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To: Minister of Science and Innovation

Release of review of the New Zealand regulatory environment for manufactured nanomaterials

For action	Routine	26 June 2011

SUMMARY

As mentioned in your Weekly Report of 19 April 2011, a report commissioned by the Ministry of Research, Science and Technology on the regulatory environment for manufactured nanomaterials has been completed. MSI seeks to release the technical report to interested parties. This briefing includes our recommended communications approach.

As a commissioned report from consultants, the report does not represent a government position on the regulatory environment for manufactured nanomaterials.

On 22 June 2011, documents related to this report were subject to several OIA requests, including one to you.

RECOMMENDATIONS

I recommend that you:

a.	**Agree** that MSI will place the commissioned review of New Zealand's regulatory landscape for manufactured nanomaterials on its interim website.	Yes / No
b.		Yes / No
c.	**Note** that there is likely to be media interest in the report and that MSI has developed a recommended communications approach in collaboration with the relevant regulatory agencies, which will be discussed with your office.	Yes / No
d.	**Note** that there is the potential that aspects of the report are likely to be used by some non-governmental organisations to further criticise the regulation of nanomaterials.	Yes / No
e.	**Note** that MfE is currently exploring the issues and opportunities associated with the regulation of chemical and biological risks, and that this will include consideration of nanotechnologies.	Yes / No
f.	**Note** that individual regulatory agencies already have or are in the process of undertaking work to clarify regulatory requirements in relation to manufactured nanomaterials.	Yes / No
g.	**Note** that individual Ministers may need to respond to specific regulatory issues raised by the report.	Yes / No

h.	**Agree** to refer this briefing to the Ministers for the Environment, Health, Food Safety, Labour, Consumer Affairs and Customs.	Yes / No

MINISTER'S COMMENT

Wayne Mapp
Minister of Science and Innovation

Date: 12/ 7 /2011

CONTACTS

AUTHOR	
PRIMARY CONTACT	
OTHER DEPARTMENTS OR AGENCIES CONSULTED	Ministry for the Environment, Ministry of Health, Ministry of Agriculture & Forestry, Ministry of Consumer Affairs, Department of Labour, New Zealand Customs Service, Environmental Risk Management Authority of New Zealand, Food Standards Australia New Zealand

ANNEXES

Annex One: Main findings of the Review
Annex Two: Copy of "A Review of the Adequacy of New Zealand's Regulatory Systems to Manage the Possible Impacts of Manufactured Nanomaterials"
Annex Three: Recommended communications approach

Release of review of the New Zealand regulatory environment for manufactured nanomaterials

KEY DECISION REQUIRED OF YOU

1. MSI seeks your approval to make a technical consultant's report called "A Review of the Adequacy of New Zealand's Regulatory Systems to Manage the Possible Impacts of Manufactured Nanomaterials" available to interested parties.

EXECUTIVE SUMMARY

2. In 2010, the then Ministry of Research, Science & Technology (MoRST), after consultation with other agencies, commissioned a technical consultants' review of the suitability of existing New Zealand regulations to appropriately manage manufactured nanomaterials. This followed a 2009 workshop on nanotechnology and similar reviews overseas.

3. The review was undertaken by the New Zealand Law Foundation Centre for Law and Policy in Emerging Technologies at the University of Otago.

4. The review provides an external assessment of New Zealand's relevant regulatory frameworks and practices. It identifies where, in the opinion of the authors, improvements could be made. It does not provide legal advice, recommendations or bind agencies to make changes. While generally helpful in identifying some regulatory issues, government agencies do not necessarily agree with everything in the report.

5.

6. When the review was commissioned there was an expectation that the findings would be made publicly available to provide transparency and confidence in regulatory oversight. There is interest in the review from some media and non-governmental organisations.

7. Since some of the relevant government agencies have expressed concern about the report, an official release of it is not proposed. Instead, MSI proposes to place the final consultants' report on its interim website without endorsing it as an officially accepted view of the regulatory environment.

8. The main finding of the review is that overall existing regulatory instruments are generally adequate to manage potential risks associated with manufactured nanomaterials. However, the report identifies four main areas where the authors consider that regulatory oversight could be improved:

- Reducing uncertainty over when regulatory assessments should be triggered for manufactured nanomaterials;

- Enhancing regulation of medical devices in New Zealand. Developing medical devices that incorporate nanotechnologies is a particularly active area of research and development, but the authors' view is that regulatory oversight of medical devices in New Zealand is currently inadequate;

- Addressing the lack of specificity about the evidence required to demonstrate safety of manufactured nanomaterials; and

- Reducing uncertainty over what manufactured nanomaterials are already present in New Zealand.

