



Abstract

Reduced public support for carbon taxation and taxes to finance green transformation of infrastructure, lead to continued demand for cheaper and more readily available fossil fuels. Strong development in domestic manufacturing is supported by UK discoveries of shale gas, which leads to reduced energy costs. Increasing public investments in shale gas production in northern England heavily contributes to the removal of the North-South divide. The economy increases rapidly providing benefits for all people. Environmental protection is reduced and agriculture intensifies in lowland areas, whilst uplands are rewilded for tourism. Technological solutions are used to counter the impacts of large-scale environmental degradation. Large increases in population lead to rapidly expanding “city-states” and massive urban sprawl.



Full narrative

Present to 2040

A series of shocks in the exchange of international financial services result in a contraction of the financial sector and loss of tax revenues. Reduced public support for carbon taxation and taxes to finance green transformation of infrastructure lead to continued demand for cheaper and more readily available fossil fuels. Public opinion also drives demand for domestic manufacturing and produce, which is perceived to strengthen the economy and create jobs. As government intervention is geared towards short-term societal buy-in, energy security and immediate economic growth, the increase in demand for fossil fuels for economic development results in the opening of more oil and gas fields from the North Sea.

Investments become targeted towards the manufacturing and technology sectors. Further increases in manufacturing are supported by the discovery of large sources of shale gas, which leads to reduced energy costs when combined with the import of cheap fossil fuels from Europe. Shale gas production results in northern England becoming a net contributor to tax revenues, and hence receiving a greater share of national government investment. Shale gas, therefore, heavily contributes to the removal of the North-South divide. This leads to a strong UK within a globalised economy with less interventionist governance structures.

Cities expand very fast, driven by the strong economic development in the technology, manufacturing and energy sectors, and high population growth and relaxation of planning legislation (e.g. green belt). This prevents a centralisation of urbanisation in southeast England. However, urban sprawl leads to a steady loss of agricultural land surrounding major urban areas throughout the UK. Strong competition for land also leads to an overall decrease in forestry as the priority for land use is given to the urban and agricultural sectors. Urban sprawl also contributes to increasing transport infrastructure, with a focus on road building and support for regional airports, at the expense of investment in the rail network.

To meet increasing demand for food and other natural resources, the UK government and Devolved Administrations roll-back environmental protection legislation. Agri-environmental schemes are also removed to maximise technologically-driven agricultural intensification. This leads to increasing demand for water for irrigation and decreasing water quality due to leaching from increasing fertilizer use, particularly in the lowlands and most markedly in former Nitrate Vulnerable Zones. Increased leaching and pollution from poor manure and slurry management and high application rates has detrimental effects on environmental health and biodiversity. Increasing faith in finding effective solutions to environmental degradation is placed in overall technological and economic development, including investment in efficiency (but not green technology).

Domestically, lower unemployment and higher public income, arising from the successful rebalancing of the economy, lead to increased spending on healthcare and education. This ensures widespread access to healthcare, which results in general improvements in human health and life expectancy. Universities grow in importance, particularly for STEM, as young people are encouraged to gain a tertiary education to boost the demand for highly skilled labour. Increases in employment income and reduced energy prices due to the “shale gas effect” stimulate growth in spending. This in turn feeds back into the manufacturing and technology sectors, helping to maintain buoyant economic growth.

Social structures are strongly influenced by the importance attached to the individual rather than the collective good. Consequently, whilst individual wealth and investment in education and the health system are at relatively high levels, there is little sense of community. Lifestyles are dominated by high personal consumption of goods and services, such as cars, other manufactured and electronic goods, and financial services. High incomes and the availability of free-time provide many opportunities for tourism and leisure. Diets are high in red and white meat consumption, although fruit and vegetables are also widely available and consumed, especially those imported from overseas, including tropical fruits.

Thanks to these economic successes, the UK plays a strong role in international trade. This includes increases in exports, making the UK a global leader in exports. Imports of food slightly increase driven by demand for consumer choice. This strong dependence on international trade leads to the UK becoming more susceptible to international shocks, particularly in agriculture. However, increased incomes mean that the population is easily able to absorb price inflations due to any shocks.

