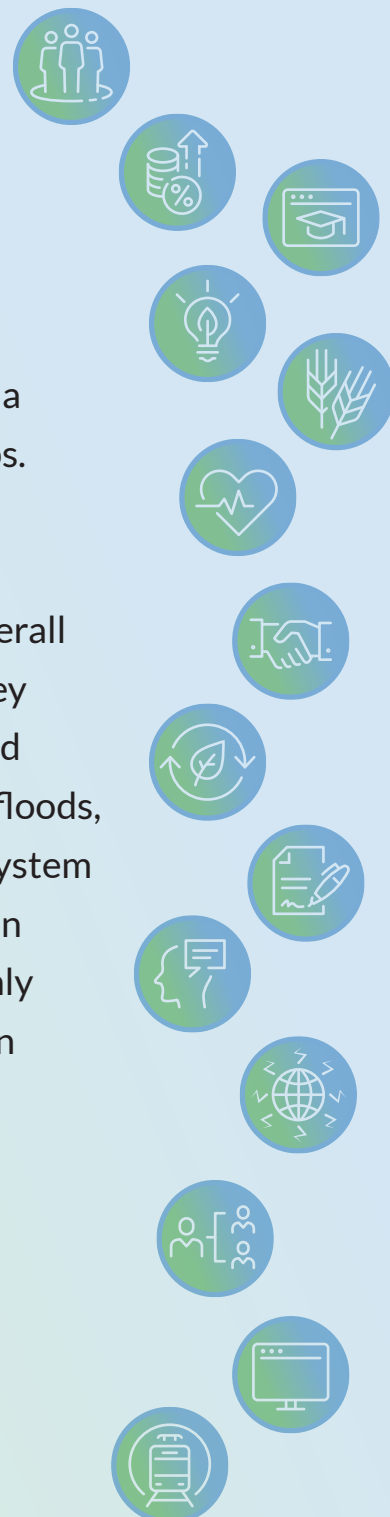




Abstract

Key public services, such as the health and pension sectors, reach a crisis point, prompting reform through public-private partnerships. Public-private partnerships also push forward technological development and investments in other sectors, such as transport, energy, IT and infrastructure. While the UK continues to enjoy overall economic growth, social inequalities slowly increase, although they are somewhat countered by the introduction of a basic income and new working rights. A series of shocks, such as crop diseases and floods, leads to strong policy responses that introduce Payment for Ecosystem Services schemes to address unsustainable food systems, pollution and biodiversity loss. Both urban and rural planning becomes highly regulated leading to fully integrated and optimised land use within and outside city-states for achieving social good.



Full narrative

Present to 2040

The UK continues to decentralise its governance system, devolving further powers to Scotland, Wales and Northern Ireland, as well as expanding the role and decision-making authority of mayors of major UK cities. All decision-making levels work together cooperatively to ensure the UK plays a key role in international agendas, including those related to sustainable development.

Key public services, such as the health and pension sector, reach a turning point. The ability of the National Health Service (NHS) to provide good healthcare to all is severely compromised. Because of the high costs associated with reforming the NHS, the preferred solution is to increase privatisation of general and specialised health services and medication provision. Citizens are encouraged to purchase private insurance policies in order to receive better healthcare. This transitional period worsens care for the poorest in society.

Similarly, the pension provision system reaches a critical state due to greater demands from an ageing population and is gradually replaced by private insurance. Although state pension provision is planned until 2040 and thus remains rather fixed (with gradual increases in retirement age), the strain to the system is too high to continue having a universal system. Pensions are increasingly privatised, however, failures of company pension schemes increase, with the costs being picked up by government under the Pension Protection Fund.

Other sectors, such as transport and infrastructure, also maintain a mix of public-private investments. City-wide transport systems increase (e.g. buses, trams and local trains), and are linked to the implementation of congestion charges. In both urban and rural areas, dependence on trains and buses increases as the UK moves towards lower carbon means of transport. Low-emission zones continue to be implemented and drive down car use, especially for the poorest, increasing demand for public services. Walking-only areas are established within cities.