9. All but the second point above are either being or can be addressed by operational actions rather than legislative change.

10. Some of the New Zealand regulatory agencies have already clarified requirements associated with manufactured nanomaterials, and are actively monitoring regulatory developments elsewhere.

11. The review has little new information for regulators, so there are no significant actions emerging from it. MfE is currently exploring issues and opportunities associated with the regulation of chemical and biological risks in New Zealand, and in this process will consider risks posed by nanomaterials.

12. Despite the overall positive findings of the review, it is possible that some non-governmental organisations could use parts of the report to criticise the regulatory environment in New Zealand. Because of this, a communications approach (Annex Three) has been developed across the relevant regulatory and policy agencies. We propose to discuss this with your office, and then develop a more detailed communications plan across agencies to ensure a consistent government response upon release of the report.

13. On Wednesday 22 June, a request under the Official Information Act was sent to your office by Stephanie Howard of the Sustainability Council of New Zealand. It asked you to provide any briefings sent to you as Minister of Research, Science and Technology/Science and Innovation since 2009 relating to nanotechnology.

14. The Environmental Risk Management Authority (ERMA NZ) and MfE have also received OIA requests related to the review from Stephanie Howard.

BACKGROUND

15. Materials and products produced by, or involving, nanotechnologies are becoming common. Hundreds of consumer products (worldwide) are estimated to contain manufactured nanoscale materials[1]. The types of products and applications involving nanomaterials or nanotechnologies that are available now or in the pipeline include paints, plastics, packaging, cosmetics, clothing, sporting equipment, auto parts, electronic and medical devices. Specific examples include nano-sized zinc oxides and titanium dioxides used in sunscreens, nano-scale silver particles used as anti-microbial agents in

[1] A list of products can be found at http://www.nanotechproject.org/inventories/consumer/

clothing, and carbon nanotubes, which are starting to be used in a range of electronic and other consumer goods.

16. The presence of nanomaterials in the environment is not new. Naturally occurring materials (such as components of volcanic ash, foods) occur in the nano-scale. Similarly, components of by-products of every day living (such as car exhaust fumes and emissions from industrial processes) can be at the nano-scale. The same nanomaterial produced naturally or through intentional design is not expected to differ in terms of safety.

17. Several organisations (nationally and internationally) are voicing concern over the potential hazards of some manufactured nanomaterials, and are critical of the adequacy of current regulatory oversight. This is because at the nano-scale materials can have quite different properties than the same substance at larger scales, so their risk profile may differ from more conventional forms of the substance. For instance, while conventional gold is considered inert, gold at the nano-scale can have reactive capabilities. The Sustainability Council of New Zealand has been the most active local critic of New Zealand's regulatory regime so far.

18. Not all nanomaterials are considered harmful or have risks different from more traditional forms of the chemical. However, there is often insufficient information on the potential risks of many manufactured nanomaterials. International research is helping address some knowledge gaps, but the diversity of manufactured materials being produced means that significant uncertainties will remain for some time. The OECD and other organisations are moving to help develop procedures and standards to inform risk assessments of manufactured nanomaterials. New Zealand, through one of ERMA NZ's staff, is a member of the OECD's Working Party on Manufactured Nanomaterials.

19. One outcome from a nanotechnology workshop hosted by (the former) MoRST, MfE and the MacDiarmid Institute in April 2008 was interest in having an independent assessment of the ability of New Zealand's regulations to effectively manage risks associated with nanomaterials. Internationally, increasing attention is being paid to the regulation of nanotechnologies. MoRST therefore commissioned, in consultation with other agencies, a review of New Zealand's regulatory framework for manufactured nanomaterials (henceforth called "the Review"). Similar reports have been undertaken elsewhere and published.

20. The Review was similar to the one undertaken in Australia – *A review of possible impacts of nanotechnology on Australia's regulatory framework*[2], now commonly referred to as the "Monash report".