The UK also de facto ignores the Paris Agreement. Greenhouse gas emissions controls and legislative binding instruments are not enforced upon the UK and adverse transnational impacts are not monitored. Increases in imports of food and raw materials for the manufacturing sector results in the UK exporting a large part of its environmental footprint to the rest of the world.

2040 to 2070

Environmental health continues to deteriorate, with soils and water bodies being critically affected across the UK lowlands. However, technological developments are used to deliver effective solutions to mask environmental degradation, i.e. techno-fixes that deal with the consequences of the environmental degradation. For example, the huge increases in water demand and declines in water quality of the previous decades are addressed through increased water storage, inter-basin transfers, drinking water treatment and desalination plants. Therefore, water abstraction peaks at the end of the 2050s and sectors that rely heavily on water availability, such as the agricultural sector, are not affected in spite of increasing pressures.

Agriculture becomes consolidated in fewer, larger farms on the most productive land in lowland areas that have been spared from urban sprawl. Large increases in yields arising from technology and high inputs continue, but use of N and P fertilizers gradually decrease from 2040 because of reduced global supply. Investments in crop breeding and nutrient-efficient farming technologies ensure this has no effect on yields and profits from intensive lowland farms.

The removal of subsidies, increased productivity of lowlands and the increased reliance on food imports leads to a contraction in upland agricultural areas. Former upland farms undergo a form of rewilding to support tourism. Rewilding is acceptable to local communities who see opportunities for income generation from tourism and food products such as game meat. By the 2060s, international tourism flourishes in these upland areas of the UK.

The rewilding of the uplands contributes to a relatively better environmental condition of these lands. Rural tourism strategies are implemented to maintain the aesthetic value of the rural upland environment. This includes a slight expansion in attractive native woodlands. Biodiversity is positively affected in some upland areas by the rewilding initiatives, including the maintenance of some National Parks for tourism. But the development of large estates for intensive tourism and sporting activities partly offsets these benefits. All other land with market value is commercially exploited, usually to the detriment of biodiversity.

Environmental degradation continues to increase, but the distribution of impacts from environmental damage is more just. That is, the 'winners' compensate the 'losers' where development results in environmental damage that affects some sectors of society, either through monetary compensation or investment in targeted techno-fixes.

By the 2050s, UK society is very diverse and dynamic due to high mobility within the UK, high immigration and substantial international tourism. A housing boom results from the continued population increase, especially in cities. Whilst migration is important in driving population increases, immigration controls focus on skilled labour with restrictions on unskilled migrants. In spite of high urbanisation pressures, land use conflicts do not arise as less land is needed for agriculture. In addition, governance, although predominantly driven by laissez-faire economics, becomes more inclusive and participatory to take account of societal needs. This includes market mechanisms to keep house prices at a level that is accessible to the majority of the population. Cities become technology hubs and rapidly expand. This leads to an increase in "city-states" and results in massive urban sprawl due to weak spatial planning policy.

Governmental intervention through policy is in general relatively weak, although there is continued investment in the education and health sectors, since these are considered to be critical to further economic development. The drive to “hands-off” government means that the Devolved Administrations become relatively less important as disparities in wealth, education and health across the UK decline. Because society is well educated and consumes high levels of goods and services, the economy continues to grow rapidly, and this leads to low levels of unemployment, and equity of opportunity across the UK. Although personal and corporate taxation levels are low, the overall strength of the economy means that government has sufficient taxation income to invest in education and health.

Air pollution worsens within the city-states and in general across the UK, leading to increases in heart and lung diseases. But large investments in the National Health Service mean that overall the population remains in reasonably good health as new drug treatments and technological improvements (e.g. artificial organ transplants) become rapidly and widely available.

