MEMORANDUM FROM RESEARCH COUNCILS UK (RCUK) IN RESPONSE TO THE ROYAL COMMISSION ON ENVIRONMENTAL POLLUTION STUDY: THE ENVIRONMENTAL IMPACTS OF DEMOGRAPHIC CHANGE IN THE UK

INVITATION TO SUBMIT PRELIMINARY INFORMATION TO THE STUDY

1. Research Councils UK (RCUK) is a strategic partnership set up to champion the research supported by the seven UK Research Councils. RCUK was established in 2002 to enable the Councils to work together more effectively to enhance the overall impact and effectiveness of their research, training and innovation activities, contributing to the delivery of the Government's objectives for science and innovation. Further details are available at www.rcuk.ac.uk.

2. This evidence is submitted by RCUK on behalf of all Research Councils and represents their independent views. It does not include or necessarily reflect the views of the Science and Research Group in the Department for Business, Innovation, and Skills. The submission is made on behalf of the following Councils:

- Economic and Social Research Council (ESRC)
- Natural Environment Research Council (NERC)

3. Comments from the ESRC are based on input from the International Centre for Lifecourse Studies and the Centre for Microsocial Change. The Centre for Population Change contributed to the previous round of questions and has nothing further to add at this stage. Comments from NERC are based on input from Swindon Office staff, Proudman Oceanographic Laboratory, Plymouth Marine Laboratory, the National Oceanography Centre, Southampton, and the British Geological Survey.

Text from RCEP letter

In the light of the comments received so far, the Commission has decided to consider the period to 2050 and takes the view that over that timescale the demographic trends most likely to have a significant environmental impact in the UK are:

- the ageing population and changes in healthy life expectancy
- changes in household size and composition
- the distribution of population between urban and rural areas
- the regional distribution of population and the regional variation in population change
- internal and international migration (though the Commission notes that there are differing opinions on the degree to which this will have an impact).

The Commission recognises that the relationship between these trends and the environment is not straightforward. It notes in particular that variations in the social and economic circumstances of individuals and groups affected by each of the above trends will also need to be considered.

However, the Commission's initial view is that the following are the areas most likely to be significantly affected:

- water use and quality
- energy use and climate
- air quality
- food and waste
- landscape and land use
- biodiversity.

Summary of RCUK comments

- The RCEP study is complex, but relevant to several RCUK priority themes, including Living With Environmental Change (LWEC). It will require cross disciplinary input to achieve its aims.

- While for research on developing countries, demographic trends and environmental changes have often been considered together. There has been less work on societies such as the UK, so correlations and more important cause-effect relationships and mechanisms need to be further developed.

- ESRC and NERC hold information relevant to a number of the demographic trends and environmental areas which would be useful to such research.

- In interpreting data RCEP should be advised:
    - The impact of demographic change on the environment is complex; apart from the pressures that arise from a simple increase in population size, it is the level and nature of behavioural change resulting from the demographic change which is important.
    - Projections that build in informed estimates of changes in behaviour and technology, and how these are likely to be distributed across demographic groups will be of greatest relevance
    - Changes in social policies and laws can have a major influence on the environmental impacts of populations, but are particularly challenging to research in countries as diverse and dynamic as the UK.

- In general, population trends are difficult to predict in the very long term so, for example, population ageing is well established for coming decades but would not be in the very long term because fertility is rising at present.

- Demographic trends are likely to increase the intensity of conflict between different land uses. For example, demand for housing and mineral resources for construction is likely to increase along with demand for designated land e.g. National Parks, exacerbating opposition to existing and new settlement and mineral extraction in these areas.

- To help prepare for the changes identified by RCEP, LWEC is undertaking research relevant to all six of the environmental areas, which could provide an evidence base for policy

- Important trends and impacts not identified by RCEP include some trends towards an increasingly coastal population and impacts on the marine and coastal environment, through a variety of demands.

