AEA

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Final Report for
Task 4: Links between science and policy making in practice

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Executive summary

The overall goal of the project 'UK-Russia Climate Change Collaboration', funded by the UK Foreign and Commonwealth Office is 'to improve the UK and Russia's understanding of climate change science and climate change impacts (physical and economic) on Russia and the UK. Over 3 years, this work aims to raise the profile of climate science through various outputs, including a joint research programme, and awareness raising activities, and as a result will provide a platform from which greater account can be taken of climate science evidence in policy-making.

The project website (http://www.uk-russia-ccproject.info) provides more detailed information on the work programme, and includes project reports, presentations, news, etc.

Science and Policy linkages (Task 4)

This Final Report outlines the work that has been carried out on Task 4: Links between science and policy making in practice, and summarises the findings, key learning points and conclusions that have been developed as a result of activities in Russia and the UK.

The purpose of Task 4 was to provide information and practical examples that would increase the level of understanding of how science is used and interpreted to inform and underpin sound evidence-based policy, and in particular how these linkages may be improved in the area of climate change. The work drew on experience in relevant fields from both UK and Russia, and included a wider ranging review of literature and other information sources, interviews with science and policy stakeholders and a detailed examination of two case studies (one from UK and one from Russia) on science and policy linkages. This evidence was analysed to identify linkages between science and policy that occur in practice, and whether there are any distinctions between the approaches of the two countries in terms of how science and policy making are linked. Based on the findings, conclusions have been developed that focus on improving interactions between science and policy making, and that are therefore relevant to future climate change policy.

Gathering information and practical examples

In order to gain an understanding of the theory and practice (examining real situations) of how science and policy-making are linked, evidence was gathered from a wide range of sources in Russia and the UK. This examined relationships, organisations, mechanisms, and processes that are, or could be, important in promoting and facilitating the effective use of science in strategic decisions, and in policy development, implementation and impact monitoring.

Literature Reviews (UK and Russia)

Two literature reviews have been prepared that explore how science and policy-making are linked in practice in the UK and Russia. This provided a broad understanding of the extent to which scientific evidence is accessible to policy makers, how governments (UK and Russia) make use of this data and information e.g. formal mechanisms, networks, appointed advisors, scientific committees), and whether / how scientific research agendas are influenced by government bodies.

The literature review for Russia provides an historic perspective on the links between scientific research and policy-making. It highlights how this relationship has changed over time and that this has often been reflected in the priority the government has given to science and its role in supporting policy development and implementation, including in environmental protection and climate change.

The literature review for the UK explores the linkages between science and public policy, primarily over the last ten years, and examines the role of evidence, and in particular science and scientific advice, in policy decisions in the UK. The 'routes' through which the results of scientific research and expert advice reach Government policy makers were examined, together with the roles and relationships of various organisations (and individual posts) that have been established to support and facilitate this flow of information, or that have themselves developed a role in this regard.

As a result of this work, diagrams have been developed that show the linkages (through various routes, such as funding, formal institutional relationships) between the key science and policy making organisations in the UK and Russia, and in particular highlighting those relevant to climate change science and policy making.

Case studies (UK and Russia)

Alongside the literature review, historic examples or 'case studies' were used to understand and demonstrate the way that science and policy can be linked in practice. Two case studies were developed, one from the UK and one from Russia. Both case studies were selected based on information from discussions with a number of science and policy stakeholders and in light of the availability of publicly accessible information.

The case study for the UK *'Development of UK climate scenarios and their use in public policy'* (see Box 1) focused on how the process of developing climate scenarios for the UK has changed over time, and explored how this has been influenced by changes in funding and calls from users for the scenarios to be more accessible.

Box 1: UK Case Study

Development of UK climate scenarios and their use in public policy

This case study explored the phases of climate scenario development in the UK, and how this has changed over time. It considered how and why government policy goals (and associated funding) were able to influence the scenarios, and the extent to which these were made available to researchers. It explored the drivers that underpinned the changes that occurred and who steered them. A key component of this work is the question of how the wider involvement of stakeholders changed the availability, accessibility and usability of the scenarios (and data), and what impact this has had for different stakeholder groups (particularly the wide diversity of users). The case study also considered the impact of the formation of the UK Climate Impacts Programme (UKCIP).

The case study concluded that the UK government has been influenced by academic research and the findings of the IPCC to initiate the funding of climate change scenarios for the UK. The government played a central role in the transfer of information within the academic community and also to a wider group of stakeholders through the establishment of UKCIP. Over the past decade, there was a gradual shift occurred to increasingly consider the requirements of end users, although this has also been steered by the science available. UKCIP have also worked to present the scientific information and the climate scenarios in an accessible format for non-academic stakeholders such as private companies and local government. End users now have easy access to detailed guidance for undertaking climate impact assessments and this has led to an improved understanding of climate change, the risks, and potential impacts. The consequence of government influence has been for UKCIP to focus on its own funded work. This combined with limitations in computer resources has meant that work from international modelling centres has not been utilised to the extent that it was in the early 1990s. A trade-off therefore exists between the level of detail demanded by the increasingly well informed end users and the information that can be provided by the climate scenarios.

The case study for Russia *Federal Task programme (FTP) – 'World Ocean'* (see Box 2) provides a very strong demonstration of how the results from a well-funded and accountable research and development programme can be used directly to solve existing problems, and where they able to have immediate practical value.

Interviews with science and policy practitioners

A wide range of stakeholders, from government, scientific research institutions, academia and NGOs, were identified in the UK and Russia. A number of face-to-face and telephone interviews were conducted, and a short questionnaire completed by other Russian stakeholders that we had not been able to meet in person. These interviews also provided additional opportunities to raise awareness of the overall project and disseminate the project brochure to key science and policy stakeholders.

The evidence compiled from the literature reviews, case studies, interviews with science and policy practitioners, dialogue from workshops and other meetings, and feedback from FCO and our project

partners was analysed to draw out the distinctions and similarities between the approaches of the two countries, and to identify key areas of learning that could improve the interactions between science and policy making.

Box 2: Russian case study

Russia *Federal Task programme (FTP) – 'World Ocean'*

This case study provides a very strong demonstration of how the results from a well-funded and accountable research and development programme can be used directly to solve existing problems, where they are able to have immediate practical value. The Federal Task Programme "World Ocean" (hereafter FTP-WO) was initiated in accordance with the Russian Federation President's Decree #11 as at 17 January 1997 and the RF Government's Bylaw # 192 as at 22 February 1997, and was ultimately approved by the RF Government's Bylaw #919 as at 10 August 1998. The RF Ministry of Economic Development provides the overall coordination of the FTP-WO.

Overall, the findings and achievements of the FTP 'World Ocean' have been fed into the country's national maritime policy and aimed to fulfil the tasks of the Maritime Doctrine of the Russian Federation, strengthen the country's economic potential, enhance scientific research on the World Ocean, expand maritime freight, improve the profitability of fisheries and increase employment and tax proceeds.

A key achievement of the FTP has been to establish control systems for facilities operating on the continental shelf, in the exclusive economic zone and in the vicinity to Russia's State border. This helps prevent illicit fisheries and harvesting of sea resources in the state waters, strengthens the security of Russia's sea craft and improves the effectiveness of rescue operations.

The research projects realised as part of the FTP have produced a considerable number of practical findings. Recommendations developed on the basis of the findings have been taken into account by institutions and agencies that co-ordinate design, construction and operation of facilities and installations in the coastal areas and on the sea shelf. Integration of the scientific findings in such activities has already resulted in a 10% reduction in an estimated cost of the works. Environmental and social findings of the Programme enabled a reduction in the costs of response measures both in offshore and onshore emergencies that result from the ocean-induced effects on climate, such as in tsunami-prone regions of the Pacific and Russia's Far East. Projects implemented as part of the Transport Communications Sub-programme have enabled fulfilment of the goal to ensure the country's transport autonomy by enhancing its seaports.

Realisation of the Programme 'World Ocean' has also allowed the country to strengthen its positions in international organisations. For example, a pilot project was commenced in 2004 under the aegis of the WMO/ IOC's Joint Commission for Oceanography and Sea Meteorology to create an end-to-end technology for managing sea data that is based on the solutions of the UISWO. The pilot project united experts from Russia, France, United Kingdom, U.S., Belgium and Canada.

Key learning points and conclusions

This work has provided a powerful insight into the historical and current linkages between science and policy in Russia and the UK. Analysis of the evidence gathered and the resulting learning points have enabled the development of a number of conclusions that policy makers and scientists in both countries, and wider, may wish to consider in their work.

An important finding regarding cooperation between the UK and Russia that was raised in the stakeholder interviews was the importance of recognising that although there are different approaches to many aspects of the funding and implementation of scientific research programmes (e.g. tendering timescales and processes), these are not and should not be seen as barriers to collaboration.

