A Climate Resilience Plan for the Western Gateway Strategic Investment Plan

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Written in a personal capacity

Introduction

This document is a proposal to address the now-certain deterioration in climate at both a global and regional level in the UK, given the strong likelihood of 2ºC warming [1] and an increased probability of 3ºC warming [2]. It references studies that give the likelihood of different climate scenarios and suggests interventions that could be facilitated to improve the resistance of the region to climate shocks. The recommendation is that much of the co-ordination could be done at regional level. It is argued that the Western Gateway region is the smallest civilisational unit that could be made self-sufficient, as it contains both farming land, population centres and industrial areas, which could be connected in an emergency to manufacture key essentials even if national power lines and transport routes are disrupted.

A. Scenarios to prepare for in order of likelihood and urgency:

1) Increasing severity of storms felling trees – although hurricanes in the UK are estimated to be unlikely [3], trees are already being felled by storms, blocking roads and railways and felling power lines, leading to power cuts and making the National Grid vulnerable [4]

2) Flooding – impact on housing and farming – impact on food prices – this has already happened in the UK [5].

3) Food supply disruption – only 60% of food consumed in the UK is sourced from the UK [5] – as climate disruption hits production and supply lines, the need for self-sufficiency in food rises [7]

4) Fuel supply disruption from geopolitical factors (most recently the Ukraine war) [7]

5) Internet outages caused by flooding [9]

6) Atlantic Meridian Overturn Current (AMOC) collapse (giving a -10ºC drop in temperature for Northern Europe) – snow and ice, no food production except in factory conditions. Greater need for warmth. [10] The most recent estimate of when this collapse might occur is in 20-30 years, i.e. between 2045 and 2055 [11].

7) Societal breakdown as food, fuel and supply chains are broken [12]

8) Sea level rise – the worst-case scenario in case of continued high emissions is 2.2 metres by 2100 and 3.9 metres by 2150 [13]. If the Thwaites glacier melted completely it would lead to a 3.3 metre rise much earlier [14]

B. Existing plans

Professor Tim Lang has recently released a report [15] that relates the different UK resilience plans that are in motion, such as [16], but his conclusion is that civil food security is not addressed adequately. He commends the Swedish Total Food Defense plan [17]. There is some work going on

to look at the potential risks to large cities such as London, but no food resilience plan, even for London, has yet been put in place [11].

The Government is considering the fragility of fossil fuel dependency from the lessons of 2021, and recommends that decarbonisation will increasingly become a resilience strategy, even if decarbonisation does not slow the onset of significant climate shocks [19].

Thus a decarbonisation plan which implements adequately decentralised interventions is both a strategy to avert climate change and a strategy to mitigate against climate shocks.

C. UK-specific recommendations for resilient decarbonisation and co-ordination:

1) Of the highest priority: Solar panels and solar batteries in every home, business, community and region, provided that the UK earthing system is improved to allow off-grid operation [20]. Domestic solar panels and batteries would help to buffer the grid in cases of power supply disruption, and “flux” batteries buy energy from the grid at night, helping to balance load. As these can be modularised to the household level, they are potentially far more resilient than the present dependency on fossil fuels.

2) Hydropower on local rivers as well as at reservoirs – this was considered in Bristol for Netham Lock by Bristol Energy Co-operative but the project has been paused [21], [22]. Domestic wind turbines of modest size could also be used, although at present most home turbines give significant noise pollution[23].

3) Air-source and ground-source domestic heat pumps [24], [25]. These work by transferring heat from outside the building into the building, much as a refrigerator, and therefore up to three times the efficiency of electric heaters that work using heated coils and fans. They are extensively used in Scandinavia despite the lower temperatures there.

4) District heat networks - harvesting heat energy from the air industrial processes and from rivers – this has been tried in Bristol for Netham Lock but this project has been paused [20]

5) Regional self-sufficiency in food. Each city should secure its own local food supply from surrounding farms, flour mills, bakeries and food-packaging factories. The Riverford farm project supplies seasonal vegetable boxes to households in Bristol but this needs to be scaled up [27]. The Swedish Total Defense Plan uses this as its key consideration, which essentially converts the food industry from a “just in time” lean design to overbuilding and duplicating for increased resilience [17]. The Swedish plan also addresses drinking water, which in the UK could arguably be dealt with by introducing universal rain collection and water filtering at a household level, given the higher rainfall in the UK.