2070 to 2100

With increasing energy demand and decreasing availability of shale gas, fossil fuel energy prices begin to increase. However, the UK technology and manufacturing sectors remain internationally competitive and exports continue to increase. The problems of peak oil are largely avoided through the continued development and application of oil and gas exploration technology, and the capacity of the UK to access fossil fuel resources on the global market.

Cities continue to expand, stimulated by further population increases from skilled migrants. Environmental degradation continues, but as most of the UK population live in urban areas they feel separated from the natural environment. Because of high incomes and low unemployment, people maintain their individualistic, resource-intensive lifestyles.

Technological solutions are still sought for environmental degradation, but they become only partly successful. The water industry is able to maintain plentiful good quality water, with the amount of abstracted ground- and surface-water less than at present. But intensive agricultural land starts to become less productive due to soil erosion and poor soil health despite agri-tech. Polarisation of environmental degradation also increases in spite of the social distribution of the negative impacts of environmental damage. For example, biodiversity loss is more limited where rewilding took place (uplands), but native species have nearly disappeared in the degraded lowlands. As it becomes clear that technological advances are not sufficient to fully counteract the environmental damage of previous decades, other solutions are sought to avoid food shortages and maintain living standards.

Country specificities in relation to the full narrative

The following paragraphs build on the main narrative, emphasising differences of each UK country from the full narrative or providing specific regional examples. They should be read in conjunction with the main narrative.

England

The discovery and exploitation of shale gas reserves in northern England strengthens ties across English regions and levels of society. The UK Government invests in extracting the energy resources in the north and ensures the economic benefits are redistributed across the country and throughout society through Sovereign funds. This results in a decline in the North-South divide. Communities in northern England that are impacted by the extraction of fossil fuels accept the impacts, as they receive lots of income for such high environmental impact activities.

A hybrid public-private system, involving both central and local governments, slowly leads towards slightly more autonomy. Specific policies and interventions (e.g. relating to shale gas) are administered by local governments, but taxes remain centralised in Westminster.

Socio-economic differences across England are less related to social inequality, but rather to the source of income generation in the uplands and lowlands. The uplands are no longer needed for agricultural production and re-orientate towards high-value tourism, such as in the Yorkshire Dales and the Lake District. In the lowlands of England, much land is taken up by the expansion of cities into city-states with substantial urban sprawl. The remaining lowlands in southern and eastern England focus on highly intensive agriculture. Many foods are imported, so domestic production turns to a mix of staples, high-quality meat, high-end specialised goods and artisan products.

Wales

The power and autonomy of the Welsh Government erodes as Wales' economic ties with and dependency on England increase. Fossil fuel exploitation leads to reduced inequalities across Wales and energy security as part of a UK-wide energy plan. A few locally produced and economically cheap renewable energy sources, especially in the least populated areas of mid-Wales and coastal areas remain from past investments, otherwise the energy mix of Wales shifts substantially to fossil fuels.

As environmental legislation is rolled-back across the UK nations, Welsh Government legislation on sustainability is reversed. Wales benefits from the shale gas dividend through increases in their allocation of public expenditure, reflecting the strong growth in the UK economy. The infrastructure of key ports in Wales, particularly energy ports such as Milford Haven, is further developed, turning them into major oil importing hubs.

Populations from eastern and northeast Wales experience more migration to cities and commuting to places where job values are higher. The rural economy in Wales focuses on the development of niche markets for high-value products, particularly in food, such as market gardening or fruit or potato production. These products are aimed at the more affluent consumers in Wales and the rest of the UK. Agriculture intensifies in the lowlands, particularly in parts of eastern Wales (e.g. Wye Valley) and in Pembrokeshire. The rewilding of the Welsh uplands is planned (rather than resulting from abandonment of sheep breeding), being driven by income generation from diversified rural activities, including tourism and leisure, and game meat.

As land becomes a commodity, English corporations buy up land in Wales for tourism or niche agricultural activities, which is embraced by land use planners. Economic planning in Wales heavily relies on a vibrant tourism sector with wealthy tourists coming from northwest England. Social and political differences between Wales and England lessen and Welsh national identity reduces in importance.

