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DETERMINING WHICH CHEMICALS MAY HAVE SIGNIFICANT IMPACTS ON BIODIVERSITY

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1. Introduction

1.1. The purpose of this paper is to introduce work underway to provide JNCC with a better strategic basis for its advice on when chemicals are causing significant impacts on biodiversity, or likely do to so in the future. The paper sets out the scope of the work, and the intention is to provide results of the work at the Committee's December meeting.

1.2 This information paper also discusses, in its last section, the status of knowledge about the environmental impacts of novel materials, and whether it is possible to participate in risk assessment and regulation to ensure potential biodiversity impacts are properly assessed.

2. Impact is minimised through risk based approval mechanisms

2.1 Thousands of kinds of chemicals are used daily for a very wide range of purposes. Many of these are released into the environment as the result of normal regulated use, or through failure to comply with regulations. The result is exposure of biodiversity, as a component of the environment, to potential diffuse or point source pollutants.

2.2 Pollutants have been responsible for very significant environmental impacts, (for example DDE, a degraded form of the insecticide DDT, was a significant factor in driving declines of several species of raptors in the USA and UK between the 1950s and 1970s). Driven by this history, there are now established regulatory processes that aim to minimise the risks posed by chemicals. They do this by running approval mechanisms dependent on risk assessment and incorporating the precautionary principle.

2.3 Protection of human and animal health are primary drivers for regulating chemicals, but pollution remains a major potential threat to biodiversity, and the regulations include (to varying degrees) an assessment of the risk to the environment. The regulatory arrangements are complex and operate at EU and member state levels, but, in essence, there are separate processes based around the uses of chemicals e.g. Plant Protection Products, Biocidal Products, Veterinary Medicines, Personal Care Products, Pharmaceuticals, and general (industrial) chemicals. In the cases where there are direct releases to the

environment (with the exception of veterinary medicines) Natural England, as the Committee's Lead Agency, provides advice as part of the risk assessment and approvals processes to the relevant competent authorities.

2.4 General chemicals are currently poorly regulated, with an estimated 30,000 chemicals in use that have not yet had any environmental risk assessment. This gap is being addressed by the EU 'Registration, Evaluation and Authorisation of Chemicals' (REACH) regulation that came into force in June this year. This will require manufactures to register their chemicals and carry out a risk assessment process including an environmental risk assessment. The UK competent authority for REACH is the Health and Safety Executive. However, this process will take until 2020 to complete.

3. The case for a supplementary 'biodiversity' risk assessment

3.1 Superficially, we could consider the regulatory processes in place sufficient to be protective of biodiversity where these processes include an environmental risk assessment. We are engaged and provide advice on the individual assessments and the processes for prioritisation.

3.2 There are several reasons, however, why chemicals may pass into use through the regulatory processes and still pose major risks to biodiversity such as population effects or disruptions to ecosystem functioning:

i. the testing carried out in support of risk assessments is based largely on short term exposure to a few test organisms under controlled laboratory conditions. Such testing may not detect long term effects of low doses or may not reflect the actual behaviour of the chemical in the environment and hence how the organisms would be exposed in the natural environment;

ii. regulatory testing is also usually carried out for each individual chemical separately. Although formulations (multi-actives) may be tested for pesticides, this is more usual in higher tier tests. However, even this does not account for the cocktails of chemicals that are found in environment;

iii. scientific knowledge of the properties of some chemicals and how they interact in the environment is still limited;

iv. the regulated use may not in practice prevent unwanted release of chemicals with a known significant impact into the environment;

v. un-regulated use is significant and either not recognised or the mechanisms to pick it up are not sufficient;

vi. environmental, human health and other benefits are balanced when considering regulation, so benefits for human safety may be considered against potential environmental impact, especially where no alternatives are available (as is done for flame retardants - reducing human mortality -vs- long term environmental impact);

vii. there will, for the next decade or so, be a very large number of general chemicals that have not been through an environmental risk assessment.

3.3 It is not possible for the biodiversity sector to take on the task of running more extensive risk assessments based on laboratory and other testing.

3.4 One approach is to maximise the use of biodiversity state monitoring e.g. animal, plant, population monitoring, to highlight adverse impacts to biodiversity, and then, through research, attribute impacts likely to be due to chemical pollution. This does need to occur, but has significant limitations. Firstly, impacts will become apparent after widespread pollution has occurred, and when it is likely to take a long time to reverse. Secondly, it may be very difficult to pick out chemical impacts, and isolate the chemicals involved for regulatory action.

3.5 However, our advice does need a framework that allows it to pick out where the most significant potential risks to biodiversity are likely to be, given the regulation in place. For this reason, work is underway to develop, from the experiences of the advice and horizon scanning undertaken so far, a framework for identifying likely chemical risks to biodiversity. It is envisaged that the framework will also assist in identifying data gaps.

