

Part 2B

Main Panel B criteria

Main Panel B covers the following sub-panels:

- 7 Earth Systems and Environmental Sciences
 - 8 Chemistry
 - 9 Physics
 - 10 Mathematical Sciences
 - 11 Computer Science and Informatics
 - 12 Aeronautical, Mechanical, Chemical and Manufacturing Engineering
 - 13 Electrical and Electronic Engineering, Metallurgy and Materials
 - 14 Civil and Construction Engineering
 - 15 General Engineering
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The following sections set out the criteria that Main Panel B and its sub-panels will apply in assessing submissions. These should be read alongside the guidance provided in REF 02.2011, 'Assessment framework and guidance on submissions' (hereafter 'guidance on submissions') and the generic statement of criteria and working methods provided in Part 1 of this document.

Section B1: Submissions and units of assessment

Section B2: Assessment criteria: outputs

Section B3: Assessment criteria: impact

Section B4: Assessment criteria: environment

Section B1: Submissions and units of assessment

Introduction

1. The nine sub-panels that fall within Main Panel B invite submissions in units of assessment (UOAs) 7-15 as set out in the following paragraphs.
2. The sub-panels encourage submitting units to use research groups to assist both with the description of submissions by HEIs in these UOAs, and with the assessment of submissions by the sub-panels.
 - a. Where research groups are used to structure the environment template (REF5) (see paragraph 91a), staff should be allocated to research groups through the staff details form (REF1a).
 - b. Where an individual is a member of a single research group, it will be assumed that all of that individual's research outputs are associated with that group. Where an individual is a member of more than one research group, individual research outputs may be allocated to the appropriate groups through the research outputs form (REF2).

Unit of assessment descriptors and boundaries

UOA 7: Earth Systems and Environmental Sciences

3. The UOA includes earth, environmental and planetary sciences, including: geophysics; geochemistry; palaeontology; geology; mineral physics; evolution of planetary atmospheres, surfaces and interiors; earth surface processes; the physics, chemistry and biology of the environment, including ecology and conservation; atmospheric, marine, freshwater, terrestrial and soil sciences; innovative measurement systems; global change; natural resources; natural hazards; pollution and environmental management.
4. The sub-panel expects submissions in this UOA from all areas of earth systems and environmental sciences, as defined above, and expects that the majority of the research activity submitted will have made a direct contribution to the UOA as characterised in the UOA descriptor. It recognises, however, the increasingly interdisciplinary nature of research, and expects that submissions may contain work that contributes to this UOA and other cognate disciplines. It is expected, however, that submissions will be made to the UOA where there is the most appropriate expertise to assess the body of work as a whole.

UOA 8: Chemistry

5. The UOA includes all areas of experimental and theoretical chemistry, including appropriate areas of pharmacy, chemical engineering and materials science, where the research is primarily concerned with chemical aspects rather than clinical or engineering.
6. The sub-panel expects submissions in this UOA from all areas of chemistry, as defined above, and expects that the majority of the research activity submitted will have made a direct contribution to the UOA as characterised in the UOA descriptor. It recognises and welcomes, however, the increasingly interdisciplinary nature of research, and expects that submissions may contain work that contributes to this UOA and other disciplines, including those which have boundaries with this UOA, such as UOA 5 (Biological Sciences), UOA 7 (Earth Systems and Environmental Sciences), UOA 9 (Physics), and other cognate disciplines.

UOA 9: Physics

7. The UOA includes all areas of physics encompassing, but not limited to, theoretical, computational and experimental studies of: quantum physics; atomic, molecular and optical physics; plasma physics; fusion and energy; particle physics; nuclear physics; surface and interface physics; condensed matter, materials and soft matter physics; biophysics; semiconductors, nanoscale physics, lasers, optoelectronics and photonics; magnetism, superconductivity and quantum fluids; fluid dynamics; statistical mechanics, chaotic and nonlinear systems; astronomy and astrophysics, planetary and atmospheric physics; cosmology and relativity; medical physics; applied physics; chemical physics; instrumentation; pedagogic research in physics.
8. The sub-panel expects submissions in this UOA from all areas of physics, as defined above, and expects that the majority of the research activity submitted will have made a direct contribution to the UOA as characterised in the UOA descriptor. It recognises and welcomes, however, the increasingly interdisciplinary nature of research, and expects that submissions may contain work that contributes to this UOA and other cognate disciplines.

UOA 10: Mathematical Sciences

9. The UOA includes pure and applied mathematics, statistics and operational research, including the development and application of these areas in the study of biological, physical and social sciences, commerce, engineering, finance, government, health, industry, information science, medicine and elsewhere.

10. It therefore includes: algebra; analysis; category theory; combinatorics; complexity theory; continuum mechanics and magnetohydrodynamics; differential equations; dynamical systems and ergodic theory; environmental, financial, geophysical and industrial mathematics; geometry; integrable systems; mathematical biology; mathematical logic; mathematical methods; mathematical aspects of operational research, including optimisation and stochastic modelling; mathematical physics; number theory; numerical analysis and scientific computing; operator theory and operator algebras; probability; statistical methodology and applications including biostatistics, data mining, environmental and social statistics, experimental design, mathematical statistics and statistical computing; topology. This list is necessarily incomplete, and any research in which the primary contribution is mathematical may be considered in this UOA, including experimental, theoretical or computational investigations related to mathematical or statistical models applied in other subject areas.

11. The sub-panel expects submissions in this UOA from all areas of mathematical sciences, as defined above, and expects that the majority of the research activity submitted will have made a direct contribution to the UOA as characterised in the UOA descriptor. The sub-panel welcomes the submission of interdisciplinary research that incorporates significant and innovative mathematical, statistical or operational research content, irrespective of the primary research focus of the medium in which the output is disseminated. It also expects to receive some outputs on the history of mathematical sciences when they incorporate significant mathematical or statistical insights. The sub-panel does not expect to receive outputs describing purely pedagogic research, and will cross-refer such outputs to Sub-panel 25 (Education) if received. Operational research that is focused on business and management should not normally be submitted in this UOA.