Scotland

As the UK as a whole becomes stronger, differences between the UK nations diminish. The Scottish Government becomes relatively less important in economic decision-making due to the UK-wide laissez-faire economic policies. However, Scottish Government maintains control over Scottish natural resources. Permission is granted for further exploration of new oil and gas fields and the drilling of additional wells in the North Sea. Scottish Government also lifts bans on unconventional onshore oil and gas exploration, including shale gas fracking and coalbed methane extraction, which focuses on the Central Belt.

Several major oil and gas plants are also opened in the Central Belt. These fossil fuel resources generate income for Scotland, which it uses to improve the social governance system, leading to a more equal society that operates within the larger UK system. As the economic power of the fossil fuel industry increases, public-private partnerships form to ensure revenues are brought into the public purse in the form of dividends and redistributed in line with the “Scottish spirit”. This is supported by new laws that allow greater resource exploitation, but also compensation and redistribution of the wealth this generates. These laws gain buy-in from both corporations and the general public as society quickly becomes wealthier.

Aberdeen, Edinburgh and Glasgow thrive becoming city-states with substantial urban sprawl. Dundee also grows considerably as a high-tech hub. In the Scottish uplands, income from rewilding comes from diversified (multifunctional) rural activities, including tourism, leisure and game meat. Forestry also increases in the form of large conifer plantations to provide timber and wood for wood-burning stoves. In addition, specialist livestock production (e.g. Aberdeen Angus beef) expands in the uplands supported by crop production in the lowlands to meet the demand for cattle feed.

Northern Ireland

With a move towards laissez-faire market economics by the UK government operating in a globalised world, Northern Ireland’s economic ties with the Republic of Ireland increase. Extractions of hydrocarbons and shale gas around Northern Ireland (including fracking) escalate, particularly in the border region with the Republic of Ireland. This is facilitated by a weaker environmental framework and less public resistance to fossil fuel extraction as the population sees the economic benefits from the “shale gas effect” in northern England.