21. The aims of the Review were to:

- Assess New Zealand's existing regulatory framework to determine whether potential risks of manufactured nanomaterials are covered by existing regulatory frameworks;
- Identify where manufactured nanomaterials may not be adequately covered by any existing regulatory framework; and
- Analyse whether the changes to the regulation of industrial nanomaterials proposed by the National Industrial Chemicals Notification and Assessment Scheme (NICNAS) in Australia are relevant to provisions under the HSNO Act.

[2] Available at http://www.innovation.gov.au/Industry/Nanotechnology/Documents/MonashReport2008.pdf

22. The Review was undertaken by the recently established New Zealand Law Foundation Centre for Law and Policy in Emerging Technologies at the University of Otago. Statutes considered to be the most directly relevant to managing risks associated with manufactured nanomaterials were identified by officials and the researchers undertaking the review. The researchers examined these statutes and interviewed staff from the relevant government agencies. In some cases legal scholars familiar with the particular piece of legislation were also interviewed.

23. The legislation examined and the agencies involved in administering them are listed in the following table.

Legislation	Relevant Agencies
Hazardous Substances and New Organisms Act (HSNO)	Environmental Risk Management Authority Ministry for the Environment
Waste Minimisation Act	Ministry for the Environment
Food Act (specifically the Food Code aspect of the Act)	Food Standards Australia New Zealand (FSANZ) New Zealand Food Safety Authority (now Ministry of Agriculture and Forestry)
Agricultural Compounds and Veterinary Medicines Act	New Zealand Food Safety Authority (now MAF)
Health and Safety in Employment Act	Department of Labour
Fair Trading Act	Ministry of Consumer Affairs
Consumer Guarantees Act	Ministry of Consumer Affairs
Imports and Exports (Restrictions) Act	Ministry of Economic Development
Customs and Excise Act	New Zealand Customs Service
Medicines Act	Medsafe

NANOTECHNOLOGY IN NEW ZEALAND

24. New Zealand investment in nanoscience and nanotechnologies is small compared to investments by other countries. MSI has invested in a number of nanotech research projects related to high value manufacturing industries, as well as research to advance the identification and assessment of risks associated with nanomaterials. Investment from Vote RS&T (now Vote S&I) into nanotechnology-related R&D totalled $20.7 million per annum as at September 2009/2010. However, investments where nanotech was the principal area of investigation represented only $5m of that total. Additional government investment comes through tertiary education; for example, funding for the MacDiarmid Institute for Advanced Materials and Nanotechnology.

25. Nanotechnology-related businesses are emerging in New Zealand. They include Izon (manufacturing nanoparticle analysers), Titanox (production of Titanium alloy powders for industrial uses), Revolution Fibres (creating nanofibres for a range of uses, such as

filtration systems and textiles) and PolyBatics (who produce protein-coated bioplastic particles).

REPORT FINDINGS

26. The Review represents the assessments and opinions of the authors. Feedback on drafts of the report was provided by the relevant agencies (identified in paragraph 20 above) to the authors. Government agencies do not agree with all of the statements or assessments in the Review. After the final report was accepted, some additional concerns about statements in it were brought to our attention. These are noted later in this briefing.

27. The main findings of the Review are generally consistent with those of the Monash Report (as well as other reviews of national regulatory systems). Overall, existing regulatory instruments are generally adequate to manage potential risks associated with manufactured nanomaterials. Limitations identified in existing regulatory instruments are not usually specific to manufactured nanomaterials but apply to other materials and products as well.

28. The main issues identified in the Review relate to:

- Clarifying when manufactured nanomaterials require regulatory oversight;
- Consideration of mandatory reporting on manufactured nanomaterials;
- Clarifying where labelling may be appropriate to inform the public; and
- Some cases where products that produce nanoparticles may not be adequately regulated.

29. The Review considers that the current regulatory oversight of medical devices in New Zealand is inadequate. These are likely to be an important area of application for nanotechnologies, but may not have the same level of regulatory scrutiny in New Zealand as other nanotechnology applications. However, on 20 June, the Prime Minister announced the intention of the Australian and New Zealand governments to proceed with establishment of the Australia New Zealand Therapeutic Products Agency (ANZTPA), a proposal which has been on hold for several years. It is envisaged that the ANZTPA will result in greater oversight of medical devices. Its establishment, which will involve a merger of Medsafe with the Australian Therapeutic Goods Administration, is expected to take up to five years.