Focusing on policy makers:

- Foster and support the functions of national science academies, through policy statements and the allocation of an appropriate level of public budget, in order to ensure that this important link between science and policy makers is both maintained and further developed.
- Increase the demand amongst policy makers for evidence and solutions that will be delivered as a result of applied scientific research, including the provision of an appropriate level of

earmarked funding, this would also help to raise the practical value of research results to decision-makers and businesses

- Strengthen the ability of policy makers to ensure that they have the knowledge, tools and experience to appropriately consider scientific evidence in their policy making.
- Strengthen scientific component in the structure of governmental bodies by bringing forward the role of scientific units and advisors, improving the status of scientists within government departments and ensuring that those officials with a science background have opportunities to be actively involved in the use of science in policy making
- Broaden the practice of scientific expert reviews and joint scientific-public hearings on draft policies, laws and project decisions; this could also involve international experts in the provision of evidence and advice

Focusing on scientists:

- Ensure that scientific reports, position papers and briefing notes submitted to the governmental bodies clearly outline the problem and provide greater focus on specific recommendations and actions of relevance to policy makers and their specific issues and policy decisions.
- Maintain and, where necessary, strengthen the role of professional scientific / technical associations and similar bodies in providing scientific evidence to policy makers in order to enable a joint scientific opinion to be actively communicated to policy makers.
- Broaden the international exposure of scientific research undertaken in Russia by increasing the number of scientific papers prepared by Russian scientists that are published in foreign peer-reviewed journals
- Encourage a move away from workshops where the majority of the programme consists of formal presentations from scientists and other experts towards a format that actively encourages and facilitates discussion and debate from and amongst Russian scientists, and provides a platform for developing mutually agreed decisions / opinion
- Improve the component of public relations in scientific and research institutions, including the approaches to interacting with mass media

General – for policy makers and scientists

- Ensure that where appropriate workshops and conferences are held jointly with scientists and interested parties (including policy makers, businesses, etc) who will make use of the results of scientific research. The involvement of external experts and others able to challenge the findings, conclusions and application of specific aspects of science can be valuable in stimulating debate.
- Increase the number of joint workshops for scientists and policy makers to engage in discussion and better understand the others position. Events frequently feature one policy maker talking to scientists or visa versa.
- Develop national climate strategy for Russia and, based on this, establish a national climate research programme and funding stream; related to this, establish a Public Council on Climate that will involve state representatives, scientific community, NGOs and political parties.

In summary, measures of particular interest in strengthening the linkages between science and public policy making are those that may assist in facilitating increased interaction, and improving dialogue and collaboration between scientists and policy makers in and between both countries, and internationally. It is also important to consider that solutions to climate change issues are likely to need much more than science and technology can deliver alone – these will also require political commitment towards innovative policies and international collaboration.

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1 Introduction

1.1 Project overview

This Final Report has been produced under the project, UK-Russia Climate Change Collaboration, funded by the UK Foreign and Commonwealth Office. The overall goal of the project is 'to improve the UK and Russia's understanding of climate change science and climate change impacts (physical and economic) on Russia and the UK. The project will raise the profile of climate science through various outputs and awareness raising activities, and as a result will provide a platform from which greater account can be taken of climate science evidence in policy-making.

The project comprises the following core activities:

- Task 1: Project Vision Meeting (involving AEA, FCO and Roshydromet; agree the vision for the project and finalise the work programme)
- Task 2: Define and finalise working arrangements
- Task 3: Review existing climate change science and impacts for the UK and Russia (provides the foundation for the project and will identify science contacts – report prepared by CCRM)
- **Task 4: Links between science and policy-making in practice** (investigation of how sound science and policy-making are linked, including in climate change)
- Task 5: Awareness-raising activities
- Task 6: Scoping study
- Task 7: Research programme

The project website (http://www.uk-russia-ccproject.info) provides more detailed information on the work programme. Project reports, presentations, news, etc will also be made available.

This report outlines the work that has been carried out on **Task 4: Links between science and policy making in practice**, and summarises the findings, conclusions and recommendations that have been developed as a result of activities in both Russia and the UK.

1.2 Task 4 - Science and Policy linkages

The purpose of Task 4 was to provide information and practical examples that would enable a greater understanding of how science is, or could be, used to inform and underpin evidence-based policy. The objectives of this task were to:

- Collate, review and present existing evidence on the links between environmental science and policy-making in practice in both the UK and Russia
- Develop two case studies (one from the UK and one from Russia) of specific environmental policies or policy areas and the use of scientific evidence in their development
- Use this evidence to develop conclusions about the links between science and policy-making relevant to future development of climate change policy. These conclusions and resulting key messages and recommendations may also influence how dissemination and policy linkages of Task 7: Research programme are designed.

Using the evidence gathered from the literature reviews, case studies, interviews with practitioners, dialogue at workshops and other sources, this task considers four key inter-linked questions:

- What are the roles of the institutions with regard to delivering environmental science and developing and implementing environmental policy?
- What are the methods used by policy-makers to ensure that policy is based on sound scientific evidence?
- What processes are in place to ensure both independence and policy-relevance in scientific research?

- What are the communication processes that facilitate dialogue between scientists and policy-makers, and vice-versa?

By examining these questions for both the UK and Russian contexts, this analysis also aimed to draw out distinctions between the approaches of the two countries in terms of how science and policy making are linked, and to identify any underlying reasons for these distinctions. The resulting improved understanding of the links between science and policy would then be used to explore how best to represent this relationship e.g. as a linear process between the two extremes of science and policy (either one-way or 2-way), as a loop, or as an alternative model.

1.3 Structure of the Report

This Final Report outlines the work undertaken on Task 4, and summarises the main conclusions and learning points from exploring science and policy linkages in both the UK and Russia.

This report begins with an overview of the evidence gathered through the course of the project work. This includes:

- A summary of the literature reviews for both the UK and Russia

- Two case studies:
  - The UK case study focuses on the development of UK climate scenarios and their use in public policy.
  - The Russian case study focuses on the Federal Task programme (FTP) – 'World Ocean'

- Summaries of interviews with scientists, policy-makers, and representatives from NGO's in both the UK and Russia.

Following this, there is a section that draws together the key learning points from the evidence collected and outlines the main conclusions of this work.

A number of Appendices are included that provide additional detail to support key sections of the report.

2 Collated evidence

The main aim of Task 4 was to gain an understanding of how science and policy-making are linked in both theory and in practice (examining real situations) and what relationships, organisations, mechanisms, processes, etc are, or could be, important in promoting and facilitating the effective use of science in strategic decisions, and in policy development, implementation and impact monitoring.

Evidence was gathered from a wide range of sources in Russia and the UK, and is presented in the following summaries:

- Literature reviews (Russia / UK)
- Case studies
- Interviews with science and policy practitioners

2.1 Literature Reviews (Russia / UK)

Two literature reviews (see Appendix 1 – Russia; Appendix 2 – UK for full text) have been prepared to examine how science and policy-making are linked in practice in the UK and in Russia. Their purpose is to provide an understanding of the extent to which scientific evidence is accessible to policy makers, how governments (UK and Russia) make use of this data and information (e.g. formal mechanisms, networks, appointed advisors, scientific committees) and whether / how scientific research agendas are influenced by government bodies. This included a limited review of academic literature to explore the interface between science and policy making from a theoretical perspective.

Both the UK and Russian literature reviews have made use of publicly available information. Although the work plan originally anticipated that literature and information from Russia would not be as readily available via the Internet, in practice this has not been the case. Initial searches found a wide range of documents (in Russian) that provided sufficient source material to inform the literature review for Russia.

A brief summary of the key findings from each of the literature reviews is provided below (Sections 2.1.1 and 2.1.2). This work has also enabled the development of a series of diagrams showing the linkages (through various routes such as funding, formal institutional relationships, flows of information and advice, etc) between science and policy-making organisations in Russia and in the UK. These linkages 'maps', which focus particularly on the areas of climate change science and policy, are collated separately in Appendices 3, 4 and 5, and referenced from the full text versions of each of the literature reviews.

2.1.1 Links between science and policy making in Russia

The literature review for Russia provides an historic perspective on the linkages between scientific research and policy-making. It highlights how this relationship has changed over time and that this has often been reflected in the priority the government has given to science and its role in supporting policy development and implementation, including in the areas of environmental protection and climate change.

During the Soviet period, the state and the government exerted considerable, if not total, control over the research priorities and programmes of state funded scientific institutions. However, it is also clear that policy-makers consistently recognised the importance of underpinning their policies and supporting implementation programmes with the results of scientific research. In many periods of the Soviet history, science was funded specifically to generate results that would strengthen the case for individual policy approaches (in contrast to informing decisions on the direction that policy should take). As such, science was in many cases used as an enabler of particular policies rather than an advisor on different alternatives. The need to accelerate economic development and maintain military capacity were strong drivers of many policy decisions however, the priority given to consideration of the environmental consequences and funding for related scientific activities has varied widely in

different periods of recent Russian history. This reached critical levels during the economic crises of the 1990s when the funding of environmental activities became almost non-existent.

From the mid 1990s onwards, it was again recognised by the government and others that science had a crucial role to play in substantiating environmental policy. In 1996, the *Doctrine on the Development of Russian Science* formally announced that support to science was a priority goal of the state; amongst other things, it established a mechanism for the state regulation of scientific activities, made funding commitments, and introduced tax and tariff concessions. The need to provide the means to facilitate the participation of Russian scientists in international projects was also acknowledged. The Doctrine clearly stated that these commitments were intended to lay the foundation for the scientific community to contribute to Russia's transformation into a country that would demonstrate a high regard for environmental protection. In the same year, the relationship between scientific institutions, state authorities and consumers of scientific services was defined and regulated by enactment of the *Federal Law on Science and State Scientific and Technical Policy*.

By 2002, there was an increasing emphasis on policies that would regulate and facilitate improved protection of the environment and mitigate the impacts of climate change. The Russian Federation Government stated that it placed extremely high importance on scientific research on global and regional changes in climate and the environmental impacts, and on the need to develop state-of-the-art methods for environmental monitoring *(Environmental Doctrine of the Russian Federation).* Support to fundamental science was again recognised as one of the highest priorities of the State in the *Principles of the Russian Federation's Policy on Scientific and Technological Development until 2010 and in the Long Term,* as was the development of international scientific co-operation. Importantly this document also stated that the scientific community, in line with the country's national interests and the world's scientific and technological trends, should determine the priorities for fundamental research studies.

In May 2006, 'sustainable environmental management' and 'energy and energy efficiency' were amongst a list of priority areas for scientific, technical and technological development in the Russian Federation approved by the President (Putin). An associated list of critical technologies included atmospheric and hydrological monitoring and forecast, renewable sources of energy, and risk reduction and mitigation of the consequences of natural and man-made catastrophes.

In the areas of climate science and the impacts of climate change, there is clear evidence of extremely strong linkages between science and policy, including the extensive use of scientific evidence to underpin Russia's negotiation and ratification of key international agreements.