To counteract the excessive influence and lobbying of the private sector in politics, key reforms to citizens' working rights are passed, and this maintains intermediate levels of social equity. These reforms include protection from exploitation by remote employers and reflect the increasing dominance of home-working and temporary contracts, facilitated by improvements to internet access, rather than traditional site-based permanent employment. By 2040, personal income from internet-based sectors exceeds that from the manufacturing sector.

Population growth continues. Even in an internet-driven society, there are still benefits to co-location, therefore jobs cluster in cities. This motivates increased movement of people from rural to urban settings leading to increases in housing density within cities and related inequality issues. England, in particular, experiences higher population growth compared to other countries due to the attraction of its major cities. Consideration of green spaces in cities and their link to wellbeing increases. Urbanisation proliferates around public transport hubs (e.g. railway stations), stimulating additional investments in rail infrastructure, including high-speed rail, financed through public/private partnerships.

The focus on the private sector and maintenance of a market-driven economy allows technological development to continue and expand, especially in the agricultural sector where, for example, the use of drones for improving the efficiency of agricultural management becomes the norm. Public-private partnerships also push forward technological development in the transport (e.g. driverless cars), energy (e.g. new forms of micro-energy) and IT (e.g. artificial intelligence) sectors. As the UK specialises in services, it is at the forefront of new technologies as they develop. This facilitates the UK in maintaining a strong role in international trade.

A series of shocks (e.g. diseases of crops and timber, floods, droughts, epidemics related to human health) triggers a strong R&D and policy response. The R&D response in the agricultural sector focuses on improving genomics and agricultural resilience to pests.

The policy response aims to address unsustainable food production systems and pollution. This is initially tackled through reform of agricultural subsidies such that incentives focus on outcomes related to soil health, water and biodiversity protection. Later, in the 2030s, farm payments are replaced by Payment for Ecosystem Services (PES) schemes across all UK nations to encourage landowners to implement sustainable agricultural intensification and/or sustainable provision of public goods, such as carbon storage and air quality regulation. PES schemes are designed to cater for the increasing demand for domestic food production, despite rising food imports, and for changing consumer patterns as demand gradually shifts towards different food products, particularly vegetarian and vegan. Plant-based diets become more popular due to the policy changes promoting sustainable agriculture, increasing meat prices and health considerations. Increasing domestic food production, along with population growth and expanding urbanisation, results in increases in water demand. Regional to local food branding also becomes a leading principle.

UK government and the Devolved Administrations concentrate significant efforts on the pursuit of sustainable development. This includes specific sustainability-driven land use targets, such as ambitious afforestation targets for carbon capture. However, effective implementation of such plans is often impeded by competition from other land use sectors, e.g. through investments in high-speed rail infrastructure, housing and urban development, or bioenergy and agriculture to maintain energy and food security. Reliance on bioenergy with carbon capture and storage increases across the UK. While each UK country still relies on fossil fuels, they also make the most of their natural resources within their energy mix and have their own targets for renewables. For example, England chooses to focus its renewable energy targets primarily on solar parks, whilst Scotland concentrates on wind farms and tidal energy. Conflicts over land are partially resolved through spatial planning regulations and mixed use where possible, e.g. agro-forestry and solar-livestock farms. Overall, this leads to a stabilisation in the state of the environment. But, while some of the previous biodiversity loss is counteracted due to implementation of PES schemes in both agricultural and forested land, overall biodiversity still declines.

2040 to 2070

While the UK continues to enjoy overall economic growth, social inequalities both within and between regions slowly increase. Markets become more flexible, supported by increased free movement of people and goods, but this does not facilitate income convergence. A basic subsidy for everyone (Universal Payment) is established in an attempt to address income inequality. However, this subsidy is very low and insufficient to fully address the widening income gap. Nevertheless, it contributes to the provision of basic needs for poorer parts of the population, enabling improved access to health services, food and shelter.

Continued dependencies on fossil fuels prompt energy-related shocks, particularly due to dependence on imported oil and gas. These shocks have especially strong impacts on communities with high levels of fuel poverty and in areas where a significant proportion of the population are dependent on oil and gas (e.g. Northern Ireland). This leads to social unrest. In order to ensure stable energy provisions, more nuclear power stations are opened, financed by public-private investments. At the same time, the private sector finances large-scale infrastructure projects for renewable energy (e.g. barrages) to diversify risks due to concerns around the long-term costs of disposal of nuclear waste. Micro-generation of energy also becomes widespread.