UOA 11: Computer Science and Informatics

12. The UOA includes the study of methods for acquiring, storing, processing, communicating and reasoning about information, and interactivity in natural and artificial systems, through the implementation, organisation and use of computer hardware, software and other resources. The subjects are characterised by the rigorous application of analysis, experimentation and design.

13. The sub-panel expects submissions in this UOA from all areas of computer science and informatics, as defined above, and expects that the majority of the research activity submitted will have made a direct

contribution to the UOA as characterised in the UOA descriptor. It recognises and welcomes, however, the increasingly interdisciplinary nature of research in this area, and expects that submissions may contain outputs that make contributions to computer science, informatics, and other disciplines.

UOA 12: Aeronautical, Mechanical, Chemical and Manufacturing Engineering

14. The UOA includes engineering research in aeronautical, mechanical, chemical and manufacturing engineering. Topics may include, but are not limited to: acoustics; aerodynamics; automotive engineering; avionics; biochemical and biomedical engineering; computational methods; control; dynamics; engineering design; engineering management; environmental and systems engineering; failure analysis; food process engineering; fluid power; fluid mechanics; fluidics; fuel technology and energy engineering; heat transfer; manufacturing technology, processes and systems; physical ergonomics; materials; material processing; maritime engineering; mechanics; mechatronics; naval architecture; product design; product and process engineering; solid mechanics; sustainable engineering; thermodynamics; turbo-machinery and propulsion; and vibration. It also includes pedagogic research in aeronautical, mechanical, chemical and manufacturing engineering.

15. The sub-panel expects submissions in this UOA from all areas of aeronautical, mechanical, chemical and manufacturing engineering, as defined above, and expects that the majority of the research activity submitted will have made a direct contribution to the UOA as characterised in the UOA descriptor. It recognises and welcomes, however, the increasingly interdisciplinary nature of research in this area, and expects that submissions may contain outputs that make contributions to aeronautical, mechanical, chemical and manufacturing engineering and other disciplines, including those which have boundaries with this UOA, such as UOA 13 (Electrical and Electronic Engineering, Metallurgy and Materials), UOA 14 (Civil and Construction Engineering) and UOA 15 (General Engineering).

UOA 13: Electrical and Electronic Engineering, Metallurgy and Materials

16. The UOA includes research carried out in all areas of electrical and electronic engineering, including but not limited to: communications; electronic materials and devices; microelectromechanical systems (MEMS) and nanoelectronics; bioelectronics; electronic systems and circuits; optoelectronics and optical communications

systems; communications and networks; multimedia; video and audio processing and coding; signal and image processing, modelling and estimation; radio frequency (RF) techniques up to terahertz; antennae and radar; measurement; instrumentation; sensors; control, robotics and systems engineering; electrical power systems, machines and drives; power electronics; computer and software engineering. It also includes research into both fundamental and applied aspects of the study of the structure, properties, manufacture, processing and applications (and their interrelationships) of all categories and forms of materials (such as metals, ceramics, polymers, composites, biomaterials, nanomaterials, natural materials and textiles). The UOA also includes pedagogic research into electrical and electronic engineering, metallurgy and materials.

17. The sub-panel expects submissions in this UOA from all areas of electrical and electronic engineering, metallurgy and materials, as defined above, and expects that the majority of the research activity submitted will have made a direct contribution to the UOA as characterised in the UOA descriptor. It recognises and welcomes, however, the increasingly interdisciplinary nature of research in this area, and expects that submissions may contain outputs that make contributions to electrical and electronic engineering, metallurgy and materials and other disciplines, including those which have boundaries with this UOA, such as UOA 8 (Chemistry), UOA 9 (Physics), UOA 11 (Computer Science and Informatics), UOA 12 (Aeronautical, Mechanical, Chemical and Manufacturing Engineering), UOA 14 (Civil and Construction Engineering), and UOA 15 (General Engineering).

UOA 14: Civil and Construction Engineering

18. The UOA includes research carried out in: construction; design; infrastructure; fluid mechanics; hydraulics and hydrology; computational mechanics and informatics; structures and materials; geomatics (including surveying); transportation; geotechnical and geo-environmental engineering; earthquake engineering; energy; environmental engineering (including air, water, waste and contamination); offshore and coastal engineering; extreme events; fire engineering and wind engineering; impact of and adaptability to climate change; sustainability; building physics; management, safety and risk assessment aspects of the above. It also includes pedagogic research in civil and construction engineering and the application of civil engineering principles to other disciplines (such as biomechanics).

19. The sub-panel expects submissions in this UOA from all areas of civil and construction engineering, as

defined above, and expects that the majority of the research activity submitted will have made a direct contribution to the UOA as characterised in the UOA descriptor. It recognises and welcomes, however, the increasingly interdisciplinary nature of research in this area, and expects that submissions may contain outputs that make contributions to civil and construction engineering and other disciplines, including those which have boundaries with this UOA, such as UOA 7 (Earth Systems and Environmental Sciences) and UOA 16 (Architecture, Built Environment and Planning).

UOA 15: General Engineering

20. The UOA includes multi-disciplinary and interdisciplinary engineering research in fields such as medical engineering, bioengineering, biomechanics, environmental engineering, sustainability engineering, offshore technology, renewable energy/energy conversion, spacecraft engineering, control systems engineering and industrial studies. The UOA also includes mineral and mining engineering and pedagogic research in engineering.