The country's leaders based their decision to ratify the UNFCCC on the comprehensive information on climate change that had been produced by the Russian scientists; this included the required baseline information on the effects of climate change on human health, economy, and the status of ecosystems and biodiversity. Investigations were conducted into adaptation options for the national economy and biosphere, and into the measures that may be required for the different regions in response to changes in ambient temperature and precipitation. Forecasts for the emissions of the main greenhouse gases from key sectors (energy, industries, transport and agriculture) had also been developed. The scientific community in Russia has made a significant and continuous contribution to the work of the Intergovernmental Panel on Climate Change (IPCC), and led a working group on the social and economic consequences of climate change. The availability of scientific data ensured that Russia's delegation to the UNFCCC was able to fully substantiate its negotiating position. The importance placed on the joint working of scientists, government, business and the public on climate change problems, adaptation and mitigation was re-iterated by the then President, Vladimir Putin, in his opening speech to the World Scientific Conference on Climate Change held in Moscow (in 2003).

Russian science has been a major driving force behind the national policy on climate change. This has been positively influenced by the organisation of virtually all the scientific research institutions involved in climate change studies under the supervision of Roshydromet. The leading role of Roshydromet and its close working relationship with key Ministries has ensured that climate issues have been incorporated into national policy. Top scientists and administrators from the organisation also make important individual contributions to international efforts on climate change e.g. joint chairmanship of the Climate Change Subgroup, established under the Environment Dialogue of the Russia-EU Partnership. The strategic forecast of climate change in the Russian Federation 2010-2015

prepared by Roshydromet, and presented at a joint Russia-EU workshop on adaptation to climate change (September 2007) organised by the subgroup, emphasised the need 'to prioritise adaptation measures when drafting Federal and regional development strategies'.

In November 2007, Vladimir Putin – then President of the Russian Federation – emphasised the importance of the State Programme for Fundamental Scientific Research for 2008–2012 that had been largely initiated by the Russian Academy of Sciences. The President reiterated that science would be receiving stable and steady earmarked funding over the next five years. In May 2008, it was reconfirmed that 250 billion Rubles would be allocated for fundamental scientific research.

Organisation of and participation in high profile international conferences and workshops in Russia e.g. Climate Change Adaptation and its role in Sustainable Development of the Regions (Murmansk, May 2008) provides a key mechanism through which science and policy are linked; these meetings provide a forum in which policy-makers (Ministry officials) are exposed to the detailed results of scientific monitoring and research, analysis, and evidence-based recommendations. They also provide ideal opportunities for the international exchange of information and practical experience on different policy approaches and funding options. The resolution passed at the Murmansk conference illustrates that such meetings also generate important outcomes – in this case, recognition of the importance of creating sufficient incentives for scientific research on climate change adaptation in Russia and strengthening the potential of Russian experts, and formal acknowledgement that the development of an effective adaptation strategy is a complex task that will require concurrent actions from a wide range of stakeholders, including decision-makers, businesses and the public.

Although there has always been a strong emphasis on regulation and 'top-down' approach to policy-making in Russia, it is clear that Russian scientists and science continue to make important, influential and valued contributions to the direction and content of both national policies and international agreements on environmental protection and climate change.

2.1.2 Science and policy linkages in the UK

The literature review for the UK (see Appendix 2 for full text) explores the linkages between science and public policy, primarily over the last ten years, and examines the role of evidence, and in particular science and scientific advice, in policy decisions in the UK. We have identified the 'routes' through which the results of scientific research and expert advice reach Government policy makers, and reviewed the roles and relationships of the various organisations (and individual posts) that have been established to support and facilitate this flow of information, or that have themselves developed a role in this regard.

This work has revealed a complex network of organisations, individuals, responsibilities and interactions (both formal and informal) that package and delivers scientific information and advice, policy priorities and requirements, and research funding. There is a clear hierarchy and direction involved in disbursing government research budgets and the reciprocal delivery of results and outputs, primarily focused on the allocation of budget to seven research councils and subsequently through programmes and projects undertaken by universities and similar technical institutions. The allocation of funding for scientific research is open and transparent and, although government is a major source of these budgets and sets the thematic areas in line with the strategic issues facing the UK, the decisions on which specific projects and programmes are supported are taken independently. For other organisations and roles, however, the nature of the linkages and the relationships that are required are not defined at the outset but are identified and developed (tailored) with the aim of achieving a set of objectives or terms of reference (e.g. for the leading roles within the scientific advisory structure, or for stakeholder engagement initiatives).

In 1999 the White Paper on Modernising Government said that the UK Government would be *'forward looking in developing policies to deliver outcomes that matter'* and that policies would be *'shaped by the evidence rather than a response to short-term pressures'*. It committed to improving policy-making through *'the use of evidence and research so that we understand better the problems we are trying to address'*.

An evidence-base approach to policy making has been defined as one that:

- Reviews existing research
- Commissions new research
- Consults relevant experts and/or uses internal and external consultants
- Considers a range of properly costed and appraised options.

The need for sound science in government policy-making was emphasised by the findings and recommendations from the inquiries into two major crises in the UK – BSE and the Food and Mouth outbreak in 2001. They played a key role in highlighting the crucial and growing need for policy-making to be underpinned by sound evidence, including science and scientific advice. One of the major lessons that the Anderson Lesson Learned Inquiry into the Foot and Mouth Outbreak of 2001 drew attention to was the need to *'Base policy decisions on best available science and ensure that the processes for providing scientific advice are widely understood and trusted'*. Tackling today's and future challenges, such as climate change, are also likely to require continuous development of more and more innovative policies and a growing need for multi-faceted policies (in turn requiring the science, skills and experience from many different disciplines).

A common failing has been that science has not been involved early enough in establishing policy priorities and defining the bigger strategic questions that government needs to answer; these typically originate in the Cabinet or Treasury, where they are less used to engaging with scientists. In order to ensure that key stakeholders can comment on and influence, where appropriate, policy direction and detail, it is important that they are involved at an early stage and continue to be engaged throughout the policy development process.

For links between science and policy to work in practice, relevant and diverse evidence from specialists, businesses, charities and the voluntary and community sectors need to be available to policy makers in an accessible and meaningful form. Civil servants must also have the capacity to make effective use of this data and information. There is a growing need for scientists and non-scientists (particularly those with skills to 'translate' scientific information) to work together, and for multi-disciplinary approaches and teams. The UK government has clearly recognised that civil service staff must be equipped with relevant skills and training, and this has led to the development of specific policies and initiatives aiming at increasing the provision of professional training. This has been focused on increasing awareness of the availability and use of evidence, and improving skills in recognising, analysing, applying and presenting scientific data, advice, etc in their day-to-day decisions and in policy development.

Over a number of years the Government has been working to improve the internal structures and initiatives through which it advances and supports evidence-based policies, and facilitates and integrates the use of science in policy-making. Several Government Departments now host key science advisory and policy units; this includes the Government Office of Science (GO-S) which also hosts two cross-government activities / units - Foresight Programme and the Horizon Scanning Centre (located in the Department for Innovation, Universities and Skills). All Departments have now appointed a Chief Scientific Advisor whose principal responsibilities are to: support the use of scientific evidence in policy-making; ensure the quality of the science used in their departments; ensure that their departments are intelligent customers for science; promote and support the interests of scientists and engineers in their departments; and explain science inside government and engage with public opinion. The extent to which individual departments specifically make use of science varies in line with their remit and the historical significance that has or has not been given to science within their policy development work, e.g. Defra has a long and strong association with the use of science whereas the Department of Culture, Media and Sports has only recently appointed its first departmental Chief Scientist Advisor.

There is also evident that there is an increasing emphasis on cross-departmental working, for example, the Office of Climate Change (OCC)[1] which was established to improve climate change policy development and delivery in the UK and to support the strategic decisions of Ministers. Funded by a number of departments, OCC acts as an internal consultancy group by providing independent advice and challenge on key climate change issues and providing support to policy development.

[1] Originally located in Defra but moved to the new Department of Energy and Climate Change (DECC) in Oct 08

In addition to the formal appointments and relationships within government, there are a multitude of external organisations, expert groups and individuals that are called upon to provide, or themselves offer, scientific advice and opinion. Amongst these are academic institutions, the Royal Society (who are in the process of establishing an International Science Policy Centre), Chatham House, non-governmental organisations (NGOs) and the general public. The relationship between policy-makers and these science providers can be formal (e.g. the provision of evidence to a Select Committee) or informal (e.g. the publication of a report or article or interview in the public domain, and often through the mass media). An aspect that is growing in importance is engagement with the public on matters related to policy development, implementation and impact monitoring. Specific initiatives have been established in the UK for this purpose – *Sciencewise,* a programme supported by the Department for Innovation, Universities and Skills, aims to improve UK policy-making by embedding public dialogue in the early stages of policy development. The professional training provided to government officials on the use of evidence also covers when and how to engage public opinion.

There are a large number of potential linkages between science and policy in the UK however the extent to which, in practice, these are functioning effectively and as intended (particularly where formal roles and responsibilities are defined or specific organisations have been established) varies depending on the policy area, the existence of on-going initiatives to promote and facilitate these links and the specific organisations with key roles and responsibilities. The importance of international collaboration is also increasingly evident in the work of both government and non-governmental organisations.

2.1.3 Linkages maps – UK and Russia

Results from each of the literature reviews, together with those from the case studies (see Section 2.2) and stakeholder interviews (see Section 2.3), have been used to develop diagrams ('maps') showing linkages between the key organisations involved in climate science and / or policy making in the UK and Russia. Linkages exist in a number of areas including funding, structural institutional relationships and information flows; these are illustrated in a series of schematic diagrams (see bullet list below for relevant appendices):

- Russia's Federal Executive Bodies (new structure) as of 1st Sept 2008 (Appendix 3)
- Russia's Representative and Legislative Bodies as of 1st July 2008 (Appendix 3)
- Russian Academy of Sciences (institutional relationships and funding flows) (Appendix 3)
- Russian Foundation for Fundamental Research (RFBR) (institutional and funding interactions) (Appendix 4)
- UK Government structure[2] focusing on funding routes for science and technology, and in particular climate science (Appendix 5)
- UK climate change policy and science influences (information flows) (Appendix 5).