30. The Review does identify areas where regulators could provide clarity or additional guidance with respect to manufactured nanomaterials (or more generally). These largely have been or can be addressed through operational actions rather than legislative change.

31. Particular attention in the Review is paid to the HSNO Act and the Environmental Risk Management Authority, which have a lead role in assessing many of the manufactured nanomaterials. Attention is also paid to the Food Code (part of the Food Act) and Food Standards Australia New Zealand, since the use of manufactured nanomaterials in foods is potentially an area of significant public interest.

32. The Review found that the regulatory changes proposed by NICNAS in Australia are not relevant to New Zealand, since the regulatory systems differ. In particular, the

HSNO Act does not have a quantity threshold below which an approval is not required.

33. More details on the Review's findings are included in Annex One.

IMPLICATIONS OF THE REVIEW

34. Some readers of the Review may be concerned about actual or potential gaps in the regulatory system, and will expect to see steps taken to close or reduce these. They may also consider that regulatory agencies will not have enough information on potential risks of manufactured nanomaterials to enable them to be effective regulators.

Regulatory gaps

35. Some uses of the term 'gaps' in the Review may create confusion, since it can imply an omission or oversight in the regulatory framework when in fact there was a deliberate decision to limit the scope of the regulation. For example, environmental assessment of manufactured nanomaterials is not required by all of the regulatory agencies because of the recognition that ERMA NZ will undertake such assessments in certain circumstances.

36. The Review does recognise the distinction between deliberate restrictions in the scope of coverage by different pieces of legislation and unintentional regulatory omissions. However, this distinction may not be acknowledged by some commentators, who may draw the conclusion that the regulatory system is flawed when it comes to manufactured nanomaterials.

37. Development of a perception that regulatory oversight of manufactured nanomaterials in New Zealand is poor is likely to adversely affect public attitudes to nanotechnologies more generally. This may discourage use of manufactured nanomaterials and other applications for economic, social and/or environmental benefits.

Regulatory uncertainty

38. The Review notes ongoing uncertainty about potential hazards of some manufactured nanomaterials. As with most regulated items in New Zealand, much of the research to reduce uncertainty is undertaken in other countries, so New Zealand regulators are often dependent on research elsewhere to inform their decision-making.

39. International efforts (for example, in the OECD) are working toward providing guidance on procedures for testing and assessing the hazard of manufactured nanomaterials, and providing more information on certain types of nanomaterials to assist in assessing risk and regulatory oversight. In the absence of such guidance there can be concerns that there is poor regulatory governance. This issue is common to regulators across the world, and the OECD work is evidence of the level of cooperation underway.

40. Non-governmental organisations in other countries have previously called for bans or prohibitions on the import or manufacture of nanomaterials or products containing them because of uncertainties over risks. New Zealand groups may also do so following the release of the report.

Labelling

41. Labelling of products containing manufactured nanomaterials is likely to be an area of considerable interest to the media and public, with calls for greater labelling of such products. The Review proposes labelling for consumer information purposes (i.e. not for safety). The Review notes that meaningful information would need to be provided on labels, and that the associated costs of doing so also need to be considered.

OFFICIALS' RESPONSE TO THE REVIEW

42. The relevant agencies (listed in paragraph 20 above) consider that the Review provides some useful independent assessment of New Zealand's regulatory environment and has not identified any unexpected issues. While regulators do not agree with all of the opinions, statements or conclusions made in the report, they do note that the report will be used to inform any future regulatory changes.

43.

44. MSI and other agencies associated with the Review do not agree that the Review is seriously flawed. However, they recognise that MfE, ERMA NZ and the Environmental Protection Authority (EPA) may be the agencies that will have to deal with the majority of any critical responses to the Review.

45. It is the view of officials that the Review does not provide any substantially new information about limitations in the existing regulatory frameworks.

46. Despite its limitations, officials believe that the Review should be made publicly available. A range of organisations are already aware of the Review and may choose to use the Official Information Act to obtain it if it is not published. As mentioned above, there have already been OIA requests related to the report.

47. There are three options in relation to making the Review available:

- Release following approval by Cabinet; or
- Targeted release upon receiving your approval to release; or
- Placing the review on the MSI website with no official release, and noting that it has not been endorsed by government.

