proves that electric motors can produce plenty of power and offer good reliability for the most-part. Early trains were Diesel electric, much as the car that has a petrol driven generator to drive the motor. However, what if you replaced the petrol / Diesel generator with a Hydrogen powered generator? Surely, this would result in a number of advantages:

- No fossil fuels;
- Much smaller amounts of Hydrogen needing to be stored than in a completely Hydrogen powered engine;
- Only water / steam as an emission.

Of course, there are challenges too with respect to the country's infrastructure and that will be discussed in the relevant section below.

2.2.2. Agriculture

Much has been written about sustainable agriculture: What it is, how to approach it and on what scale. The scale of agricultural planning across the world varies from the smallholding to the old Soviet 5 year plans and the Chinese centralised planning of the whole country's agricultural output.

A study of the carbon footprint of some commonly procured foods in the public sector² prepared for Defra in September 2010 by ADAS UK Ltd provided an interesting insight into the challenges and barriers to the measurement of carbon in the food supply chain.

Defra has produced a number of reports concerning the sustainability in the food industry (2006, 2007) as has central government, describing five elements that are key principles.³ The elements described in the reports are not very dissimilar to those outlined here; however, the focus here is on outcomes rather than principles.

So, what should sustainable agriculture be about? In essence, it must be a form of agriculture that does not have a detrimental impact on biodiversity – easy to say, very difficult to deliver. This may be why so many efforts never achieve enough scale or profitable revenue to be adopted broadly. Why not? What are the individual elements that would be required to make such a venture work? These may include:

² PAS 2050 informing low carbon procurement: Pilot study - Food

³ www.defra.gov.uk/sustainable/government

- **Energy:** “Clean” energy sources that do not take the place of food crops. This may be limited to solar, wind or water power for non-mobile farm equipment and a technology such as that discussed in 2.2.1 above for tractors, harvesters etc.

- **Water:** A source of water that can be used for irrigation and livestock at all times. This is a real challenge and it may be the case that a breakthrough technology is required to enable, for example, an infrastructure of cost effective desalination plants to be established along coastal regions that could supply water inland to the agricultural industry. In addition, an approach of effective rainwater capture purification and use would also assist in this area.

- **Crops and livestock:** The mix of crops and livestock would need to be synergistic. That is, crops and livestock have to be planned so that the crops can support the desired livestock and still leave enough profitable production to put into the market, whilst supporting enough livestock to also be profitable.

- **Flora and Fauna:** Biodiversity must be maintained to ensure that species that are critical to efficient agriculture are protected. For example, Bees – the most efficient pollinators known: Try to calculate the cost of pollinating as efficiently on a large scale by any other method and the costs are several magnitudes higher.

- **Land / scale:** Scale is a key issue to resolve: What is a scale that is large enough to enable adoption of such a scheme such that food production meets a reasonable degree of market demand and is profitable for the farmer without creating a “price shock” to consumers? Therefore, a piece of further work is required to determine the demand for seasonal produce and meat, the marketable yield by product per hectare using this type of system, development of a risk analysis and risk mitigation strategy and an assessment of the optimal farm size to produce food in this way.

The notion of farming using the “sustainable” system described is very different from “organic” farming, as it does not preclude the use of GM materials or limited amounts of chemical fertilizer or pesticides. It is sustainable because the system is largely self-sufficient, uses water efficiently, values and respects useful species and includes them in the farm plan and has a low carbon footprint. Any use of GM material or chemical “enhancers” would have to be within the context of not damaging these other useful species – and it

may be that a whole new branch of agriscience will have to start to develop innovative new products to meet these requirements.

2.2.3. Infrastructure:

A major area requiring investment will be infrastructure. Aside from the well worn arguments for investment in a water infrastructure that does not leak more water than it delivers, more efficient rail transport, roads and the counter that the country cannot afford such massive investments, there is a real need to move away from the old Chestnuts and re-think how to develop the UK's infrastructure and the way in which it is funded.

The model described above argues for power generation by Hydrogen combined with desalination of water to provide the raw material. Therefore, investment is required to build the plants (both desalination and power generation). A form of PFI might be an attractive way to deliver this with some seed funding from a green investment bank to stimulate research into the most cost effective technology to use / develop.

There is also the question of how to deliver Hydrogen and deionised water for cars that will use it to drive their electricity generators (as it is assumed that a small amount of Hydrogen will be required to start the electricity generating process before electrolysis of water can commence). Logically, delivery of small Hydrogen cylinders to a central point (such as a filling station) would be a route and at the filling station cars could be charged with deionised water, much in the same way as filling up with petrol happens today. This water can be manufactured in the desalination plants, stored and distributed by road tankers. An alternative would be for every home to have its own deioniser – but there would be consequences from vastly increased water demand from households on an ageing, creaking water distribution network using this method.

2.2.4. Domestic housing:

Much has happened in the area of housing in terms of trying to improve energy efficiency, but how much of it has enhanced the quality of life? What have energy certificates delivered apart from knowledge that the UK's Georgian, Victorian and Edwardian housing stock (and that's a lot of houses) are not considered energy efficient and that if you want to change it, there will be a high price attached to the work involved? Yes, good roof insulation makes sense, but so many new "energy efficient" homes are stuffy, airless and claustrophobic.

So, here's the good news: If the UK pursues the route of generating electricity using Hydrogen, is it necessary to live in hermetically sealed houses? After all, our carbon footprint due to domestic heating will be very low – not that we should be profligate in the use of electricity – sensible insulation should be mandatory, but at least the population should be allowed to benefit from the high ceilings and feeling of space that much of the older housing stock provides. Of course, that is not to say that a change in approach should only benefit those living in old properties or that developers and builders should produce poorly designed, energy inefficient houses. However, a more diverse approach to design could be encouraged by focusing on the basic requirements of energy efficiency instead of trying to achieve a zero emission state.

3. Conclusions

In conclusion, this paper has looked at current government initiatives that are in place and work that has recently been conducted to try and describe a more holistic approach to sustainability. It is clear that such approaches are necessary to understand the interrelationships between different facets of sustainability and to raise the fact that in order to achieve any form of breakthrough in solving the question of how UK society can continue to enjoy a relatively high quality of life whilst increasing the country's sustainability.

The paper identifies some of the challenges that face any attempts to improve sustainability through integrated approach. These include sourcing funding to develop the types of technology that will deliver real change and how our approach to sustainability must include transportation, agriculture, infrastructure and domestic living. Further, that in order to make any such investments attractive to the private sector, consideration must be given to both short-term returns and long term returns. The implications for how central and local government plan are profound: The implication is that more intervention will be necessary, not less - simply because all of the elements of integrated sustainability must be developed on a scale that impacts pretty much the whole population and requires a degree of synchronisation, even when much of the technology and funding could well come from private sector organisations rather than public funds.

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