After a period of transition financed by public-private investment, including several failures and setbacks, the healthcare and pension systems transition to private insurance-based systems following the top-up model of some European countries. This leads to improved provision across society, particularly for healthcare.

The population continues to rise along with increasing urbanisation, putting growing pressures on sustainable urban growth, particularly in southeast England. House building expands in urban areas across all four UK countries. Rural areas remain important and well connected to urban areas, contributing to economic development.

Increasing water demand and water losses are partially mitigated after the 2040s as R&D responses improve green infrastructure and regulation for water provision. However, water abstraction increases until it peaks at the end of the 2050s, after which abstraction declines due to efficient technology, especially for irrigation. Public-private partnerships to fund public goods increase. For example, water companies fund planting of trees for water regulation, whilst greenhouse gas emitting industries pay for carbon storage.

Agricultural technologies continue to improve. Fertilizer input decreases gradually as a result of the sustainable intensification of agriculture, so yields improve as a result of both higher availability of arable land and fertilizer use efficiency. From the 2050s, food system innovation leads to substantial structural changes, including the restructuring of markets. This facilitates the production of artificial meat and a shift towards large-scale urban vertical (land-less) agriculture.

2070 to 2100

The extensive population movement from rural to urban areas continues into the 2070s. Increasing the resilience of urban centres to both population and environmental pressures through urban planning becomes a priority across the four UK countries. High-density cities with integrated and optimised land use, including large-scale vertical agriculture, are established through participatory planning involving businesses, citizens and government regulation. This improves the liveability of cities, driving their further expansion, and their eventual transformation into city-states.

Land use outside of urban areas is highly regulated and planned to achieve social good. The population no longer relies only on rural areas for food production, reducing land use conflicts and freeing up more land for conservation. Home and industrial energy use includes a significant proportion of renewables, with nuclear, wind, solar and tidal energy becoming the dominant energy sources by the end of the century.

After 2080, the amount of abstracted ground- and surface-water decreases and power stations are cooled using (desalinated) sea water.

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

Devolution in England is strong at the city- and regional levels through expanding the role of city mayors (in both number and decision-making power) and establishing regional assemblies (e.g. in southwest England). Privatisation dominates particularly in urban areas, and the boundary between public and private gradually dissolves. This leads to tensions as public-private partnerships are perceived to weaken public control, whilst devolution aims to give greater decision-making powers to regional communities. Increasing devolution improves relationships between some English regions with other UK nations, particularly northern England and Scotland.

Social inequalities remain within rural and urban communities, and regional inequalities between northern and southern England also persist. Public attitudes favouring economic growth prevail, but are moderated by some in society preferring sustainability and a welfare economy. While in some regions, these two poles (economic growth vs. sustainability) periodically change in emphasis, in other regions, the focus on sustainability or on growth is more stable (e.g. in some cities, pro-sustainability mayors temper the public-private partnerships towards public good).

The population continues to migrate to cities, particularly larger cities such as London and Manchester, which quickly become city-states. The gradual depopulation of rural areas results in land use planning that focuses on biodiversity protection and food production. The system of payments for ecosystem services (PES) becomes more robust, incentivising the delivery of public goods and leading to slight and gradual improvements in the non-production functions of English landscapes. As a reaction to changing diets, livestock production slightly decreases. In cities, land use planning for biodiversity conservation and food production depends on the priorities of the city leadership and public attitudes.

Economic development is predominantly driven by the service sector, particularly financial services in London and southeast England, but aerospace, IT, pharmaceuticals, tourism, agriculture and manufacturing remain important sectors in specific English regions. The energy mix is varied, with a gradual move away from fossil fuels to nuclear and renewables, particularly solar energy.

Wales

Further devolution of powers to Wales is complemented by stronger and deeper collaboration between Welsh and English regions (e.g. between the English Northern Powerhouse and Wales), as well as with Scotland. Energy becomes a devolved policy sector enabling large-scale investments by the Welsh Government in energy infrastructure. Increased devolution also sees Wales playing a greater role in international relations.