General comments

4. This is a very complex multidisciplinary issue requiring input across research councils. The areas investigated by the study will provide a testing ground for the three objectives of RCUK's framework for the future which states that: *RCUK working in partnership cultivates the essential research and skills to provide the bedrock for the UK to have a productive economy, healthy society, and contribute to a sustainable world.*

5. Living With Environmental Change (LWEC)[1] could provide RCEP with a seminar to help access the latest cross-disciplinary research on this topic. RCUK would welcome a discussion of the study with the RCEP chair and its members.

Q1. What information is currently available and what this tells us about these trends and their drivers?

1.1 Demographic change is a basic driver for several priority RCUK themes[2] (LWEC, LifeLong Health and WellBeing) and a factor for others (Digital Economy, Energy, and Global Uncertainties). Emergent initiatives in food and well-being are also relevant.

1.2 A major issue is that the trends and their drivers are not often considered together, so that even correlations may not have been investigated, let alone for cause and effect or functional relationships, or issues of supply and demand.

1.3 NERC is happy to work with the commission to identify relevant data sets where these are held by it's centres. These are listed below, alongside other relevant sources NERC is aware of:

- *water use and quality* - The Environmental Information Data Centre (EIDC)[3] at the NERC Centre of Ecology and Hydrology (CEH) may have some data on water quality, as part of the National River Flow archive[4]. Outside of NERC, the Environment Agency would be a good source for water quality data, and water use data would normally be held by utility companies etc.
- *energy use and climate* - NERC does not have access to energy use data, but some data on energy use are available through the UK Energy Research Centre Data Centre[5]. The NERC funded National Centre for Atmospheric Science (NCAS) British Atmospheric Data Centre[6] (BADC) holds relevant information on climate. BADC also provides access to selected Met Office data sets for research purposes.
- *air quality* - Some of the data sets held by the BADC may be of use, as may some held by or interpreted by CEH.

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[1] http://www.lwec.org.uk/
[2] http://www.rcuk.ac.uk/innovation/ktportal/priority.htm
[3] http://www.ceh.ac.uk/sci_programmes/env_info.html
[4] http://www.ceh.ac.uk/data/nrfa/index.html
[5] http://ukedc.rl.ac.uk/index.html
[6] http://badc.nerc.ac.uk/home/

- *food and waste* – NERC does not have relevant information. For data on waste NERC suggests WRAP[7].
- *landscape and land use* – NERC has access to relevant information obtained through projects such as Country Side Survey[8] or UK Landcover[9]. Data are available from EIDC.
- *Biodiversity* – NERC has access to relevant information through the Biological Records Centre[10] which is hosted by CEH.

1.4 In addition, the data generated by the Rural Economy and Land Use Programme can be readily made available by the ESRC. The ESRC can also make available population data from, for example, the British Household Panel Study.

1.5 The impact of demographic change on the environment is by definition complex. It is the level and nature of behavioural change along with demographic changes that, in turn, affect the environment. Furthermore, the impacts of behaviour are often mediated by technologies. In predicting impacts on the environment a considerable number of years in to the future, it is important to take into account the interactions between demographic changes, likely behavioural changes, and likely technological changes. Absolute increases in population will also result in changed pressures on the environment due to overall increased demands for resources or because of the geographical distribution of growing population centres.

1.6 For example, the environmental impact of an apparent extra requirement for domestic heating (e.g. due to a growing population or due to a reduction in household sizes) will be mediated by the insulation properties and energy micro-generation properties of the housing in which the additional households reside. So, if the ageing population creates demand for additional residential and nursing homes, say, it is likely that a proportion of those homes will be new-build and that new-build will be subject to much higher standards of energy-efficiency and higher levels of micro-generation than existing build. A simple projection of the current mean energy consumption amongst residents of residential homes to the projected population of residential homes at some point in the future could therefore be rather misleading.