48. The third option is preferred by MSI.

49. Discussing the Review at Cabinet is not preferred since the Review does not establish a government position on the regulation of nanotechnologies. Sharing this briefing with the relevant Ministers is an alternative way to identify risks and develop appropriate responses to them.

50. Targeted release of the Review was considered but rejected because it could be seen as official endorsement or acceptance of all the views contained in the report.

51. Placing the report on MSI's website without a formal release is seen as making the report available without the government endorsing it or requiring a formal response to it. The Review can be considered as a technical report.

52. A coordinated communications approach from all of the relevant government agencies has been prepared to ensure whole of government responses to any issues arising following the release (Annex Three).

53. MfE is currently undertaking an exploration of issues and opportunities associated with regulation of chemical and biological risks. The Review will be considered as part of their exploratory work.

54. New Zealand regulators are connected to some of the international discussions aimed at improving knowledge about hazards and management of risks from manufactured nanomaterials. For example, ERMA NZ has a representative involved in the OECD Working Party on the Manufactured Nanomaterials.

55. Individual regulatory agencies will continue to monitor local and international developments in nanotechnologies and regulatory assessments of manufactured nanomaterials and update their regulatory requirements and processes.

ACTIONS ARISING FROM THE REPORT

56. Since the Review provides no substantial new findings there are no significant actions arising from release of the Review.

ACTIONS FOR MSI

57. MSI does not have any regulatory responsibilities associated with nanotechnologies. Consequently, there are no direct regulatory actions for MSI.

58. FRST and MoRST have previously been involved in facilitating discussions on the implications of nanotechnologies, and continued involvement by MSI in such activities is desirable to inform investment and policy decisions.

59. Scientific capabilities relevant to identifying, assessing and managing risks associated with nanomaterials are important to underpin New Zealand's regulatory system and workplace health and safety practices. Manufactured nanomaterials could play an important role in some of the high value manufacturing industries that may develop. MSI therefore considers it important that New Zealand's regulatory system is robust, does not impose unnecessary requirements on affected parties, and is supported by relevant research.

60. MSI's investments in research are undertaken under current appropriate regulatory controls. Furthermore, our Request for Proposals for nanotech investments have recently required researchers to provide a plan for how they will deal with the safety aspects of nanotechnology. Nonetheless, it is possible that MSI could face some criticism of its investment in nanotech research.

COMMUNICATIONS APPROACH

61. Before the Review is made publicly available officials in MSI will discuss communications issues with your office and coordinate communications across the other relevant agencies to ensure consistency of responses (see Annex Three).

MEDIA IMPLICATIONS

62. Interest in the report has already been expressed by some media organisations (television and print), as well as some non governmental organisations (NGOs). The release of the report is likely to result in some NGOs repeating their concerns about the potential hazards of nanotechnologies and the need for improved regulatory oversight. This is likely to receive media coverage.

ANNEX ONE – MAIN FINDINGS OF THE REVIEW

1. The main findings from the review are summarised below.

Triggers for Regulatory Assessment

2. The Review notes the potential for some novel manufactured nanomaterials to miss regulatory scrutiny if there is a failure to recognise that they have properties distinct from existing larger-scale compositions of the same substance. This is consistent with a key finding in the Monash Report. The report notes that regulators could consider clarifying the level of proof they require to trigger regulatory assessment.

3. A challenge for regulatory assessments of manufactured nanomaterials internationally is the lack of information on potential toxicity or other adverse effects that specific manufactured nanomaterials may generate. This is not just an issue for manufactured nanomaterials, but is applicable to many new products or materials.

4. However, the diversity of manufactured nanomaterials being produced and the new characteristics that they may have can make risk assessments of many manufactured nanomaterials difficult.

Mandatory Reporting

5. The Review notes the interest that some organisations and members of the public have in information about what products containing nanomaterials are present in the country. While a range of consumer products appear to contain manufactured nanomaterials, it is often difficult to identify which specific ones have these materials. Such information can also help regulators better understand the types of nanomaterials present and nature of their use.

6. Voluntary reporting schemes, both here and elsewhere, for firms to alert regulators to the presence of manufactured nanomaterials have generally been ineffective in identifying the full range of nanomaterials in products. Several regulators elsewhere are consequently moving to mandatory reporting.