21. The sub-panel also welcomes submissions from single organisational units within institutions that include activities spanning two or more of the other three UOAs in the fields of engineering: UOA 12 (Aeronautical, Mechanical, Chemical and Manufacturing Engineering), UOA 13 (Electrical and Electronic Engineering, Metallurgy and Materials), and UOA 14 (Civil and Construction Engineering). However, for submissions of this nature, the sub-panel will cross-refer any outputs that they consider to be more expertly assessed by other sub-panels in the fields of engineering.

22. The sub-panel expects submissions in this UOA from all areas of general engineering, as defined above, and expects that the majority of the research activity submitted will have made a direct contribution to the UOA as characterised in the UOA descriptor. It recognises and welcomes, however, the increasingly interdisciplinary nature of research in this area, and expects that submissions may contain outputs that make contributions to general engineering and other disciplines, including those which have boundaries with this UOA, such as those UOAs within the remit of Main Panel B.

Interdisciplinary research and work on the boundaries between UOAs

23. The main panel recognises that the UOAs described above do not have firm or rigidly definable boundaries, and that aspects of research are naturally interdisciplinary or multi-disciplinary or span the boundaries between individual UOAs, whether within the main panel or across main panels.

24. The arrangements for assessing interdisciplinary research and submissions that span UOA boundaries – including through the appointment of assessors and, where necessary, cross-referring specific parts of submissions between sub-panels – are common across all main panels and are described in Part 1, paragraphs 92-100.

Pedagogic research

25. Research on pedagogy and educational issues within higher education that relate to the disciplines covered by Main Panel B may be submitted in the UOA to which it relates or in UOA 25 (Education), as deemed appropriate by submitting HEIs. Main Panel B will have at least two sub-panel members or assessors who will have expertise in pedagogy. Generally, such research will be assessed either by the sub-panel for the UOA in which it is submitted, or by one of the sub-panel members or assessors with expertise in pedagogy referred to above, who will work across several Main Panel B sub-panels. The only exception to these arrangements is for Sub-panel 10 (Mathematical Sciences), where pedagogic research relating to higher education will be cross-referred to Sub-panel 25 (Education).

26. Bodies of research into teaching in other education sectors or on general educational issues should be submitted in UOA 25. Individual outputs on these issues received by the sub-panels in Main Panel B will be cross-referred to Sub-panel 25 as appropriate.

Multiple submissions

27. 'Guidance on submissions' (paragraphs 50-52) sets out the arrangements whereby institutions may exceptionally, and only with prior permission from the REF manager, make more than one submission (multiple submissions) in the same UOA. These exceptions include situations where a sub-panel considers there is a case for multiple submissions in its UOA, given the nature of the disciplines covered.

28. Sub-panel 12 (Aeronautical, Mechanical, Chemical and Manufacturing Engineering) and Sub-panel 13 (Electrical and Electronic Engineering, Metallurgy and Materials) consider that there is a case, based on the nature of the disciplines covered by their UOAs, for multiple submissions in these UOAs. Such requests will be considered according to the procedures and criteria at paragraph 50d of 'guidance on submissions'. In addition, the normal expectation is that it will be difficult for convincing cases to be made for multiple submissions in these UOAs with a small number of staff, typically less than 10 Category A FTEs, in each requested submission.

29. Sub-panels 7, 8, 9, 10, 11, 14 and 15 do not consider that there is a case for multiple submissions in their UOAs, based on the nature of the disciplines covered, and do not expect to receive requests for multiple submission in these UOAs (other than for the reasons stated at sub-paragraphs 50a and 50c of 'guidance on submissions').

Section B2: Assessment criteria: outputs

Output types

30. The main panel welcomes all forms of research output that fulfil the eligibility criteria for the REF (set out in paragraphs 105-117 of 'guidance on submissions' and in Part 1, paragraphs 43-44 of this document.)

31. All forms of research output will be considered equitably in terms of the assessment, with no distinction being made between the types of output submitted nor whether the output has been made available electronically or in a physical form.

32. The main panel welcomes all forms of output submitted to its sub-panels, including:

- books, book chapters and research monographs
- conference papers and reports
- new materials, devices, products and processes
- patents
- published papers in peer-reviewed journals
- software, computer code and algorithms
- standards documents
- technical reports, including confidential reports.

33. These are provided as examples of outputs that might be specifically relevant to Main Panel B, but should not be regarded as an exhaustive list.

34. In relation to all forms of output, submitting HEIs should be mindful that the purpose of the assessment of research outputs is to assess the quality of original research reported. In particular, sub-panels will accept the submission of review articles only where they contain a significant component of unpublished research or new insight. Such outputs will be judged **only** on original research or new insights reported.

Outputs with significant material in common

35. As stated in 'guidance on submissions' (paragraph 108), where two or more research outputs listed against an individual in a submission include significant material in common, the sub-panels may decide to assess each output taking account of the common material only once, or judge that they should be treated as a single output if they do not contain sufficiently distinct material.

36. Where a submitted output includes significant material in common with an output published prior

to 1 January 2008, as stated in Part 1 paragraph 44, submissions should explain how far the earlier work was revised to incorporate new material (maximum of 100 words).

Co-authored/co-produced outputs⁵

37. Where a co-authored or co-produced output is submitted for assessment, it must be listed against an individual member of staff who made a substantial research contribution to the output. Information may be requested through an audit to verify this, and where it cannot be verified the output will be graded as 'unclassified'. Neither the order of authorship nor the number of authors will be considered important.

38. With the exception of the arrangements for the submission of a co-authored output twice in the same submission, detailed at paragraphs 41-43, and for Sub-panel 9 (Physics), detailed at paragraph 45, the sub-panels do not require the submission of textual information about individual co-authors' contributions to co-authored outputs and, if received, will take no account of such statements.

39. Once the sub-panel accepts that the author has made a substantial research contribution to the output, the sub-panel will assess the quality of the output taking no further regard of the submitted member of staff's individual contribution. The quality of each output will be judged on its merits independent of authorship arrangements.