1.7 It should also be noted that both in the case of behaviour and in the case of technology there are good reasons to expect both changes in average levels and changes in the differences in consumption between demographic groups. To take an example of behaviour, people on average might consume less energy to heat their homes in the future, but the reduction in average consumption might be higher for the elderly than for the young. To take an example of technology, improved vehicle emission technology might reduce the average impact of a private car on air quality, but this impact might be much greater amongst urban dwellers than rural dwellers if new technology vehicles are made available first in large cities only (as has happened with electric cars).

1.8 The general point is that the Commission should give higher weight to projections that build in informed estimates of changes in behaviour, changes in technology, and of how those changes are likely to be distributed across demographic

[7] http://www.wrap.org.uk/
[8] http://www.countrysidesurvey.org.uk/
[9] http://www.ceh.ac.uk/sci_programmes/BioGeoChem/LandCoverMap2000.html
[10] http://www.brc.ac.uk/

groups. Simply assuming that current differences between demographic groups in a particular environmental impact will continue – and projecting those differentials onto predictions of future demographic compositions – is unlikely to produce accurate predictions.

1.9 We also wish to make an important point about multi-national agreements. Changes in these can have a major influence on the environment impacts of population (e.g. consider the impact that the Montreal Treaty on CFC emissions had on the ozone layer and the fact that this impact was transmitted primarily via purchasers of new domestic refrigerators, a group distributed rather unevenly across demographic categories). Changes in these societal-level factors are particularly difficult to predict.

1.10 An underlying theme of our comments is that association cannot be taken to equate to causality. Good predictions rely upon an understanding of the reasons for associations and the mechanisms by which changes in one factor (demographics) cause a change in another (environmental impacts). High quality studies of causal effects require longitudinal data, i.e. data that contain repeated measures on the same set of subjects over time.

1.11 A major data resource that has considerable potential to answer some of the questions posed by the RCEP study is the ESRC's Understanding Society (www.understandingsociety.org.uk), though relevant results only begin to be available in 2010. We envisage that several of the sets of questions asked will be potentially useful in assessing environmental behaviour (e.g. questions on energy usage, travel behaviour and environmental attitudes). We are reviewing the questions to be included in future waves of data collection and would welcome additional input on priority areas.

Q2 Whether they are locked in or are likely to change in the period to 2050.

2.1 It is difficult to determine what is locked in and what is not since it might be expected that there will be considerable changes in economic conditions, behaviours and consumer preferences in the period between now and 2020. Both will in turn be affected by the pace of environmental change and the extent to which trends and drivers are affected and respond to these changes.

2.2 Some evidence suggests that the growth in households where both parents work full time is associated with children having an increased environmental footprint in a variety of ways.

2.3 High levels of family breakdown are often thought to lead to a greater demand for smaller housing units. However this may be offset now by an increase in children staying with parents for much longer.

Q3 What we already know about the likely impacts of these trends on those aspects of the environment identified above?

3.1 A key consequence of simultaneous demographic and environmental change could make populations even more vulnerable to a range of stresses than they would have been otherwise. Amongst other factors this is likely to increase the costs of adaptation and mitigation.

3.2 In relation to land-use, the impact of demographics on our utilisation of indigenous mineral resources must not be overlooked. The UK may retain a major dependence on domestic mineral resources to develop and maintain the built environment and infrastructure, particularly so if population pressures increase demand for housing and associated infrastructure. Population pressure has a major influence on land use and perceptions about land-use change.

3.3 The UK's population is projected to grow. As this occurs there will be more competition for land use and more demand for mineral-based products, sourced nationally and internationally, particularly construction minerals for housing and associated infrastructure (an average of 400 tonnes aggregate per house is required). Uneven population growth will result in amplification of these pressures in some regions, especially those designated 'growth areas' in southern England, as well as a greater disconnection between areas of supply and areas of demand.