4. Work to develop a supplementary chemical risk to biodiversity framework

4.1 Work is underway to produce a framework comprised of a series of steps to identify chemicals that may have a significant risk to biodiversity, or could do so in future, despite the risk assessments and mitigation delivered by key regulatory processes.

4.2 The idea is to assess, periodically, new knowledge delivered by research science, biodiversity state monitoring, and regulatory processes, to update data gaps and identify actions.

4.3 The concept is a framework that will work for all chemicals. As usage and pathways to the environment are included within the framework, it is envisaged that broad predictions of scale could be produced. A framework also allows flexibility, which is necessary as chemical characteristics, uses and protection goals (e.g. species, food chains, ecosystem functionality) are very different.

4.4 The outcome of the process is intended to be the identification of a set of chemicals where there may be a significant risk to biodiversity, to provide the starting point for further work and, ultimately, advice. The framework will also address the criteria needed to decide whether additional evidence is needed to support advice, and what type of evidence is needed (research or monitoring, and what kind of monitoring). For example, is the effect on biodiversity clear but we just need to prove the chemical is reaching the environment? Or, has research shown long term toxic effects for a widely-used regulated chemical, in which case is 'hindcasting' required - analysing historical tissues samples would show whether it has been building up in the food chain?

4.5 A key application of the framework is clearly through advice to the regulatory processes. Another application is to identify and set priorities for conservation-led research and monitoring, where it is clear that no existing process will deliver the required evidence.

4.6 JNCC through its surveillance programme funds, with CEH, Natural England, the Environment Agency and the Campaign for Responsible Rodenticide Use, a long-term archive of top-of-food-chain bird tissues, and a scheme to monitor chemicals in tissues, known as the 'Predatory Bird Monitoring Scheme'. The scheme currently monitors, every year, concentrations of a number of persistent chemicals in tissues. It has also been used to carry out one-off studies on chemicals in tissues by hindcasting. The tissue-bank is also available for other conservation or environmental protection research, though, as a finite resource, this is restricted to high value studies. JNCC also assists DEFRA in the management of the 'Cetacean Strandings Investigation Programme' which organises the analysis of tissues for a range of chemicals from stranded animals. A specific application of the framework will be to judge the priorities for the use of these and other schemes such as the Environment Agency's Otter Programme to provide evidence to support advice.

4.7 This framework is a novel piece of work for JNCC and is being developed initially with a subset of chemicals of concern. The aim is to provide Committee at its next meeting with an outline framework, and some results of initial chemical risk identification using the framework. It is hoped that this will be sufficient to allow the value of the approach to be judged before further development is undertaken.

5. The impacts of novel materials on the environment

5.1 Nanotechnology[i] and nanoscience are leading to wide application of these new forms of chemicals in the environment. For example, sunscreens are increasingly based around microfine particles, nanocomposites are being used in car bumpers and carbon fibre components, and titanium dioxide nanoparticles are used in self cleaning windows. Other advances are finding novel uses for chemicals, for example introducing rare metals into alloying processes.

5.2 The current state of understanding of the properties of these new technologies is in its early stages, and the research into toxicity and, particularly, environmental impacts is not mature. In essence, we are using the technologies without knowing the risks. It looks like the state of knowledge on how to predict the behaviour and test for impacts is not yet sufficient for the new technologies to follow the risk-based approval regulation processes used for other chemicals. It is also too early to determine whether biodiversity impacts need any special assessment processes.

5.3 The Royal Commission for Environmental Pollution is undertaking a study into the 'Environmental Effects of Novel Materials and their Applications'. The study hopes to report early in 2008. The study includes looking at:

i. toxicity and eco-toxicity issues;

ii. what the potential environmental impacts are, both positive and negative, along with possible ways of dealing with them:

iii. whether novel materials and applications are adequately regulated under existing environmental regulations.

5.4 It would seem sensible to use the outcome of the Commission's report to start thinking on how to integrate assessment the risk of novel materials to biodiversity into mainstream regulation.

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[i] *Nanoscience and nanotechnology involve studying and working with matter on an ultra-small scale. One nanometre is one-millionth of a millimetre. Nanotechnology describes many diverse technologies and tools, which don't always appear to have much in common.*

One thing that all nanotechnologies share is the tiny dimensions that they operate on. They exploit the fact that, at this scale, materials can behave very differently from when they are in larger form. Nanomaterials can be stronger or lighter, or conduct heat or electricity in a different way. They can even change colour; particles of gold can appear red, blue or gold, depending on their size

(Definition taken from Royal Society summary of nanotechnologies).