Listing a co-authored output multiple times within the same submission

40. Where two or more co-authors of an output are returned in **different** submissions (whether from the same HEI or different HEIs), any or all co-author(s) that made a substantial research contribution to the output may list the same output.

41. The main panel considers that, given publication patterns in its disciplines, the fullest and most favourable impression of a submitted unit's research will normally be gained when each co-authored output is listed only once in a submission. However, the main panel recognises that there may be exceptional circumstances where there are substantial pieces of co-authored work reflecting collaborative research, that institutions wish to list against more than one member of staff returned within **the same** submission.

42. Therefore, where two members of staff in a single submission have made distinct and substantial research contributions to a co-authored output the main panel will, exceptionally, accept such an output

⁵ 'Co-produced' refers to outputs that are not in a written form.

listed against both members of staff. Such exceptional circumstances include cases where, because of the nature of the subject, a collaborating group or groups within a submitting unit produce few papers which are likely to be substantial in the publication period, and may therefore be unable to submit four different outputs for every member of the group.

43. The submission must clearly identify where a co-authored output has been listed against two members of staff returned within the same submission, and specific information should be provided about the distinct and substantial contribution to the research of each co-author against whom the output is listed (maximum 100 words). A single co-authored output may be listed against a maximum of two members of staff within a submission.

44. Once the sub-panel has determined that each co-author's contribution to the research content of the output is distinct and substantial, it will assess the quality of the output as a whole, taking no further regard of each individual co-author's contribution. If a sub-panel is not persuaded by the justification for listing the output twice, one occurrence of the output will be graded as 'unclassified'.

Additional requirement for information on co-authored outputs – Sub-panel 9 (Physics) only

45. In physics, large numbers of co-authors may contribute to research outputs, therefore for outputs with more than 10 co-authors submitted in UOA 9 (Physics) specific information is required about the author's contribution (maximum 100 words), to allow the sub-panel to assess the nature of that contribution to the output. Once the sub-panel has determined that the author's contribution is a significant contribution to the research content of the output, it will assess the quality of the output as a whole, taking no further regard of the individual author's contribution.

Outputs for which the panel considers that the author has not made a significant research contribution will be graded as 'unclassified'. HEIs should note that this information is not required for research outputs with 10 or fewer co-authors; if submitted, the sub-panel will take no account of such statements.

Double-weighted outputs

46. The sub-panels recognise that there may be some exceptional cases where the scale of academic investment in the research activity and the scope of the research is considerably greater than the disciplinary norm, thereby limiting the capacity of the individual researcher to produce four outputs within the assessment period. The sub-panels will consider requests for such outputs to be double-weighted in

the assessment; in other words for it to count as two outputs in both a submission and in the calculation of the outputs sub-profile.

47. The sub-panels anticipate that they will double-weight outputs only where they derive from substantial academic endeavour by the member of staff against whom the output is listed in the submission. Such endeavour might be understood in terms of (but is not limited to) the length of research time it took to produce or the ambition of the project. Considering the patterns of publication across Main Panel B's areas of activity, the sub-panels expect that such requests will occur only very exceptionally. In particular, the sub-panels anticipate that outputs published as journal articles and conference papers will not normally embody work of this nature, and they therefore do not normally expect to receive requests for double-weighting these types of outputs.

48. An HEI may request that an output is treated as double-weighted using a supporting statement to justify the claim (maximum 100 words). Sub-panels will assess the claim for double-weighting separately from assessing the quality of the output, and there is no presumption that double-weighted outputs will be assessed at the higher quality grades.

49. No more than two outputs listed against an individual may be requested for double-weighting. Requests for double-weighting may not be made for co-authored outputs that have been submitted twice in a single submission, as set out in paragraphs 41-43.

50. In requesting double-weighting of an output, HEIs must either reduce the number of outputs listed against that individual by one per double-weighting request, or identify one output as a reserve for each double-weighting request. Reserve outputs will be assessed only if the sub-panel does not accept the request for double-weighting. If no reserve output is included and the request for double-weighting is not accepted by a sub-panel, then the 'missing' output will be graded as 'unclassified'.

51. Sub-panels will double-weight an output only if a request is made by the submitting institution, and is accepted by the sub-panel. Sub-panels will not double-weight any output for which a request has not been made by the institution.

Additional information on outputs

Information about the research process and/or content

52. For non-text, or practice-based outputs (including patents, software and standards documents) all sub-panels require the submission of a description of the

research process and content, where this is not evident within the output (maximum 300 words).

53. For reviews, sub-panels welcome the identification of the original research or new insights reported, to assist with the assessment of research quality (maximum 300 words).

Factual information about significance

54. Sub-panels 7, 8, 9 and 10 consider that, within their disciplines, normally all the relevant information that the panel requires will be contained in the submitted outputs and the accompanying citation data, where the latter are provided by the REF system. They therefore do not wish to receive additional information in this category and, if received, will take no account of any statement in this category.

55. Sub-panels 11, 12, 13, 14 and 15 consider that the nature of their disciplines is such that the significance of an output may not be evident within the output itself. They therefore invite factual information to be provided (maximum 100 words) that could include, for example, additional evidence about how an output has gained recognition, led to further developments, or has been applied. They would welcome the inclusion of relevant and verifiable information for all outputs, wherever available.

56. HEIs are instructed to ensure that such evidence is succinct, verifiable, and externally referenced where appropriate. Where claims are made relating to the industrial significance of the output, the name and contact details of a senior industrialist must be given to allow verification of claims. Information provided should not comprise a synopsis of the output or a volunteered opinion as to the quality of the output, and information provided that is of this nature will be disregarded. It is expected that, in most cases, sufficient information will be provided in significantly fewer words than the 100 word limit.