Regionalisation within Wales increases, reflecting the uneven distribution of social and natural capital within Wales. As a result, larger cities (e.g. Cardiff) gradually emerge as city-states, contrasting with less populated rural areas in Wales. Demographic movement from rural to urban areas increases, with young people in particular moving to urban areas both within (e.g. Cardiff, Swansea, Wrexham) and outside Wales (e.g. Manchester, Birmingham, London).

Social structures increasingly differ between north and south Wales and become more localised, depending on the locally dominant sectors and cultural heritage (e.g. industrial and mining heritage, agricultural heritage, etc.).

Public-private partnerships boost infrastructure investments and industrial growth in Wales, as they provide more freedom for industries to relocate to places with lower labour costs. In addition, they give rise to a private social system and an associated social-care industry, resulting in large retirement communities in northern Wales that service affluent clients from areas in northwest England. This also affects property markets as affluent people from England buy second homes in scenic areas of Wales. Tourism becomes a key sector of the Welsh economy, with creative sectors (film, theatre, music) also strengthening. Land use planning and natural resource use becomes highly optimised and regulated.

Wales is at the forefront of developing payments for ecosystem services and public goods schemes. Such schemes increase investment in sustainable agricultural intensification in eastern Wales, while farming gradually decreases in the uplands with land use becoming more diversified and linked to tourism and the delivery of public goods. In the energy mix, tidal, wind and solar energy are particularly strong. The perception of national identity gains more importance in public attitudes as a result of devolution and the increasing decision-making power of the Welsh Government.

Scotland

Scotland pushes for highly devolved decision-making powers and achieves the most extensive set of devolved powers of the four countries, but remains part of the UK. Within Scotland, devolution of power also increases, resulting in the emergence of city-states (Glasgow, Edinburgh, Aberdeen, Dundee) and increasing power of local authorities in large rural areas. Political ties with Wales strengthen. Population moves from rural to urban areas and the cities grow, e.g. Aberdeen and Dundee undergo regeneration and become cultural and business hubs.

Public-private partnerships are established with a stronger emphasis on the public sector compared to England. The partnerships are initiated particularly in education (e.g. between businesses and business-oriented universities), agriculture (e.g. partnerships leading to sustainable intensification and the establishment of vertical farming in cities), tourism and forestry. The Scottish university sector claims a strong position within public-private partnerships focused on research and development. The general public in Scotland emphasise the importance of supporting public services, particularly in cities and the slowly emerging city-states, which is echoed by strong city mayors.

Scotland promotes wind and wave energy due to its high capacity for these natural resources, enabling it to sell energy to other countries, particularly England. Land use planning concentrates on agricultural intensification (both in the rural areas and in the cities through vertical farming), integrating forestry with agriculture, and addresses competition between sporting land uses in the uplands and the provision of wider public goods. The establishment of payments for ecosystem services for woodlands supports their expansion in the uplands. Livestock breeding undergoes a reduction due to a trend towards eating less meat.

Public attitudes towards sustainability issues are contingent on the intersection of political demands and ideologies and on their political framing. As economic tensions rise and fuel political changes, macro-level incentives for collective thinking and sustainability are implemented, which over time increase the awareness and liberal thinking of some segments of the society.