2.2 Case studies

Alongside the literature review, historic examples or 'case studies' have been used to understand and demonstrate the way that science and policy have been or are linked in practice. Two case studies have been developed, one from the UK and one from Russia.

Following the preparation of outlines of four case studies options for the UK, the following topic was selected in consultation with the FCO in Moscow:

> **Development of UK climate scenarios and their use in public policy**
> This case study focuses on how the process of developing climate scenarios in the UK has changed over time, due to changes in funding and calls from users for the scenarios to be more accessible.

[2] On 3rd October the UK government announced the formation of a new Department for Energy and Climate Change. This was intended to give a greater focus to solving the twin challenges of climate change and energy supply, and bring together the Climate Change Group, previously housed within the Department for Environment, Food and Rural Affairs (Defra), and the Energy Group from the Department for Business, Enterprise and Regulatory Reform (BERR). http://www.decc.gov.uk/index.htm The linkages maps presented in Appendix 5 reflect these changes.

The case study for Russia was selected based on information from discussions with a number of science and policy stakeholders and in light of the availability of publicly accessible information. The following topic was selected:

Federal Task programme (FTP) – 'World Ocean'
This case study provides a very strong demonstration of how the results from a well-funded and accountable research and development programme can be used directly to solve existing problems, where they able to have immediate practical value.

2.2.1 UK case study: Development of UK climate scenarios and their use in public policy

Introduction
This case study explores the phases of climate scenario development in the UK, and how this has changed over time. It considers how and why government policy goals (and associated funding) were able to influence the scenarios, and the extent to which these were made available to researchers. It explores the drivers that underpinned the changes that occurred and who steered them. A key component of this is work is the question of how the wider involvement of stakeholders changed the availability, accessibility and usability of the scenarios (and data), and what impact this has had for different stakeholder groups (particularly the wide diversity of users). The case study also considers the impact of the formation of UKCIP. The paper *'Negotiating future climates for public policy: a critical assessment of the development of climate scenarios for the UK*[3] was a key reference for this case study.

Case study analysis
An important driver for the development of national climate scenarios in the UK was the increased awareness and activity on climate change within the international community. During the 1980s a growing interest in climate change, both from a policy and research perspective, led to the establishment in 1988 of the Intergovernmental Panel on Climate Change (IPCC) by the United Nations and World Meteorological Organisation. The IPCC First Assessment Report (FAR) was published in 1990 and provided a comprehensive assessment of scientific literature on climate change in a format that was suitable and relevant for policy makers.

In response to ongoing UK academic work and the FAR, the Department of the Environment (DoE)[4] identified a need to explore the possible impacts of climate change on the UK. Two major government initiatives happened at this time: the government established the Hadley Centre for Climate Prediction and Research within the UK Met Office and the DoE established the Climate Change Impacts Review Group (CCIRG). This group consisted of a selection of leading academic experts who were tasked with undertaking an assessment into the potential consequences of climate change for the UK based on current levels of understanding. The findings from the first report by CCIRG[5] (published in 1991) were only independently disseminated through a peer-reviewed journal publication. Hulme and Dessai (2008) commented that "*the CCIRG91 scenarios were therefore a product of a privileged relationship between commissioning civil servants and a scientific elite, and the construction decisions were closed and unchallenged*". Wider stakeholder participation was not part of the project specification; however the Government subsequently provided funding for wider dissemination of the modelling results from the Hadley Centre through the LINK project[6].

The Government funded Hadley Centre had a significant influence on the second report and scenario set produced by CCIRG[7] (published in 1996). This report was based almost entirely on the results of

[3] Hulme, M. and Dessai, S. (2008). Negotiating future climate for public policy: a critical assessment of the development of climate scenarios for the UK. *Environment Science and Policy*, 11, 54-70.
[4] The Department of the Environment (DoE) latterly became The Department of the Environment, Transport and the Regions (DETR) then Department for Environment Food and Rural Affairs (Defra)
[5] CCIRG, 1991. CCIRG (Climate Change Impacts Review Group) - The Potential Impacts of Climate Change in the United Kingdom. HMSO, London (1991).
[6] The Climate Impacts LINK Project (known just as LINK) provides climate simulations from the Met Office Hadley Centre (MOHC) to the UK and international academic communities. The data includes climate runs from a range of MOHC models including HadCM2, HadCM3, HadRM2, HadRM3 and HadGEM1.
[7] CCIRG, 1996. CCIRG (UK Climate Change Impacts Review Group) - Review of the potential effects of climate change in the UK. HMSO, London (1996).

one modelling experiment conducted by the Hadley Centre. Although the science of climate modelling was developing rapidly, there was still little wider engagement with any decision-makers outside the DoE. The concept that there could be potential 'users' of these scenarios was yet to be considered.

The CCIRG reports were groundbreaking at the time but had limited applicability outside the select group of experts involved in their development. One problem was that the information was not developed or reported in a consistent or user-friendly format. The reports helped to generate awareness within Government of the need for (1) user-driven scenarios to stimulate response and (2) the need for consistent scenarios, datasets and information. This led to the creation of the UK Climate Impacts Programme (UKCIP) in 1997, and their publication of a new set of national scenarios in 1998. The UKCIP98 results formed part of a larger government initiative to engage and facilitate stakeholder assessments in the impacts of climate change and so engage decision-makers across the UK. This marked a significant change in approach and target audience of the results from that seen with the previous work and represented a direct attempt to integrate science, policy and a wider community of interested parties.

UKCIP has remained at the forefront of climate impact assessments in the UK since 1998 and an additional set of scenarios was released following the IPCC Third Assessment Report (TAR) in 2001. The UKCIP02 scenarios included a spatial resolution (50km compared to 300km) reflecting the improvements in the Hadley Centre model. This increased spatial resolution has improved the usability of the results for end users undertaking impact assessments. During the development of UKCIP02, difficulties were experienced in compromising between what the science could supply and what potential users were demanding; this has also emerged as an issue for wider climate change work. Pressure from users for a higher spatial resolution led to the generation of the 50km resolution - the first of its kind in the world. This however came at the expense of having a limited representation of modelling uncertainty, for example through the use of scaling factors rather than multiple runs of the model and limited reference to the results of other Global Climate Models.

The development of UK climate scenarios has been strongly influenced by the dominance of DoE/DETR/Defra in the funding of the Hadley Centre, UKCIP and specific contracts to University of East Anglia (UEA). This arrangement potentially excluded other institutions, research groups, models or ideas from making a contribution to the scenarios. It was formally criticised by a House of Commons Science and Technology Select Committee Enquiry, which expressed a concern about the 'over reliance' on results from the Hadley Centre models. This situation resulted in institutions and organisations (e.g. the UK Water Industry) that wished to consider the widest spectrum of climate risk undertaking their own studies.

There has been a clear change in scenario purpose over time. Initially this consisted of an expert review, with the results being communicated to the DoE in this context. Few could access the original data and therefore use of the 1991 and 1996 scenarios was limited. The information has become more widely available since 1998 but formal guidelines of how to interpret the results were not published until 2003. Since UKCIP was formed, the new reports have been launched as 'scientific products' accompanied by dedicated media events. Specific attempts have also been made to make the information as relevant as possible for decision-makers at different scales and sectors. An overview of the achievements of UKCIP in terms of scenario development and their implications for climate change preparation in the UK was published in 2005[8].

The technical developments at the Hadley Centre were the main influence on the nature and availability of end user information and improved modelling methods have been the primary driver for scenario design. Initially UK scenarios were supply-led although recent trends have moved much more towards considering user demands. Some consultation took place for UKCIP02 although the supply side had greater power than the demand (user) side. Wider discussion was precluded as the prior choices made by the Hadley Centre ensured that their models had to be used. The latest set of scenarios (UKCIP08) is due to be published sometime in 2009 and will feature probabilistic scenarios. The development of these scenarios was preceded by a substantial user consultation.[9]

[8] West, C. & Gawith, M (eds.) 2005. 'Measuring progress: Preparing for climate change through the UK Climate Impacts Programme'. UKCIP
[9] See: http://www.ukcip.org.uk/index.php?option=com_content&task=view&id=256&Itemid=350

Conclusions
The UK government was influenced by academic research and the findings of the IPCC to initiate the funding of climate change scenarios for the UK. The government has played a central role in the transfer of information within the academic community and also to a wider group of stakeholders through the establishment of UKCIP. A gradual shift has occurred over the past decade to increasingly consider the end user requirements, although this has also been steered by the science available. UKCIP have presented the scientific information in an accessible format for non-academic stakeholders such as private companies and local government. They now have easy access to detailed guidance for undertaking climate impact assessments and this has led to an improved understanding of climate change, the risks, and potential impacts. The consequence of government influence has been for UKCIP to focus on its own funded work. This combined with limitations in computer resources has meant that work from international modelling centres has not been utilised to the extent that it was in the early 1990s. A trade-off therefore exists between the level of detail demanded by the users and the information that can be provided by the climate scenarios.

2.2.2 Russia case study: Federal Task programme (FTP) – 'World Ocean'

Introduction
This case study provides a very strong demonstration of how the results from a well-funded and accountable research and development programme can be used directly to solve existing problems, where they able to have immediate practical value. The Federal Task Programme "World Ocean" (hereafter FTP-WO) was initiated in accordance with the Russian Federation President's Decree #11 as at 17 January 1997 and the RF Government's Bylaw # 192 as at 22 February 1997, and was ultimately approved by the RF Government's Bylaw #919 as at 10 August 1998. The RF Ministry of Economic Development provides the overall coordination of the FTP-WO.

Case study details
The main goal of the programme is to develop comprehensive solutions for studying, exploration and the efficient use of resources of the World Ocean, to the country's economic interests and security of its sea borders. Among the tasks being undertaken is the development and implementation of a unified and co-ordinated state policy aimed to consolidate domestic and international interests of the Russian Federation and to integrate various stakeholders in the development of maritime activities of the country.