57. Information provided must not include citation data. Any panels that make use of citation data will be provided with the data by the REF team, the only exception being Sub-panel 11 who will additionally make use of Google Scholar (as set out at paragraph 61). Sub-panels will take no account of any citation data provided directly by the HEI.

Other information

58. A summary of all the additional information about outputs required by Main Panel B is at Annex A. No other information should be included, and sub-panels will take no account of any such information if submitted.

Citation data

59. Sub-panels 7, 8, 9 and 11 acknowledge that citation data are widely used and consider that it is well understood in the disciplines covered in their UOAs. These sub-panels will make use of citation data, where available, as part of the indication of academic significance to inform their assessment of output quality.

60. Where available on the Scopus citation database, the REF team will provide citation counts for research outputs submitted in the UOAs identified in paragraph 59, at a pre-determined date and in a standard format. These sub-panels will also receive discipline-specific contextual information about citation rates for each year of the assessment period to inform, if appropriate, the interpretation of citation data.

61. In addition to the citation data provided by the REF team, Sub-panel 11 intends to make use of Google Scholar as a further source of citation information. Sub-panel 11 will access Google Scholar citation data in a systematic way, and these data will be used principally to identify where outputs have been cited extensively outside the body of publications indexed in Scopus⁶.

62. For the sub-panels identified in paragraph 59 citation data will inform the assessment as follows:

- a. Where available and appropriate, citation data will form part of the process of assessment, in relation to the academic significance of outputs. It will be used as one element to inform peer-review judgements made about output quality, and will not be used as a primary tool in the assessment.
- b. The absence of citation data for an output will not be taken to mean an absence of academic significance.
- c. Sub-panels will be mindful that for some forms of output (for example relating to applied research) and for recent outputs, citation data may be an unreliable indicator. Sub-panels will take due regard of the potential equalities implications of using citation data.
- d. Except for reference to Google Scholar by Sub-panel 11 (as set out at paragraph 61), the sub-panels will use citation data only where provided by the REF team. None of the sub-panels will refer to any additional sources of bibliometric analysis including journal impact factors.

63. Sub-panels 10, 12, 13, 14 and 15 recognise that the uneven and often sparse coverage of citation data in

⁶ This paragraph supplements paragraph 133 of 'guidance on submissions' which states that the REF team will procure and make available to panels a single source of citation data.

their disciplines would not provide fair and robust additional data to inform the assessment of output quality. They therefore will not receive nor make use of citation data or any other form of bibliometric analysis, including journal impact factors.

Criteria and level definitions

64. This section provides a descriptive account of how the sub-panels will interpret the generic criteria for assessing outputs – originality, significance and rigour – and will apply them at each of the starred quality levels. This descriptive account expands on and complements the generic criteria and definitions in Annex A of ‘guidance on submissions’, but does not replace them.

Interpretation of generic criteria

65. The criteria for assessing outputs will be interpreted as follows:

- **Originality** will be understood as the extent to which the output introduces a new way of thinking about a subject, or is distinctive or transformative compared with previous work in an academic field.
- **Significance** will be understood as the extent to which the work has exerted, or is likely to exert, an influence on an academic field or practical applications.
- **Rigour** will be understood as the extent to which the purpose of the work is clearly articulated, an appropriate methodology for the research area has been adopted, and compelling evidence presented to show that the purpose has been achieved.

66. Where appropriate to the output type, sub-panels may consider editorial and refereeing standards as part of the indication of rigour, but the absence of these standards will not be taken to mean an absence of rigour.

67. Some sub-panels will use citation information, where available, as part of the indication of academic significance to inform their assessment of output quality. These arrangements are discussed at paragraphs 59-63.

Interpretation of generic level definitions

68. In assessing outputs, the sub-panels will look for evidence of originality, significance and rigour and apply the generic definitions of the starred quality levels as follows:

a. In assessing work as being **four star** (quality that is world leading in terms of originality, significance and rigour), sub-panels will expect

to see evidence of, or potential for, some of the following types of characteristics:

- agenda-setting
 - research that is leading or at the forefront of the research area
 - great novelty in developing new thinking, new techniques or novel results
 - major influence on a research theme or field
 - developing new paradigms or fundamental new concepts for research
 - major changes in policy or practice
 - major influence on processes, production and management
 - major influence on user engagement.
- b. In assessing work as being **three star** (quality that is internationally excellent in terms of originality, significance and rigour but which falls short of the highest standards of excellence), sub-panels will expect to see evidence of, or potential for, some of the following types of characteristics:
- makes important contributions to the field at an international standard
 - contributes important knowledge, ideas and techniques which are likely to have a lasting influence, but are not necessarily leading to fundamental new concepts
 - significant changes to policies or practices
 - significant influence on processes, production and management
 - significant influence on user engagement.
- c. In assessing work as being **two star** (quality that is recognised internationally in terms of originality, significance and rigour), sub-panels will expect to see evidence of, or potential for, some of the following types of characteristics:
- provides useful knowledge and influences the field
 - involves incremental advances, which might include new knowledge which conforms with existing ideas and paradigms, or model calculations using established techniques or approaches
 - influence on policy or practice
 - influence on processes, production and management
 - influence on user engagement.

- d. In assessing work as being **one star** (quality that is recognised nationally in terms of originality, significance and rigour), sub-panels will expect to see evidence of, or potential for, some of the following types of characteristics:
- useful but unlikely to have more than a minor influence in the field
 - minor influence on policy or practice
 - minor influence on processes, production and management
 - minor influence on user engagement.
- e. Research will be graded as '**unclassified**' if it falls below the quality levels described above or does not meet the definition of research used for the REF.