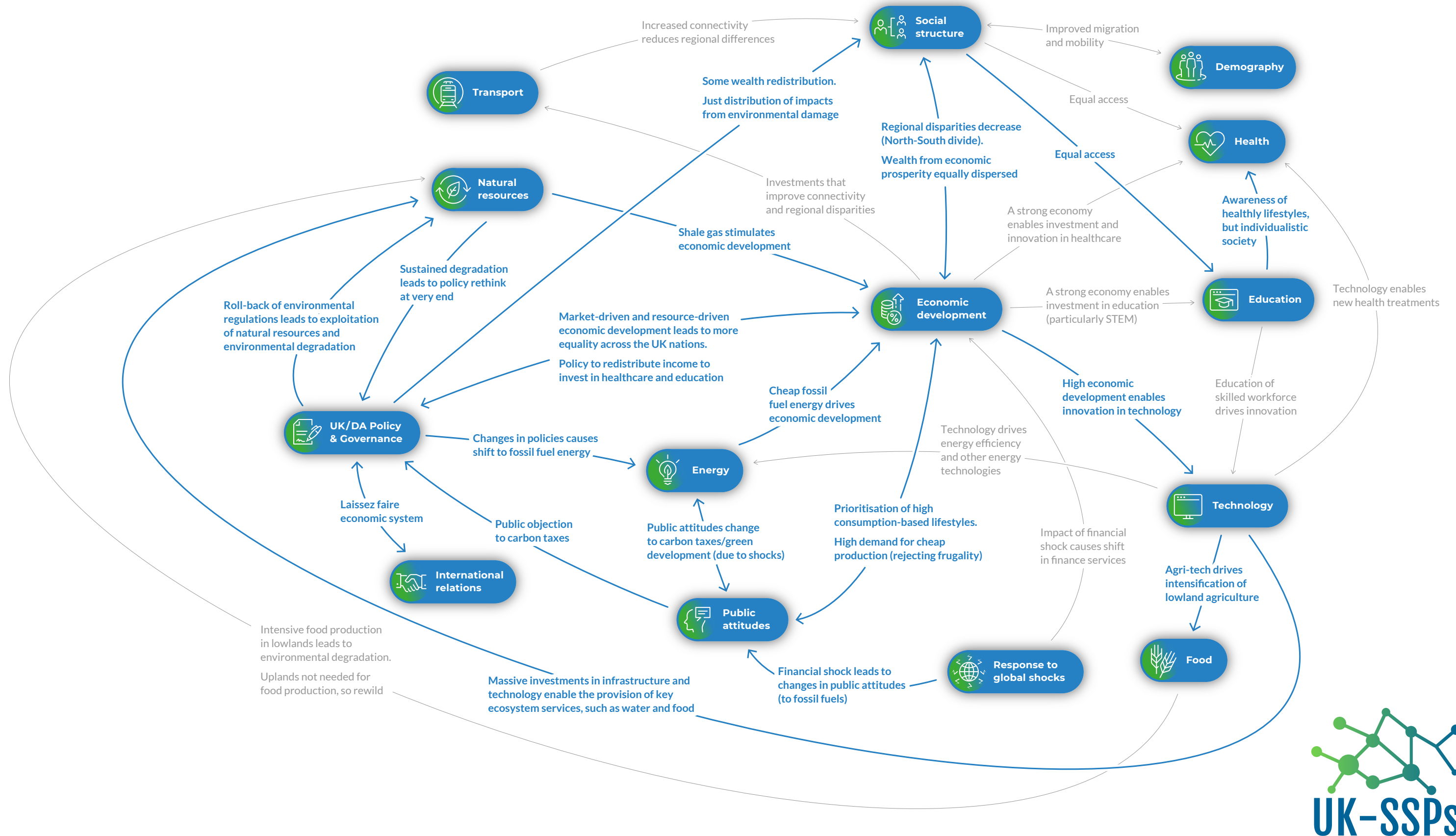
Multinational energy companies work together with government in the search for new sources of fossil fuels through exploratory or extraction licenses. The increase in resource extraction in the cross-border area leads to greater collaboration between Northern Ireland and the Republic of Ireland. This also reinforces energy security so that local supplies can be supplemented by fossil fuel imports from both the Republic of Ireland and the EU. This collaboration extends to the agricultural sector where an all-Ireland free trade area for agricultural goods is established.

The strong drive for economic growth partly overcomes historic political animosities, as economic interests overtake social priorities. This is reinforced through changing societal attitudes, which become more individualistic and focused on making money, rather than notions of nationalism, as people become wealthier. Social and political tensions ease, but divisions are not completely overcome.

The major cities in Northern Ireland expand rapidly as the country gradually urbanises. Belfast, in particular grows quickly but poor planning results in considerable urban sprawl. Other cities also grow, such as Derry, Newtownabbey and Craigavon, but Belfast dominates as the major city-state in Northern Ireland and a hub for the ICT sector. Derry expands to sprawl across the border into the Republic of Ireland further strengthening collaboration between the two countries. Increases in tourism to generate income lead to greater international visitors and urban growth around coastal towns, such as Bangor and Portrush. Pockets of protected areas remain in the uplands where they are particularly important for economic activity associated with local tourism.

System diagram visualising the interrelationships between drivers

System diagram animation available to view at:
<https://youtu.be/tlWjUmzq52o>



Acknowledgements

Project team

The UK-SSP Consortium consists of Cambridge Econometrics, UK Centre for Ecology & Hydrology, the University of Edinburgh and the University of Exeter.



The UK-SSP scenario fact sheets were jointly prepared by:

Paula A. Harrison¹, Zuzana V. Harmáčková¹, Simona Pedde¹, James M. Bullock¹, Mark D.A. Rounsevell², Jon Stenning³, Jennifer Dicks³, Ornella Dellaccio³, Magnus Merkle² & George Linney¹

¹UK Centre for Ecology & Hydrology; ²University of Edinburgh; ³Cambridge Econometrics

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