Implementation of the FTP-WO is scheduled for 1998-2012, in three phases: 1998-2002; 2003-2007 and 2008 –2012, and comprises the following sub-programmes:

- Antarctic Survey *(reported to Roshydromet);*
- Arctic Survey *(reported to Ministry of Economic Development);*
- United Information System on the World Ocean *(reported to Roshydromet);*
- Wildlife survey for the World Ocean *(reported to the Federal Agency for Science and Innovations);*
- Russia's strategic military interests in the World Ocean *(reported to Ministry of Defence);*
- Mineral resources of the World Ocean, Arctic and Antarctic *(reported to Ministry of Natural Resources);*
- Russia's transport communications in the World Ocean *(reported to Federal Agency for Sea and River Transport).*

A large number of Ministerial organisations and institutions of the Russian Academy of Sciences (RAS) participate in the implementation of the FTP-WO. A system of the so-called *programme policies* that are coordinated by the Ministry of Economic Development constitutes an important part of the FTP. Sub-programmes of the FTP-WO are designed in such a way that the obtained results are not just disparate scientific findings, but are integrated solutions for specific problems.

Implementation of the Programme has resulted in a large number of scientific and applied solutions intended to enhance the country's maritime activities and initiatives, both for the purposes of national defence and economy.

Findings of the FTP that have had the most practical importance are as follows:

- obtained data on plankton and nekton in the Sea of Okhotsk (which is Russia's main fishery area) demonstrated that the biomass of these organisms increased by 1.3-1.5 million tonnes, which was used to justify an increase in catch quotas for pollock and herring in the country's total allowable catch for 2005;
- a map of ferro-manganese occurrences was developed for Russia's Arctic shelf;
- compiled digital models of the Earth crust of the Barents Sea shelf were used to justify the continent-ocean demarcation. This information is used as a basis for substantiation of the Russian Federation's borders in the Arctic Ocean, including the border of the continental shelf.

As part of the FTP-WO Sub-programme "Russia's transport communications in the World Ocean", a final revision of the Concept for Development of the Northern Sea Route[10] was prepared which is aimed to unite the transport subsystems of European, Siberian and Far East North in a single transport complex. An integrated regional system for vessel movement control in the waters of Russian Far East has been developed based on the findings from this Sub-programme. The system will also be used to provide navigational and information support when implementing economic and military tasks in the Far East region.

As part of the Arctic survey that intends to make the Arctic region more energy self-reliant, financial and technical plans were developed to introduce the use of renewable energy sources in the remote areas, together with economic measures to stimulate the use of renewables and energy efficiency models.

To enhance the socio-economic situation and to ensure sustainable economic growth in the Arctic region, the Arctic States' Action Plan for Economic, Social, Cultural and Environmental Pillars of Sustainable Development was drafted to set up priorities, timescale and resources required from the Parties. The Action Plan was discussed at the Ministerial Session of the Arctic Council[11]. In November 2004, Ministers approved the Arctic States' Action Plan for Sustainable Development.

A project titled 'Assessment of Impacts of Global Climate Change on Maritime Activities' is being implemented as part of the 3rd phase of the FTP-WO (2008-2012).

Another project – 'Integrated Management of the Coastal Zone of Murmansk Oblast' – aims to maximise production-economic potential of the Murmansk coastal area without exceeding the established emission norms, as well as to ensure sustainable development of the region and improvement of the quality of life.

The following measures have been implemented as part of the Project:

1) Improved effectiveness of the fishing industry in Murmansk oblast;
2) Integration of modern technologies in the maritime industries in order to enhance technical quality and competitiveness of domestic goods;
3) Development of tourism and recreation;
4) Optimising spatial organisation of maritime activities in the Barents Sea and Kara Sea (in the Arctic Ocean);
5) Recommendations for prevention and resolution of conflicts of interests between users of Murmansk coastal area and the adjacent offshore zone;
6) Development of a framework for international maritime activities in the Barents and Kara Seas;
7) Integrated development of the Murmansk transport hub[12].

[10] Northern Sea Route is the shortest route between Russia's European part and Far East, the country's main shipping passage in the Arctic. The total length of the route is 5600 km. Its main purpose is supply of fuel, food provision, transportation of timber and mineral resources.
[11] The Ottawa Declaration of 1996 formally established the Arctic Council as a high level intergovernmental forum to provide a means for promoting cooperation, coordination and interaction among the Arctic States and, in particular, sustainable development and environmental protection in the Arctic. Member States of the Arctic Council are Canada, Denmark, Finland, Iceland, Norway, Russian Federation, Sweden, and the United States of America. http://arctic-council.org/
[12] Murmansk Transport Hub (MTH) is planned to be developed on the basis of Murmansk Port situated in the Kola Bay which provides all-year round ice-free access to the ocean. The Hub will play an important role in realisation of the country's export and transit potential. The Council for Production Capacity Studies under the RF Ministry of Economic Development and Russian

To ensure practical dimension of the theoretical findings of the Project, a number of priority aspects for development of the Murmansk coastal area have been identified which will be realised through a wide range of financial mechanisms, including those offered by the FTP 'World Ocean', State-Private Partnership Unit of the Scientific Council under the RF Maritime Board[13], and the RF Investment Fund.

Conclusions
Overall, the findings and achievements of the FTP 'World Ocean' have been fed into the country's national maritime policy and aimed to fulfil the tasks of the Maritime Doctrine of the Russian Federation[14], strengthen the country's economic potential, enhance scientific research on the World Ocean, expand maritime freight, improve the profitability of fisheries and increase employment and tax proceeds.

A key achievement of the FTP has been to establish control systems for facilities operating on the continental shelf, in the exclusive economic zone and in the vicinity to Russia's State border. This helps prevent illicit fisheries and harvesting of sea resources in the state waters, strengthens the security of Russia's sea craft and improves the effectiveness of rescue operations.

The research projects realised as part of the FTP have produced a considerable number of practical findings. Recommendations developed on the basis of the findings have been taken into account by institutions and agencies that co-ordinate design, construction and operation of facilities and installations in the coastal areas and on the sea shelf. Integration of the scientific findings in such activities has already resulted in a 10% reduction in an estimated cost of the works.

Environmental and social findings of the Programme allowed reducing the costs of response measures both in offshore and onshore emergencies that result from the ocean-induced effects on climate, such as in tsunami-prone regions of the Pacific and Russia's Far East.

Projects implemented as part of the Transport Communications Sub-programme have enabled fulfilment of the goal to ensure the country's transport autonomy by enhancing its seaports.

Realisation of the Programme 'World Ocean' has also allowed the country to strengthen its positions in international organisations. In 2004, a pilot project was commenced under the aegis of the WMO[15]/ IOC[16]'s Joint Commission for Oceanography and Sea Meteorology to create an end-to-end technology for managing sea data that is based on the solutions of the UISWO. The pilot project united experts from Russia, France, United Kingdom, U.S., Belgium and Canada.

2.3 Interviews with science and policy practitioners

The information and findings from the literature reviews and case studies were supported by a series of interviews with practitioners in policy-making and scientific research in both Russia and the UK. The purpose of these interviews was to further explore the links between science and policy-making and to discuss in detail any specific issues, barriers, etc that had been identified.

The interviews were conducted to enable us to better understand how science and policy are working together in practice (e.g. how science has been used in policy development, how are policy needs brought forward within new scientific developments, are formal interaction processes working well, does informal networking and dialogue play a role, etc). Consultation with stakeholders also assisted the identification of practical examples (also as case study options) and learning points of relevance to climate change policy. The discussions with stakeholders also aimed to understand how effective the

Academy of Sciences has concluded that the Kola Bay coast is the most suitable area to develop infrastructure for the oil and gas production complexes in the Barents and Kara Seas. http://dpr.ru/journal/journal_30_5.htm
[13] Maritime Board of the RF Government is a governmental body that coordinates Federal activities in the field of maritime affairs and security, World Ocean, the Arctic and Antarctic, as well as the implementation of Russia's National Maritime Doctrine. The Maritime Board unites heads/ state representatives of Federal bodies, Regional authorities and scientific institutions. Chair of the Maritime Board is Mr. Sergey IVANOV, Vice-President of the RF Government. The Scientific Council advises the Maritime Board on the country's maritime policy and initiatives as well as on protection of Russia's national interests in the World Ocean. http://www.morskayakollegiya.ru
[14] The Maritime Doctrine is a pillar of Russia's national maritime policy.
[15] World Meteorological Organisation
[16] Intergovernmental Oceanographic Commission

mechanisms, responsibilities, processes, organizations, etc that have been established to regulate, facilitate, etc these linkages are in practice.

A long list of semi-structured questions was prepared and provided a framework to guide the specific questions used for each interview. The interviews and short questionnaires (used for some stakeholders in the Russian context) were designed to enable the respondent to provide their personal view (from current and previous roles) of working either at the interface of science and policy, or from a wholly policy or science position; issues that were covered included:

- Their own experience of the use of science in public policy, illustrated with specific examples (particularly where information is in public domain)
- Their perception of their role in relation to science and policy, including issues related to the setting of priorities and funding of science
- Their views on our diagrams ('maps') showing the linkages between key science and policy organizations (see section 2.1.3 above), including links through formal relationships, funding and information flows
- Their perception on the independence and / or politicization of science, and on the main contributing factors.

More details on the stakeholders that were contacted are provided below.

2.3.1 Science and policy stakeholders – Russia

Interviews with wide range of stakeholders were mainly conducted in Moscow, and included representatives of the federal government, academia and NGOs. Telephone interviews were also held with specialist climate-related institutions located in St Petersburg, namely the Scientific Research Centre for Ecological Safety and the State Hydrometeorological University.

A large amount of information was collected through face-to-face or telephone interviews with stakeholders in Russia, and also through a short questionnaire distributed by Roshydromet. In order to fully assess the responses and maintain the anonymity of the respondents, details from the interviews have not been included in this document. The main general issues raised by stakeholders have been reflected in the key learning points (Section 3) and recommendations (Section 4).