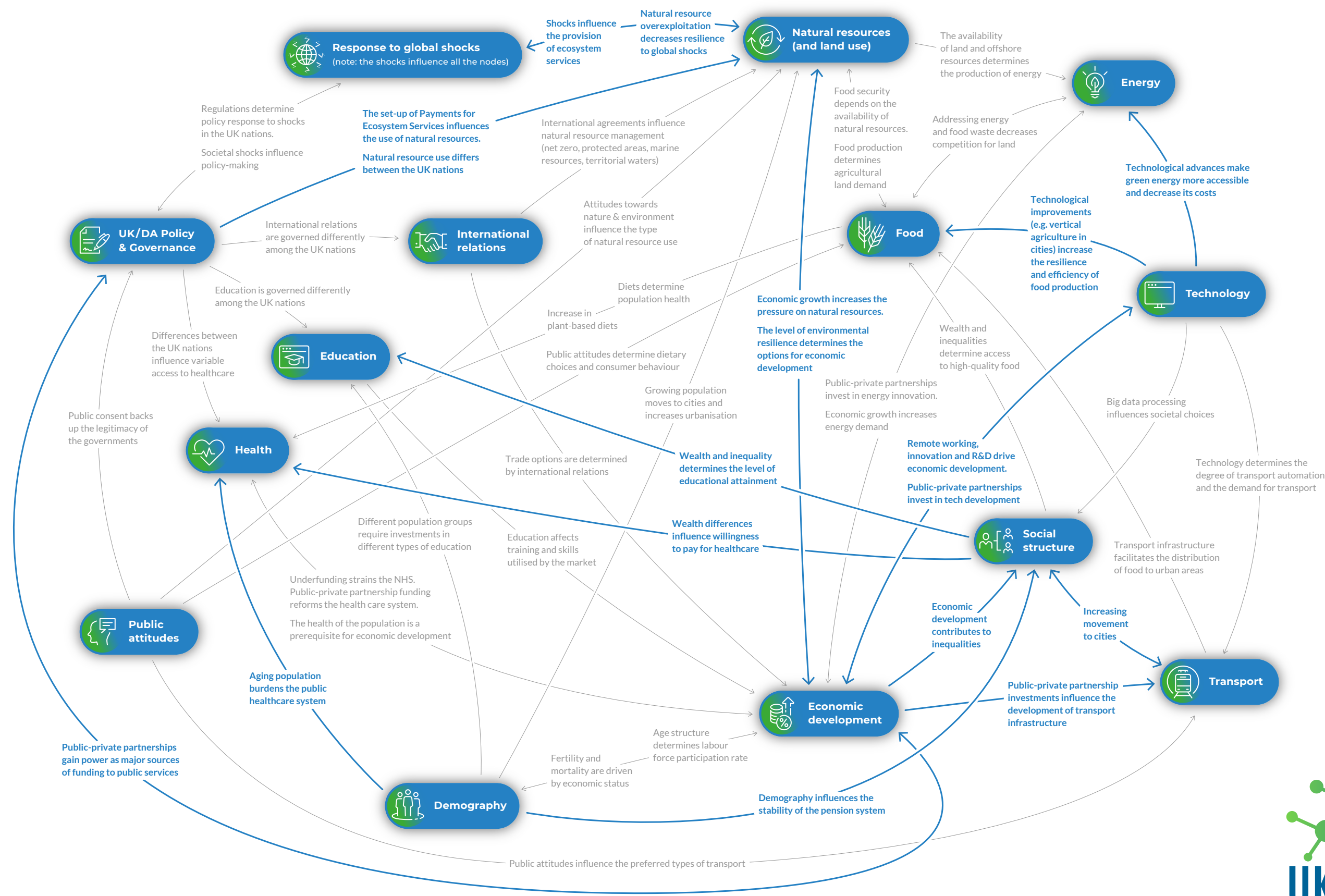
People increasingly migrate from rural to urban areas within Northern Ireland. Payments for ecosystem services in rural areas lead to a focus on delivery of a range of public goods, not just food production. Agriculture intensifies in some regions (e.g. west Ulster), whilst in others there is a greater focus on nature protection and afforestation (e.g. mid Ulster and northern regions). In the energy mix, wind and wave energy are particularly strong. Northern Ireland becomes a part of an all-Ireland energy market.

Northern Ireland

Northern Ireland remains a part of the UK but becomes increasingly devolved, with stronger ties to the Republic of Ireland. This facilitates cross-border cooperation and the movement of agricultural goods and livestock across the Irish border. Within the country, socio-economic inequalities gradually increase with tensions arising along several axes, including class, political affiliation and Irish/UK identification. Political standpoints are entrenched, and clashes take place between communities identifying as Irish and wealthier parts of the society with a greater UK identity. This results in ghettoisation in large city-states, such as Belfast, which becomes more segregated.

System diagram visualising the interrelationships between drivers

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



Acknowledgements

Project team

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