3.4 It is likely that the extent and degree of protection of designated land such as National Parks and Areas of Outstanding Natural Beauty will increase and assume greater importance in the public mind as population pressure grows, resulting in increased sensitivity and opposition to existing and new housing and mineral extraction operations in these areas. Allied with an extremely strict planning policy test for housing materials and mineral development, this means that commercial risk associated with obtaining a licence to operate a quarry or mine is very high. Public sensitivity can also, to a lesser extent, act as a barrier to entry for mineral developments elsewhere. There is also concern in some areas (such as the Derbyshire Peak District, the Mendip Hills and North East Wales) about the cumulative impact of multiple legacy and active mineral operations on the 'environmental capacity' of the landscape to carry this type of development without impacting on ecosystem services and amenity value.

3.5 Although attempts have been made to develop mineral planning decision support tools based on environmental capacity, difficulties appear to remain in translating this concept into a practical methodology for spatial planning for minerals extraction. Rising land values driven by competition from other uses are resulting in a decreasing willingness on the part of land owners to sell or lease land for mineral extraction. This is driven by demographic changes, and along with increasing public opposition to mineral development, may be contributing to current declining levels of permitted aggregate reserves, especially in South East England.

3.6 An important trend and environmental impact is that of more people moving to coastal areas on the marine and coastal environment. See 6.2 to 6.6 for comments on this.

Q4 What projections of water and energy consumption, waste production and greenhouse gas emissions have been produced for different population trends?

4.1 The International Food Research Institute[11] and the International Energy Agency[12] may be useful sources for water and energy projections respectively.

[11] http://www.ifpri.org/
[12] http://www.iea.org/

Q5 What steps, if any, are being taken to prepare for the changes?

5.1 The Research Councils are committed to extending the evidence base on which future policy can draw.

5.2 LWEC is undertaking relevant research that could provide an evidence base for policy on all of the environmental areas RCEP has identified as likely to be significantly affected by demographic trends.

6. Are there any other trends or impacts which are, or could become, of equal or greater importance.

6.1 The amount of land available per person and its multifunctionality is a key factor that must be considered. The more people there are per sq km then the more vulnerable the UK may become. Areas that may come under particular pressure may be urban areas, coasts and uplands that are required to supply ecosystem services to lowland (largely urban) communities.

6.2 An important population trend is an increase in the number of often older people moving to coastal communities. This increases vulnerability of populations to coastal flooding and erosion, exacerbated by sea level rise and increased incidence of extreme weather events, as well as other more general problems associated with dense concentrations of people. Specific to coastal regions, high popualtion density may impact tourism as a result of a decline in the quality of bathing water.

6.3 Maps depicting the multiple uses of the Irish Sea illustrate how crowded our near shore waters already are. It will be difficult to accommodate much more activity should demographic changes bring more and/or increase the intensity of competition between current demands.

6.4 Global predictions indicate that the percentage of the population living within 150 km of the coast will increase from 53% (current) to 75% by 2050. This means the equivalent of the current entire human population will be living within this distance of the coast. Increased population, and increased levels of disposal income in developing countries are bound to place an additional burden on the already stretched ecosystem services provided by the coastal region. It is important to understand how this global trend will be a significant one for the UK.

6.5 Demographic change is likely to impact the marine and coastal environment through various global sectors including:

a) Seafood: Demand for seafood will outstrip the capacity of wild-caught fisheries during the 21st Century, so that protein needs will have to be met from aquaculture or a global shift away from meat/fish protein diets, as recently suggested by Lord Stern, of the ESRC-funded Centre for Climate Change, Economics and Society.

b) Nuclear fission: Coastal locations will be in demand for future nuclear fission and fusion power stations if recent practice is continued and sea-level rise can be accounted for.

c) Renewable energy: Renewable energy from marine resources will be essential in a world with a higher population.

Again, it is important to understand how these global trends will be for the UK.

6.6 NERC/ESRC research on the impacts and consequences of an increasing coastal global popualtion will need to be encouraged, including support for governance of competing and multiple-used resources, including commercial and recreational activities.

RCUK, November 2008