2.3.2 Science and policy stakeholders - UK

The work undertaken on the literature review and case studies for the UK indicated that there is a substantial amount of publicly available information on the roles, mechanisms, processes and institutions involved in policy-making in the UK. Therefore, representatives from a small number of key policy and science organizations were contacted for their views.

One of the main findings from the technical work was that there are numerous points of interaction between science and policy in the UK i.e. those created as a result of funding relationships, formal appointments (such as the Chief Scientific Advisor roles), etc and other formal and informal mechanisms established to facilitate networking, and generate and disseminate information. As with the interviews in Russia, a key aim of the UK discussions was to gain an understanding of whether, in practice, the availability of a wide and diverse range of opportunities and specific mechanisms for accessing and utilizing science in public policy has led to better informed policy makers, and to an increase in the extent to which policy is underpinned by scientific evidence, particularly in the areas of environment and climate change.

Again in order to maintain the anonymity of the interviewees, the detailed findings from these interviews have not been included in this document but have been reflected in the literature review, key learning points and the recommendations.

3 Key learning points

A set of key learning points have been drawn together taking into account the evidence gathered from a range of sources during the course of the work to explore science and policy linkages in Russia and the UK. These have been framed around the following three general headings:

- The role of **institutions** in science and environmental policy
- **Methods and processes** available to policy makers to ensure that policy is based on sound science
- **Communication processes** that facilitate interaction and dialogue between scientists and policy makers
- **Overarching learning points (focusing on Russia)**

3.1 The role of the institutions in delivering science and developing and implementing environmental policy

There are many similarities in the roles that institutions play in the UK and Russia in delivering science and developing policy. For instance, there is a wide range of institutions (in the broadest sense) in both countries involved in the delivery of environmental science and the development and implementation of environmental policy. The distinction between those institutions that are involved in science and that those focused on policy is clear. In the main, the types of organisations operating in each area are different, reflecting their primary role and remit. In both the UK and Russia, the key institutions responsible for the delivery of fundamental research in environment are the universities and specialised technical and research institutes. The government is responsible for the development and implementation of policy. As in any country, the availability of sufficient funding is a fundamental prerequisite for any organisation to function effectively and therefore be in a position to fulfil its role, whether it is in science or policy.

The majority of scientific institutions in both countries are publicly funded and therefore rely, to differing extents, on an allocation of funding from the government. Public funding of the research undertaken by scientific institutions demonstrates the priority that the government gives to this work. It can therefore have a profound impact in terms of the potential to deliver technical advances. The effect of this prioritisation, and the associated budget allocations, on the capacity of scientific institutions to conduct research and development activities is evident in many examples. For instance, the importance of government priorities and its impact on funding can be seen from the historical changes that have taken place in Russia and the contrast between the critically low levels of funding in the early to mid 1990s and the re-confirmation in May 2008 that 250 billion roubles had been earmarked for fundamental scientific research (refer to Section 2.1.1 and Appendices 1, 3 and 4). As in the UK, the allocation of funding to scientific research organisations is becoming increasingly open and transparent. Although the government provides the majority of the funding and, through its definition of state priorities, sets the thematic areas, the decisions on which programmes are supported are taken independently.

The research work undertaken by universities and other scientific / technical institutions is of great value in the advancement of the relevant scientific disciplines. However, it is the application of this science that increases its practical value and relevance to government officials and other organisations involved in setting strategic policy directions and in developing, implementing and assessing policy measures. It is rare for those involved in policy making to have sufficient specialist scientific training or experience (or perhaps more importantly the time) to directly use the results of fundamental research work. Indeed, it would be inappropriate for people in majority of policy-making roles to attempt to understand science at this level.

Evidence from both countries suggests that ‘bridges’ (practical mechanisms) and ‘enablers’ (roles and responsibilities) are needed in order for science to be understood and effectively used in policy-making. It is clear that the availability of specific methods, tools and systems that provide a link between science and policy can create an environment in which policy-makers are encouraged and supported in their use of sound scientific evidence. Similarly, the availability of and access to a

diverse range of communication processes and networking mechanisms is important in encouraging and facilitating interactions between scientists and policy-makers. These are discussed in more detail below.

3.2 Methods used by policy-makers to ensure that policy is based on sound scientific evidence

Science has an important role to play in informing and influencing policy decisions in both the UK and Russia. It is clear that this evidence takes many different forms and that the methods used for incorporating scientific evidence into policy-making depend on the specific issue. In the past, there has been a tendency for governments not to involve science early enough in establishing the strategic questions that need to be addressed and in informing decisions on the policy priorities. Complex policy issues, such as climate change, require long term strategies, the development of which benefits significantly from early scientific input. Science therefore has an important role in informing and enabling policy development and implementation. Clearly the science that policy makers use needs to be independent and sound. On the other hand it is also possible for policy-makers to ignore or misuse the scientific evidence provided to them or not to consider science at all.

Policy makers need to use scientific evidence to ensure their decisions reflect the best scientific information available to them. Active engagement and discussion with scientists is also needed to ensure that policy makers have understood the scientific work correctly. The interaction between science and policy is rarely linear in either direction. There are many and varied linkages that rely on both formal processes and informal networks. This often involves feedback loops where science is used to inform policy, continuously monitor policy impact and effectiveness, and provide greater understanding and insight if the impact is not as expected. Development of a specific policy may utilise evidence from a number of scientific, technical and social disciplines, and these needs may be different at different stages of the policy cycle. Generally scientists are not directly involved in the policy decisions rather in the provision of sound scientific information and in a validation role.

As discussed above, policy makers need to have (or have access to) appropriate understanding and analytical skills in order to be able to interpret and make use of scientific evidence to support their policy decisions. In line with its commitment to evidence-based policy making, the UK government has taken concerted action over the ten years or so to significantly increase the level of professional skills that its officials in these areas. It is acknowledged however that improvements are still needed, in particular there are major differences between UK government departments in the extent to which they have utilised science and therefore in their engagement with scientific institutions. The inherent skills of their staff in assessing and using scientific evidence also vary considerably. In addition, historically there has been a greater emphasis placed upon the supply of good scientific evidence to government departments rather than its subsequent interpretation. In the 2007 recommendations from a House of Commons review indicated that improved quality assurance was required so that the public can be confident that scientific and other evidence is being interpreted in the correct fashion.

There is a long tradition in Russia of policy makers accessing, commissioning and using science however the manner in which scientific evidence is more usually employed is to support a specific policy (confirmation) rather than as advice on alternative policy directions or strategies. The need for both independence and policy-relevance in scientific research is clearly recognised and the Federal Task Programme (FTP) serves to provide a strong link between scientific evidence with policy-making.

The FTP is an integrated policy document of the RF Government that is based on a consistent resource framework with a set timescale. An FTP offers a package of research-and-development, design, administrative, managerial and other measures and solutions for a designated task in the area of state policy, economic development, environmental protection, and social and cultural development of the country. FTPs stipulate certain aims, tasks and measures required to meet the established goals and are important instruments for realisation of the structured policy of the state in a particular sphere. The RF Government oversees implementation of the FTPs via Ministries of Economy and Finance. State clients-coordinators of the FTPs are Ministries, State Corporations, Federal Agencies and Russian Academy of Science.

The Russian Foundation for Basic Research (RFBR), established in 1992, was specifically developed with the aim of providing scientists with more and broader opportunities to identify independent research activity and apply for the earmarked funding for the required staff and facilities. The process of funding allocation is transparent with all information on tenders, bidding and funding being available in the public domain. This approach was intended to build a new type of relationship between Russian scientists and the State; a prerequisite for receipt of a grant is that the scientists undertaking the research agree to publish and disseminate their findings.

In the UK, there are also a number of initiatives that provide important links between science and policy makers, and ensure that sound research findings are widely available to policy makers and are effectively integrated into policy making. One approach is the establishment of cross-departmental units, where funding is provided by a core number of departments but the results are actively disseminated and available to all departments.

The Foresight Programme was designed to inform strategic planning for government policy and budgets, and comprises a series of major research programmes (undertaken over 2 years) focused on the UK's priority areas and aimed at producing robust and accessible evidence. It is intended to provide insight and information into the policy process at an early stage and thereby support the work of policy makers. In addition, the relatively short timescale of Foresight programmes recognises the need for timeliness in the provision of robust scientific evidence, and that the work of policy makers is often being driven by short term political objectives. Alongside the Foresight Programme, the Horizon Scanning Centre scans technological developments, innovative approaches and predictions of long term trends and thus provides an important means of ensuring that strategic decisions are informed by science and by an analysis of possible future scenarios. It also works to collate and 'translate' existing work from across Government, the private sector and elsewhere, and feed this directly into government decision-making and into cross-government priority-setting and strategy formulation.

Addressing increasingly complex issues will require the development of innovative policies that rely on the integration of evidence, analysis and 'thinking' from a wide range of sources, including multiple government departments. In the UK, the establishment of the cross-departmental Office of Climate Change (OCC) reflected the need for multi-disciplinary evidence, the importance of the exchange of information (science and policy related) between different departments, and the expectation that policy solutions in this area will be developed as part of an overall strategy.

Scientific evidence is available in many different forms, many of which will not be of direct value to policy makers. In Russia, scientific reports, publications and presentations appear to have only a limited impact on the course of state policy actions. This mostly resulted from the overly sophisticated scientific and technical language that is typically used for such reports and may hinder straightforward understanding of an issue under discussion or the urgency of a problem. As mentioned earlier, scientific outputs may also lack specific and concrete recommendations or actions addressed to policy makers. Our findings suggest that although scientists and policy makers often interact through joint participation in workshops and conferences, there is a tendency for research results to be presented in an academic manner, with only limited time scheduled for challenge and discussion. Policy relevant information is not readily visible and therefore potentially valuable evidence and solutions may be missed. Presenting research findings in the context of specific policy issues and questions, and importantly in an appropriate format and language, will increase their accessibility and relevance to policy makers.