7. ERMA NZ has previously issued mandatory notification requirements to importers and manufacturers to collect information on the types of manufactured nanomaterials being used in cosmetics. This has elicited some information from manufacturers and importers of cosmetics, but it is difficult to assess how complete a picture this provides.

Labelling

8. The Review notes that, in some situations, labelling to inform consumers of the presence of manufactured nanomaterials may be appropriate so that they can choose whether they purchase such products.

Regulation of manufactured articles that produce nanoparticles

9. One area that the Review identifies as potentially requiring further attention is where a product does not contain manufactured nanomaterials but produces nanoparticles as part of its operation. For example, washing machines that generate nano-sized silver particles for enhanced anti-microbial activity. As a manufactured item washing

machines are not subject to the HSNO Act as they do not contain manufactured nanomaterials until they operate.

10. The Review notes that an existing provision in the HSNO Act may enable manufactured goods to be considered by ERMA NZ, but the report authors did not undertake a detailed evaluation to assess the feasibility or desirability of this.

ANNEX THREE – RECOMMENDED COMMUNICATIONS APPROACH

Overview on communications

The report *A Review of the Adequacy of New Zealand's Regulatory Systems to Manage the Possible Impacts of Manufactured Nanomaterials* contends that there are a number of 'potential regulatory gaps' related to manufactured nanomaterials, but that overall the regulatory framework does not require substantial change to manage manufactured nanomaterials.

However, this identification of potential gaps is likely to increase attention on and concerns about nanomaterials and nanotechnology in New Zealand. It may also call into question the effectiveness of the government agencies charged with regulatory protections.

There is likely to be high interest in the findings of the Review from groups concerned about the possible risks of manufactured nanomaterials, from scientists involved in nanomaterials research, industry sectors that use nanomaterials in their products (e.g. cosmetics, health and food), media and members of the public.

Though the report's brief was to focus on the adequacy of regulatory systems, the analysis is framed in such a way as to potentially lead to a debate on the effectiveness of the regulatory agencies. It is likely that it will also lead to wider debate about the safety of nanomaterials and nanotechnology in general.

Therefore communications will need to be prepared to respond to broader issues than those related to regulations. The debate around the review's findings can be expected to begin soon after it is released, as advocacy organisations such as the Sustainability Council of New Zealand can be expected to publically comment on it.

The Ministry of Science and Innovation has worked with other government agencies associated with the review to prepare this recommended communications approach to the release of the report, and some key messages.

As the review was independent and some agencies feel that the report is substandard, it is recommended that the Government does not closely associate itself with the report. A low-key approach to the release of the report is recommended, with responses on a reactive rather than proactive basis. Responses will incorporate key messages.

This communications approach and key messages will be discussed with the office of the Minister of Science and Innovation, in consultation with other relevant Ministers.

Following this a cross-agency communications plan will be developed for the release of the Review, with all relevant agencies agreeing on who will be responsible for answering questions in which policy areas, to ensure consistency.

Agencies will develop key messages relevant to their areas.

Summary of approach

- Communications approach and key messages discussed with office of the Minister of Science and Innovation, in consultation with other affected Ministers, then a communications plan developed with other government agencies.
- A low-key, reactive approach, with review released on MSI website.
- MSI to lead and coordinate communications. Each government agency is responsible for answering questions relevant to its remit.

Key messages

General

- The report was commissioned by the former Ministry of Research, Science and Technology (a predecessor agency of the new Ministry of Science and Innovation), following a 2009 workshop on nanotechnology and similar reviews overseas.
- The report reviewed New Zealand's nanomaterials regulations to see if they provided adequate management of the potential risks. The review was not intended as an assessment of the safety of nanomaterials.
- The report has been commissioned from independent consultants and therefore does not represent a government position on the regulatory environment for manufactured nanomaterials.
- With any novel technology there are inherent uncertainties and unknowns. The Government is confident New Zealand's regulatory framework is capable of managing potential risks regarding manufactured nanomaterials.
- The report confirms issues that the government is already aware of, and does not identify or highlight any new concerns. New Zealand is taking a responsible approach to managing nanomaterials that is consistent with international standards.
- Further, some agencies feel the report is substandard, containing flaws such as bias, factual inaccuracies and incomplete consideration of relevant statutes.

Ministry of Science and Innovation

- The Government will continue to invest in nanomaterials research where appropriate, which will help us better understand the benefits and risks of nanomaterials and nanotechnology.