Section B3: Assessment criteria: impact

Introduction

69. This section should be read alongside 'guidance on submissions' (in particular, Section 3, Annex A, Annex C and Annex G), which sets out the generic definition of impact for the REF, the requirements for submitting impact case studies and a completed impact template, the associated eligibility guidelines, and the generic assessment criteria and level definitions. The sub-panels will assess impact in accordance with this framework.

70. This section provides information which adds to and complements, but does not replace, 'guidance on submissions', with the intention of assisting institutions in developing their submissions for this new element of research assessment.

Range of impacts

71. The main panel welcomes case studies describing impacts that have provided benefits to one or more areas of culture, the economy, the environment⁷, health, public policy and services, quality of life, or society, whether locally, regionally, nationally or internationally.

72. A single body of research work may underpin impact which provides benefits in more than one area. An impact case study may therefore describe more than one type of impact arising from such bodies of work; for example, a new drug can generate both health and economic impact, and a new energy technology can generate both environmental and economic impact.

73. An indicative list of potential examples of impact is provided in Table B1. These are categorised according to the different domains that sub-panels expect to see in submitted case studies, with an indicative list of examples of impact for each type. In making use of this to assist with the preparation of submissions, HEIs should note that:

- a. The list of types and examples of impacts is not intended to be exhaustive, and some examples are relevant to more than one type of impact. Sub-panels wish to encourage HEIs to submit case studies describing any impacts that meet the generic definition in 'guidance on submissions' (Annex C).
- b. HEIs are **not** expected to align submitted case studies specifically with the particular types of impact defined in the list.

74. All types of impact will be considered equitably in terms of the assessment of the reach and significance achieved during the assessment period. The sub-panels expect institutions to submit their strongest case studies, regardless of the types of impact that they describe.

75. HEIs are reminded that impacts on research or the advancement of academic knowledge within the HE sector (whether in the UK or internationally) **are excluded**. Other impacts within the HE sector that meet the definition of impact for the REF, **are included** where they extend significantly beyond the submitting HEI. (See 'guidance on submissions', Annex C.) For example:

- a. The take-up by the HE sector of products arising from research such as open source software would be eligible as examples of impact **only** where there is some evidenced impact that goes beyond academic research or the advancement of knowledge **and** where the impact extends significantly beyond the submitting HEI.
- b. Impact on research outside the HE sector (such as in industrial laboratories) may be evidence of a link to an impact, but is unlikely to be a significant impact in itself.

76. The sub-panels will also welcome impacts that describe changes or benefits resulting from research that leads to a decision **not** to undertake a particular course of action. For example, the impact deriving from evidence that a particular building material should not be used.

⁷ References to 'environment' throughout Part 2, Section B3 of this document refer to both the natural and built environments, unless otherwise specified.

Table B1 Examples of impact

Economic impacts

Impacts where the beneficiaries may include businesses, either new or established, or other types of organisation which undertake activity that may create wealth

- The performance of an existing business has been improved through the introduction of new, or the improvement of existing, products, processes or services; the adoption of new, updated or enhanced technical standards and/or protocols; or the enhancement of strategy, operations or management practices.
- A spin-out or new business has been created, established its viability, or generated revenue or profits.
- A new business sector or activity has been created.
- A business or sector has adopted a new or significantly changed technology or process, including through acquisition and/or joint venture.
- Performance has been improved, or new or changed technologies or processes adopted, in companies or other organisations through highly skilled people having taken up specialist roles that draw on their research, or through the provision of consultancy or training that draws on their research.
- Potential future losses have been mitigated by improved methods of risk assessment and management in safety or security critical situations.

Impacts on public policy and services

Impacts where the beneficiaries may include government, non-governmental organisations (NGOs), charities and public sector organisations and society, either as a whole or groups of individuals in society

- A policy has been implemented (including those realised through changes to legislation) or the delivery of a public service has changed.
- (Sections of) the public have benefited from public service improvements.
- In delivering a public service, a new technology or process has been adopted or an existing technology or process improved.
- Policy debate has been stimulated or informed by research evidence.
- Policy decisions or changes to legislation, regulations or guidelines have been informed by research evidence.
- Changes to education or the school curriculum have been informed by research.
- Risks to the security of nation states have been reduced.
- The development of policies and services of benefit to the developing world has been informed by research.

Impacts on society, culture and creativity

Impacts where the beneficiaries may include individuals, groups of individuals, organisations or communities whose knowledge, behaviours, creative practices and other activity have been influenced

- Public discourse has been stimulated or informed by research.
- Public interest and engagement in science and engineering has been stimulated, including through the enhancement of science and engineering-related education in schools.
- The awareness, attitudes or understanding of (sections of) the public have been informed, and their ability to make informed decisions on issues improved, by engaging them with research.
- The work of an NGO, charitable or other organisation has been influenced by the research.
- Research has contributed to community regeneration.

Table B1 Examples of impact continued

Health impacts

Impacts where the beneficiaries may include individuals (including groups of individuals) whose health outcomes have been improved or whose quality of life has been enhanced (or potential harm mitigated) through the application of enhanced healthcare for individuals or public health activities

- A new drug, treatment or therapy, diagnostic or medical technology has been developed, trialled with patients, or adopted.
- Patient health outcomes have improved through, for example, the availability of new drug, treatment or therapy, diagnostic or medical technology, changes to patient care practices, or changes to clinical or healthcare guidelines.
- Public health and quality of life has been enhanced through, for example, enhanced public awareness of a health risk, enhanced disease prevention or, in developing countries, improved water quality or access to healthcare.
- Decisions by a health service or regulatory authority have been informed by research.
- The costs of treatment or healthcare have reduced.
- Quality of life in a developed or developing country has been improved by new products or processes.