In the UK, the preparation of clear and authoritative reports (either government commissioned or prepared by independent sources) plays a vital role in translating science and scientific advice into language that can be understood by policy makers and other non-scientists. The reports and supporting evidence prepared by those appointed to investigate, for example, the aftermath of national crises, (e.g. BSE and the Food and Mouth outbreak in 2001), policy impacts and major accidents have played a key role in making their findings and recommendations visible to a diverse audience including those in a position to bring about the necessary changes in practice and the general public.
Much of the work of inquiries and government committees is conducted in the public domain in the UK and is therefore widely accessible (e.g. through TV, radio and newspapers) and open to scrutiny and challenge. The common practice of issuing an open call for the advice and opinion and requesting the attendance of specific technical experts to provide evidence and answer questions represents an

effective method of linking policy makers (and those working on their behalf) with sound scientific and technical evidence. This questioning often involves a high degree of scrutiny and challenge.

The UK government has therefore established a number of different mechanisms through which to inform policy decisions, examine specific aspects of a policy in detail or assess the impact of particular policy measures. This includes a range of committees (referred to above; also see Section 3.3 below), and individual task forces operated for a defined timescale and focusing on a very specific issue. Although the remit of many of these bodies originates from government officials, the key participants define their precise role, aims and objectives in detail, and also have a mandate to call on other experts and organisations to provide evidence, opinion and advice. The government commitment to ensuring that policy is based on sound scientific evidence also led to improvements in internal structures and initiatives through which it aims to advance this principle, and facilitates and integrates the use of science by policy makers. A scientific advisory system has been established with the specific remit to support the use of scientific evidence, ensure the quality of the science being used, assist and enable departments to be 'intelligent customers' for science, explain science inside government, and engage with public opinion. Key initiatives include the Office of Government Science and the specific roles of Government Chief Scientific Advisor and Departmental Chief Scientific Advisors (now appointed by all departments) (see Appendix 2 for further details on these roles).

This section has concentrated on the methods (mechanisms) that are available to governments to access, filter, analyse and understand scientific findings and advice relevant to their major policy concerns and in their policy development work. However, the availability of these linkages does not necessarily ensure effective interaction and dialogue between policy makers in practice. Section 3.3 briefly examines the communication processes through which scientists and policy makers interact in their own countries, and also internationally.

3.3 Communication processes to facilitate interaction and dialogue between scientists and policy-makers

In both Russia and the UK, numerous routes have been identified through which there is interaction between scientists and policy-makers. In both counties, formal (pre-defined, open/on the record) or informal (essentially networking; *ad hoc* or facilitated through organised meetings) channels exist and are widely used.

Formal measures for dialogue between scientists and policy makers in the UK include:

- The Government Chief Scientific Advisor (GCSA) acts as a direct 'interpreter' of scientific information to the cabinet and the government.
- Departmental Chief Scientific Advisors (DCSA) (now appointed by all UK government departments) have a key role in integrating science into the work of their department and in ensuring that policy-makers are well informed and understand the science appropriate to their major policy issues.
- Formal publications of research programmes or studies are written and distributed to relevant government departments.
- As described above, the Select Committees system in the UK enables the establishment of a committee to investigate and inform aspects of public policies. They issue open calls for evidence but also have a mandate to request inputs from individual experts and learned organisations.
- Cross-departmental units and programmes now typically involve both scientists and policy-makers in the same project to deliver overall outcomes and recommendations to the GCSA, cabinet and DCSAs and departmental staff. For example, as mentioned above, the Office of Climate Change (OCC) was established and funded as a shared resource across all government departments with a remit to improve climate change policy and its delivery, by providing independent support and challenge to departments and to Ministers in all matters relevant to understanding and tackling climate change.

Related to the practical aspects of linking of science and policy, there are also numerous organisations in the UK that communicate and debate the outcomes of scientific research and publicly

(formally or informally) comment on the effectiveness (or otherwise) in which this guides policy decisions and implementation strategies.

Policy think tanks also provide highly effective means for communication between policy makers and scientists. Chatham House (the home of the Royal Institute for International Affairs) is one of the few places where policy makers and scientists may informally interact and discuss issues without these discussions being publicly available. Chatham House rules apply which mean that the individual viewpoints are not disclosed. The activities and programmes of the Royal Society and other learned organisations also provide informal opportunities for presentation of scientific and technical research results, for debate and challenge related to major policy issues and for the formulation and agreement on the delivery of authoritative advice in a specific area.

Overall, the UK has a clear strategic approach to ensuring that policy is underpinned by sound scientific evidence – its commitment to 'evidence based policy making' is emphasised in many of the Government documents. The analysis of science and policy in the UK demonstrates clearly that scientists fulfil additional roles to simply being the providers of information. Communication and interaction between scientists and policy-makers are an important part of the policy process, with the flow of information going in either direction, or both, depending on the situation.

In Russia, there is a similar mix of formal and informal means of interaction between scientists and policy makers. The formal means include:

- scientific and advisory councils/commissions/committees to the governmental bodies and high-level decision makers, including to the country's President;
- regular official reports and briefing notes prepared by scientists and submitted to the state representatives and bodies;
- formal briefing meetings where scientists are invited to speak on certain subject;
- joint forum events, such as seminars, workshops and conferences;
- attendance of events held by the Russian Academy of Sciences (e.g. annual meetings) by high level policy-makers;
- the so-called '*departmental*' or '*sectoral*' scientific and research institutes and centres, i.e. institutions that are affiliated to a particular Federal body or Ministry;
- direct contract works from the government;
- Federal Task Programmes (FTPs);
- large-scale research schemes and programmes supported by the state (e.g. *Fundamental Scientific Research Programme*);
- providing scientific input when drafting laws and developing norms and regulations;
- providing scientific input when developing the country's official position on the international arena;
- publications (e.g. academic journals, sector-specific journals and magazines)
- presentations, articles and interviews for the popular press and mass media, particularly through television.

The informal way of interaction involves inviting prominent and renowned scientists to meet a high level policy-maker for a discussion 'behind closed doors'. The scientist's opinion may subsequently be taken into account when developing certain course of policy actions.

3.4 Overarching Learning Points (focusing on Russia)

From the abovementioned formal linkages, it appears that it is the advisory boards and councils (e.g. *Science, Technology & Education Council to the RF President*, or *Scientific Council to the Maritime Board of the RF Government*), FTPs (e.g. *FTP "The World Ocean*), and direct contractual works commissioned by Federal bodies and governmental agencies (e.g. from *St. Petersburg's Municipal Water Agency*) that result in the most effective cooperation between scientists and policy-makers. The advisory boards and panels provide counsel on strategic policies of the state and the issues of national importance, develop recommendations for international scientific co-operation and carry out reviews of draft Federal legislation. Large-scale economic projects and initiatives are also subject to the scrutiny of the scientific advisory boards. The most notable example of a strategic economic

decision being made on the basis of scientific advice is the President's instruction to adjust the route of the East Siberia – Pacific oil pipeline in 2006.

The Federal Task Programme (FTP) (see Section 3.2) provides a practical instrument and defined budget for the RF Government to implement a package of research-and-development, design, administrative, managerial and other tasks, and to develop solutions for a specific issue in the area of state policy, economic development, environmental protection, and social and cultural development of the country. The RF Government oversees implementation of the FTPs via Ministries of Economy and Finance. State clients-coordinators of the FTPs are Ministries, State Corporations, Federal Agencies and Russian Academy of Science. Within FTPs, there is a significant level of interaction between the state client and the scientific institutions contracted to undertake the research.

Contracts for governmental works are assigned either directly to the departmental scientific and research institutes or to any other research institutions through bidding. In this form of the relationship the research subject will likely be determined by a client organisation, depending on the client's interests and priorities.

As discussed in Section 3.2, scientific outputs tend to lack focus on specific and concrete recommendations or actions of relevance to policy makers. The research subjects themselves are often predominantly theoretical and do not always include a practical / applied dimension. There has not been strong evidence of the fact that resolutions issued in the wake of workshops and scientific conferences promptly transfer into relevant policy actions, and this is due to formalised nature of the policy making process. The relationships between scientists and mass media remain very weak and so far this has impaired the ability of academia to influence the opinion of decision makers and general public by the means of media. Television is still considered one of the main factors that shape public attitude and thus can be effectively resorted in order to raise the public profile of science.

Since the beginning of the XXI century, the state funding of science has increased considerably and at present it represents significant improvement as compared to the amount of financial support that science was receiving in the 1990s, following the collapse of the Soviet Union. Fundamental scientific research has been recognised among the main priorities of the state, thus resulting in the allocation of 250 billion Roubles from the Government for the period of 2008-2012. However, salaries of the scientific staff reportedly remain rather low and scientific institutions sometimes still have difficulties in the purchase of expensive and sophisticated state-of-the-art equipment. In such conditions, scientists need to apply for grants that are available from foreign foundations.

The issue of climate change falls within the remit of several Ministries and Federal Agencies, ranging from the Ministry of Foreign Affairs to the Federal Service for Migration. The intricacy of such cross-coordination, the involvement of multiple stakeholders and as a consequence, various interests that each party pursues make it difficult to identify a sole governmental body responsible for taking the climate change initiative forward. Furthermore, there is no unanimity of scientific opinion on the actual causes and triggers of climate change. The hypothesis about modern climate change being a result of natural fluctuations is still supported by some representatives of academia and the anthropogenic nature of climate change is still debated and questioned. Alongside, potential economic benefits that the country may experience as a result of climate change (e.g. prolonged agricultural season, development of farming and cropping in the areas that previously were not amenable to agriculture, shortened heating season in the housing sector, development of new resort and tourist areas) also contribute to the variety of opinion on the subject, both among the scientists and policy makers. The availability of sizeable hydrocarbon reserves, which in turn underlie the country's economy, reduces the appeal of the concept of carbon-free production for businesses and decision makers. In addition, the considerable areas of natural forest justify the country's claim of being a major absorber of carbon, especially as compared with the European countries-polluters.