6) As observed by Tim Lang, mayors and councils of towns and cities would be valuable if they can co-ordinate citizen-led communities to secure key supplies [15] Arguably this could include a plan to ensure steady employment in key technologies, such as solar panels, wind turbines, heatpumps and solar batteries being essential to maintain domestic heat and factory operation [28]. Many citizens are dependent on medication for basic health, so thought should be given to identifying priority suppliers.

7) The rail network will become increasingly important when fuel shortages occur. EV charging and battery trains can be charged from solar panels. Arguably a rail network is easier to keep clear of snow in the event of AMOC collapse [29].

8) The military will become important as society disrupts, to maintain order and secure food supplies, but they will need communities to self-organise as they cannot protect or feed everyone, and would only barely be able to keep life-essential supplies going [30].

D. Regional-specific recommendations for the Western Gateway transport planning

9) The South West is a relatively wealthy region, so that many householders could afford to buy their own domestic solar panels and solar batteries for every home. If nothing else, a list of recommended local solar panel suppliers and fitters would help the average householder to navigate the bewildering choice on offer [31]. The West of England Mayoral Combined Authority (WEMCA) has a Solar Together programme for bulk buying of solar panels [25], but this does not apply to households with limited roof space.

10) Rail will become increasingly important and therefore every effort should be made now to make the rail network robust and able to take larger numbers of freight and passenger trains, such as remodelling the Westerleigh Rail Junction. Relief rail routes (such as the Melksham line) should have passing loops installed so they can be used for regular services in case of falling trees and flooding disrupting valley lines.

11) Battery electric vehicles (BEVs) and tractors should be encouraged in rural areas, as they can be charged near the home from solar panels on the domestic and farm property and modern vehicles have enough battery range to take the cars to the local population centre. EVs can also act as a battery backup for the home, using vehicle-to-grid (V2G) charging. Although funding is available in urban areas for using street lamps to charge EVs where the parking is only on the street [33], car use should be discouraged in cities. This can best be done by reallocation of roadspace away from cars by using priority bus lanes, bus gates and residential parking zones as implemented recently in Bristol. The experience in Bristol is that the reliability of bus services has increased markedly as a result [34]. Adequate funds could then be diverted from road-building schemes to investment into local rail and buses as well as electric bicycles and e-scooters, as in Bristol and Southampton.

12) It would be helpful to identify key food production and processing areas at a regional level, and if necessary facilitate the co-ordination (and building) of regional factories able to supply the basic needs of the region. After food production, next on the list (in my opinion) will be factories producing solar panels, small wind and water turbines and batteries to maintain energy self-sufficiency, as argued above. SevernNet represents a wide range of industries [35] which could be evaluated for their relevance to the region. The One City Plan in Bristol, introduced by Mayor Marvin Rees, was successful in bringing city leaders from different city bodies together, and this group continue to meet regularly [36]. A wider network from the region could be brought together at Western Gateway level to consider these matters.

E. Red herrings

✗ Hydrogen is highly energy-inefficient when green hydrogen from water electrolysis is used as an energy vector [35] and is unsafe for use in homes [36]. Decarbonisation of industry is best using electrical heat furnaces and direct molten electrolysis [39]Hydrogen is only liquid when compressed to 700 bar or cooled to -250ºC, and is therefore unsafe for refuelling and storage.

- ✗ Carbon capture and storage (CCS) itself requires significant energy and water input, and carbon sequestration is not guaranteed [40]

- ✗ Green Ammonia is best used to make artificial fertiliser, but is highly toxic if spilled when transported or burned as a fuel[41]

Summary

The Western Gateway region has a wealth of resources in terms of industrial areas, farming land and innovative energy schemes. With the right co-ordination, the region could become more self-sufficient and therefore resilient in the face of climate shocks. Providing a regional framework for mapping food supply chains, fuel and key parts supplies to small regional factories would supplement the national climate resilience strategies that is now being developed. Putting in place large infrastructure now (such as for rail junctions and freight lines) while the climate is not yet significantly disrupted in the UK would be the best use of the currently available money. Fortunately these considerations align with the other priorities of the proposed Strategic Investment Plan.

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About the author:

Christina is a data engineer at Defra, with a background in chemical enginering and physics. She has been involved in campaigning in the Bristol region for local rail (bristolrailcampaign.org.uk) and for the currently-implemented Bristol Clean Air Zone. The views expressed here, when not externally referenced, are her own personal opinion, not necessarily shared by her employer or campaigning colleagues.

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