Impacts on practitioners and professional services

Impacts where beneficiaries may include organisations or individuals involved in the development of and delivery of professional services

- Changes to professional standards, guidelines or training have been informed by research.
- Practitioners/professionals/lawyers have used research findings in the conduct of their work.
- The quality or efficiency or productivity of a professional service has improved.
- Professional bodies and learned societies have used research to define best practice.
- Practices have changed, or new or improved processes have been adopted, in companies or other organisations, through the provision of training or consultancy.
- Expert and legal work or forensic methods have been informed by research.

Impacts on the environment

Impacts where the key beneficiaries are the natural environment and/or the built environment, together with societies, individuals or groups of individuals who benefit as a result

- The environment has been improved through the introduction of new product(s), process(es) or service(s); the improvement of existing product(s), process(es) or services; or the enhancement of strategy, operations or management practices.
 - New methods, models, monitoring or techniques have been developed that have led to changes or benefits.
 - Policy debate on the environment, environmental policy decisions or planning decisions have been stimulated or informed by research and research evidence.
 - The management or conservation of natural resources, including energy, water and food, has been influenced or changed.
 - The management of an environmental risk or hazard has changed.
 - The operations of a business or public service have been changed to achieve environmental (green) objectives.
 - Direct intervention, based on research evidence, has led to reduction in carbon dioxide or other environmentally damaging emissions.
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Impacts arising from public engagement activity

77. Engaging the public with research is an activity that may lead to impact. Sub-panels will welcome case studies that include impact achieved in this way, either as the main impact described or as one facet of a wider range of impacts.

78. Public engagement is a very broad area, not all of which is underpinned by research. Case studies which include impacts that derive from engaging the public with research must:

- a. At least in part, be based on specific research or a body of research carried out in the submitted unit, and explain clearly which particular aspects of the research underpinned the engagement activity and contributed to the impact claimed.
- b. Include evidence of the reach of the impact. This should extend beyond simply providing the numbers of people engaged and may also, for example, include:
 - information about the types of audience
 - whether there was secondary reach, for example from follow-up activity or media coverage
 - other quantitative indicators such as evidence of sales, downloads of linked resources, and/or access to web content.
- c. Include evidence of the significance of the impact. This should include a description of the social, cultural or other significance of the research insights with which the public have engaged. Examples of the evidence that might be provided for this include:
 - evaluation data
 - user feedback or testimony
 - critical external reviews of the engagement activity
 - evidence of third party involvement, for example how collaborators have modified their practices, contributions (financial or in-kind) by third parties to enhance services or support for the public, or evidence of funds from third parties to enhance or extend the engagement activity
 - evidence of sustainability, through, for example, a sustained or ongoing engagement with a group, a significant increase in participation in events or programmes, continuing sales, downloads, or use of resources.

Case studies: evidence of impact

79. Each case study must provide a clear and coherent narrative that includes an account of who or what constituency, group, sector, organisation and so on, has benefited, been influenced, or acted upon. Evidence appropriate to the type(s) of impact described should be provided to support the claims made of the nature and extent of the impact, in terms of its reach and significance.

80. Evidence may take many different forms depending on type of impact(s) reported. Wherever possible, quantitative indicators should be included. Sources that could verify key evidence and indicators provided in the case study should be included in section 5 of the impact case study template.

81. The main panel recognises that some of the evidence in case studies may be of a confidential or sensitive nature. The arrangements for submitting and assessing case studies that include such material are set out in Part 1, paragraphs 58-59.

82. The examples in Table B2 provide a guide to potential types of evidence or indicators that may be most relevant to each of the types of impact described in Table B1. However, HEIs should note that:

- a. This is not intended to be exhaustive.
- b. Some indicators may be relevant to more than one type of impact.
- c. Sub-panels will consider any appropriate evidence that is verifiable.
- d. Sub-panels recognise the varying degrees to which evidence and indicator information may be available to HEIs.

Table B2 Examples of evidence and indicators of impact

Economic impacts	<ul style="list-style-type: none">• Business performance measures, for example, sales, turnover, profits or employment associated with new or improved products, processes or services.• Licences awarded and brought to market.• Jobs created or protected.• Investment funding raised from UK and/or non-UK agencies (venture capital/Business Angel, and so on) for start-up businesses and new activities of existing businesses.• Evidence of critical impact on particular projects, products and processes confirmed by independent authoritative evidence, which should be financial where possible.• Priority shifts in expenditure profiles or quantifiable reallocation of corporate, non-profit or public budgets.
Impacts on public policy and services	<ul style="list-style-type: none">• Documented evidence of policy debate (for example, in Parliament, the media, material produced by NGOs).• Documented evidence of changes to public policy/legislation/regulations/guidelines.• Measures of improved public services, including, where appropriate, quantitative information; such information may relate for example to the quality, accessibility or cost-effectiveness of public services.• Documented evidence of changes to international development policies.• Measures of improved international welfare or inclusion.
Impacts on society, culture and creativity	<ul style="list-style-type: none">• Visitor or audience numbers and feedback.• Critical reviews in the media and/or other professional publications.• Evidence of public debate in the media or other fora.• Evidence of sustained and ongoing engagement with a group.• Measures of increased attainment and/or measures of improved engagement with science in non-HE education.
Health impacts	<ul style="list-style-type: none">• Evidence from clinical trials.• Measures of improved patient outcomes, public health or health services.• Documented changes to clinical guidelines.• Evidence of take-up and use of new or improved products and processes that improve quality of life in developing countries.
Impacts on practitioners and professional services	<ul style="list-style-type: none">• Traceable reference to inclusion of research in national or international industry standards or authoritative guidance.• Traceable references by practitioners to research papers that describe their use and the impact of the research.• New or modified professional standards and codes of practice.• New or modified technical standards or protocols.• Documented changes in knowledge, capability or behaviours of individuals benefiting from training.