4 Conclusions

This work has provided a powerful insight into the historical and current linkages between science and policy in Russia and the UK. Analysis of the evidence gathered and the resulting learning points and conclusions have enabled the development of a number of recommendations that policy makers and scientists in both countries, and wider, may wish to consider in their work. Measures of particular interest are those that may assist in facilitating increased interaction between science and public policy making, and improving dialogue and collaboration between scientists and policy makers in and between both countries, and internationally. It is also important to consider that solutions to climate change issues are likely to need much more than science and technology can deliver alone – these will also require political commitment towards innovative policies and international collaboration.

An important finding regarding cooperation between the UK and Russia that was raised in the stakeholder interviews was the importance of recognising that although there are different approaches to many aspects of the funding and implementation of scientific research programmes (e.g. tendering timescales and processes), these are not and should not be seen as barriers to collaboration.

4.1 For policy makers

- **Foster and support the functions of national science academies, through policy statements and the allocation of an appropriate level of public budget, in order to ensure that this important link between science and policy makers is both maintained and further developed.**

The Russian Academy of Sciences and the Royal Society in the UK both play key and leading roles in encouraging and, importantly, facilitating interactions between scientists and policy makers in their respective countries, and internationally. The Russian Academy of Sciences has demonstrated considerable and continual leadership in initiating and fostering interactions and collaboration between the science academies of other countries, scientists and other experts, and in organising and supporting internationally important meetings that have brought together scientists and high-level policy makers.

- **Increase the demand amongst policy makers for evidence and solutions that will be delivered as a result of applied scientific research, including the provision of an appropriate level of earmarked funding; this would also help to raise the profile and practical value of research results for decision-makers and businesses**

To underpin the UK's evidence-based approach to policy making, associated professional training is provided for all government officials. This has made them better at defining their needs, analysing the data and other evidence and using this to support policy decisions, development and impact assessment. In addition, there are a number of UK government funded research programmes that are specifically designed to provide evidence that feeds directly into priority policy areas. In Russia, science has historically played an important role in policy making however, research results tend to be presented in academic formats that are not easily assimilated by policy makers. For policy relevant areas, additional effort could be made to adapt the outputs and target the content to the problems and needs to policy makers. Increasing the emphasis of tenders to encourage proposals with a high level of applied research would increase the perceived relevance and therefore value of the results for policy development.

- **Strengthen the ability of policy makers to ensure that they have the knowledge, tools and experience to appropriately consider scientific evidence in their policy making.**

Government officials rarely have sufficient skills to effectively understand and use the results of fundamental science. Two areas for improvement therefore exist. Firstly, as indicated above, the evidence itself needs to be in an appropriate format to ensure it can be utilised by policy makers – scientists need an awareness of how policy makers use science. Secondly, targeted professional training to provide adequate skills in recognising situations in which additional evidence would be

valuable, commissioning or access relevant information, filtering and analysing information and advice, and using this in the development of public policy. The requirement for mutual understanding amongst scientists and policy makers is illustrated in the following example:

> *The UKCIP08 findings will feature probability results for the first time. Policy makers typically want to extract defined probability out of scientific results (such as climate change) when these actually contain an element of uncertainty. Scientists have been unhappy assigning probability to their climate scenarios as this involves some subjectivity however, scientists need to share their understanding as to how their results can be best utilised. Policy makers also need to be aware of why scientists have concerns over an approach such as this and some scientific understanding of uncertainty.*

- **Strengthen scientific component in the structure of governmental bodies by bringing forward the role of scientific units and advisors, improving the status of scientists within government departments and ensuring that those officials with a science background have opportunities to be actively involved in the use of science in policy making**

The growing importance of science in all aspects of the work of governments and their departments, and an increased level of engagement with scientific institutions, requires structures and processes that enable the acquired knowledge and information to be effectively integrated into policy making. The UK Government's commitment to ensuring that policy is based on sound scientific evidence led directly to improvements in internal organisational structures, and the establishment of specific initiatives aimed at advancing this principle and actively facilitating the use of scientific evidence. The scientific advisory service within the UK Government has a remit to support the use, quality and 'intelligent' interaction with scientific evidence, and engagement with an increasingly well-informed public opinion. Within this, a specific responsibility of the Departmental Chief Scientific Advisors (CSAs) (appointed by all departments) is to promote and support the interests of scientists and engineers in their departments.

- **Broaden the practice of scientific expert reviews and joint scientific-public hearings on draft policies, laws and project decisions; this could also involve international experts in the provision of evidence and advice**

Processes exist in both countries through which opinion is sought from scientists, experts and other external sources during policy formulation and in the assessment of potential impacts. In Russia, historically science has tended to be funded to generate results to strengthen the case for a defined policy approach rather than informing decisions on which direction the policy should take. Eminent scientists are often invited for 'closed door' (off the record) discussions on policy issues and proposals. A system of policy making that is specifically designed to seek scientific evidence and to encourage and actively facilitate the involvement of expert / public opinion is likely to lead to the development of policies that are more robust and effective. Opening up alternative policy options to rigorous debate, test and challenge increases the level of confidence that the chosen policy approach and implementation will be widely accepted, and that the likelihood of positive outcomes will be maximised and unforeseen consequences minimised.

4.2 For scientists

- **Ensure that scientific reports, position papers and briefing notes submitted to the governmental bodies clearly outline the problem and provide greater focus on specific recommendations and actions of relevance to policy makers and their specific issues and policy decisions.**

Scientific evidence needs to be accessible to policy makers and their advisors (who may not necessarily have a background in the specific technical area). Subject matter that is complex and presented in an academic format is much more likely to be ignored or misinterpreted. Many government officials involved in policy decisions rarely have the time or inclination to read large documents and 'find' the relevant information. Where key points and messages are intended to inform

policy makers or present advice / recommendations, it is important that these are presented in a clear and succinct format and using non-technical language.

- **Maintain and, where necessary, strengthen the role of professional scientific / technical associations and similar bodies in providing scientific evidence to policy makers in order to enable a joint scientific opinion to be actively communicated to policy makers.**

A wide range of mechanisms and specific routes is utilised in both countries through which joint opinion can be authoritatively communicated to policy makers. However, improving the prominence of this approach may be beneficial in improving understanding of each others needs amongst policy makers and scientists in Russia.

- **Broaden the international exposure of scientific research undertaken in Russia by increasing the number of scientific papers prepared by Russian scientists that are published in foreign peer-reviewed journals**

This would contribute to increasing the level of engagement of Russian scientists in international discussion forums and therefore raise their awareness and knowledge of approaches and policies applied overseas. It is clear however that a potential barrier to achieving this is that these papers will need to be available in a language other than Russia (in the main this will be English), and the costs and time involved in the translation of complex scientific information.

- **Encourage a move away from workshops where the majority of the programme consists of formal presentations from scientists and other experts towards a format that actively encourages and facilitates discussion and debate from and amongst Russian scientists, and provides a platform for developing mutually agreed decisions / opinion**

The project team has attended a number of environment and climate change workshops held in Russia and found that, in the main, these are designed for the delegates present to 'receive' a series of presentations. There is often a very full agenda of slide presentations, with very little time included in the programme for questions to the speakers, or where an open discussion is scheduled. A key requirement of this more interactive style of workshop is the need for an experienced facilitator for sessions where there is an expectation of questions from the delegates or their active participation in a discussion around a particular question, issue or problem.

- **Improve the component of public relations in scientific and research institutions, including the approaches to interacting with mass media**

This recommendation is valid for the UK and Russian contexts in that the remit of scientific and technical institutions in both countries includes the public dissemination of scientific information and the promotion of public awareness and debate. Policy makers may wish to consider this route for raising awareness of policy issues and seeking opinion from a range of interested parties however, some institutions will want to maintain their 'distance' from government policy makers in order to provide independent advice and opinion.

4.3 General – for policy makers and scientists

- **Ensure that where appropriate workshops and conferences are held jointly with scientists and interested parties (including policy makers, businesses, etc) who will make use of the results of scientific research. The involvement of external experts and others able to challenge the findings, conclusions and application of specific aspects of science can be valuable in stimulating debate.**

This style of forum encourages the active discussion and exchange of opinions and can provide an important platform for developing decisions based on sound scientific evidence and mutual agreement (e.g. strategic policy direction; selection of policy measures from a range of options, applied research programme design to ensure that this delivers results that are valued by users, including policy

makers). This approach appears to be currently used to limited extent in Russia.

- **Increase the number of joint workshops for scientists and policy makers to engage in discussion and better understand the others position. Events frequently feature one policy maker talking to scientists or visa versa.**

Workshops are often designed to disseminate research results and other information to an audience, via a full programme of speakers and with only a small amount, if any, time allocated for questions and challenge from the participants. If scientists (providers of evidence) and policy makers (users of evidence) work in isolation, it is likely that scientists will have limited understanding of the strategic objectives and key issues to be addressed through policies. As a result, research programmes aimed at generating evidence in support of policy decisions may not match the needs of policy makers. Creating a forum for joint working and discussion provides an open and effective mechanism through which a common understanding of policy needs can be reached, where policy research programmes can be formulated and where results and recommendations can be presented and rigorously debated.

- **Develop national climate strategy for Russia and, based on this, establish a national climate research programme with adequate funding; related to this, establish a Public Council on Climate that will involve state representatives, scientific community, NGOs and political parties.**

In Russia, the issue of climate change falls within the remit of several Ministries and Federal Agencies. This leads to the involvement of multiple stakeholders and a complex intricacy of cross-departmental coordination that has to date made it difficult to identify a single governmental body responsible for taking forward the climate agenda and related initiatives. The UK Department of Energy and Climate Change (DECC) now has overall responsibility for coordination and development of the national climate strategy and leads the UK's participation in reaching an international agreement on climate change. This brings clarity in terms of the purpose, management oversight and value of related research programmes, and ensures that engagement initiatives (with a wide range of stakeholders) are open, well informed and effective in delivering expert advice and opinion.