Table B2 Examples of evidence and indicators of impact continued

Impacts on the environment	<ul style="list-style-type: none">• Sales of new products or improvements in existing products that bring quantifiable environmental benefits.• Traceable impacts on particular projects or processes which bring environmental benefits.• Evidence of generic environmental impact across a sector, confirmed by independent authoritative evidence.• Documented case-specific improvements to environment-related issues.• Traceable reference to inclusion of research into government policy papers, legislation and industry guidance.• Traceable reference to impact of research in planning decision outcomes.• Policy documentation.
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Case studies: underpinning research

83. As described in the impact case study template (see the 'guidance on submissions', Annex G) HEIs should provide in section 3 up to six key references to research produced by the submitting unit in the period 1 January 1993 to 31 December 2013 that underpins the impact described in the case study. A case study will be eligible for assessment only if the sub-panel is satisfied that the underpinning research is predominantly of at least two star quality.

84. Case studies may reference any type of output that is the product of research. HEIs should identify up to three of these references that best indicate the quality of the underpinning research. Based on the information submitted, the sub-panels will use their expert judgement to determine in how much detail they need to review the underpinning research in order to be assured that the quality threshold has been met.

85. Provided the sub-panel is satisfied that the quality threshold has been met, the quality of the underpinning research will not be taken into consideration as part of the assessment of the reach and significance of the claimed impact.

86. Underpinning research referenced in a case study may also be included in a submission as an output (listed in REF2), without disadvantage. In these situations, the assessment of the impact case study will have no bearing on the assessment of the quality of the output. The assessment of the quality of the output may inform the assessment of the case study, only in terms of assuring the threshold for underpinning research quality.

Impact template

87. The requirement to submit an impact template is described in 'guidance on submissions' (paragraphs 149-155), and the generic template is at Annex B of this document. The sub-panels request the following information in each section a-d of the template. Where possible, relevant illustrative examples with traceable references should be given, rather than broad general statements. The information submitted under headings a and d will be considered as contextual information for the sub-panels in assessing the case studies, and will not be assessed in forming the impact sub-profiles.

a. **Context:**

- Describe the main non-academic user groups, beneficiaries or audiences for the unit's research.
- Describe the main types of impact specifically relevant to the unit's research, and how these relate to the range of research activity or research groups in the unit.

b. **Approach to impact:** Describe the unit's approach to its interaction with non-academic users, beneficiaries or audiences and to achieving impacts from its research, during the period 2008-2013. This could include details of, for example:

- How staff in the unit interacted with, engaged with or developed relationships with key users, beneficiaries or audiences to develop impact from the research carried out in the unit⁸.

⁸ Note that within the environment template, submissions should explain research collaborations with users, and how their relationships/interactions inform the development of the unit's research activity/strategy.

- Evidence of the nature of those relationships and interactions. This may include, for example, participation in schemes such as Research Council knowledge exchange schemes and industrial doctoral training centres, and interactions through training provided or consultancy undertaken, where these have led to beneficial relationships.
 - Evidence of follow-through from these activities to identify resulting impacts.
 - Evidence of an agile approach to opportunities.
 - How the unit specifically supported and enabled staff to achieve impact from their research, and ways in which they are rewarded or recognised for achieving impact.
 - How the unit made use of institutional facilities, expertise or resources in undertaking these activities.
 - Other mechanisms deployed by the unit to support and enable impact.
- c. **Strategy and plans:** Describe how the unit is developing its strategy for achieving impact, including its goals for supporting and enabling impact from its research in the future.
- d. **Relationship to the case studies:** The sub-panels do not expect that submitted case studies will necessarily have arisen out of the approaches to achieving impacts, as described in b above, for the period 2008 to 2013. However, where relevant, they would welcome details of, for example, how particular case studies exemplify aspects of the approach, or how particular case studies informed the development of the unit's approach.

Impact criteria

88. The sub-panels will assess impact according to the generic criteria and level definitions in 'guidance on submissions', Annex A, Table A3. The criteria will be understood as follows:

- **Reach** is the extent and breadth of the beneficiaries of the impact.
- **Significance** is the degree to which the impact has enabled, enriched, influenced, informed or changed the products, services, performance, practices, policies or understanding of commerce, industry or other organisations, governments, communities or individuals.

89. The sub-panels will make an overall judgement about the reach and significance of impacts, rather than assessing each criterion separately.

90. HEIs may submit case studies describing impacts at any stage of development or maturity. However, the assessment will be solely on the impact achieved during the assessment period, regardless of its stage of maturity. No account will be taken of anticipated or future potential impact, and therefore early stage or interim impacts might not score as highly as more mature impacts.

Section B4: Assessment criteria: environment

Environment template

91. The environment template (REF5) is at Annex C. Sub-panels request the following information in sections a-e of REF5:

- a. **Overview:** This will provide context for the sub-panel in assessing the submission, and will not be assessed.
 - Submitting units should describe how research is structured across the unit, including, where appropriate, what research groups or sub-units are covered by the submission. Given that there is no expectation that the environment element of submissions will relate to a single coherent organisational unit, groups may be organisational units such as departments or schools and/or research groups.
 - HEIs presenting staff in research groups should allocate staff to research groups in the staff details form (REF1a) of the submission. HEIs should note that staff may be allocated to more than one research group.
- b. **Research strategy:** Submitting units are invited to provide evidence of the achievement of strategic aims for research during the assessment period, as well as details of future strategic aims and goals for research; how these relate to the structure described above; and how they will be taken forward. This should include (but is not limited to):
 - vision, including strategic plans
 - an evaluation of the submitting unit's current position with reference to the research position described in RAE 2008.
- c. **People:**
 - i. **Staffing strategy and staff development:** Submitting units are invited to describe staffing strategy and staff development within the unit, including but not limited to:
 - evidence of how the staffing strategy relates to the unit's research strategy and physical infrastructure
 - evidence about career development support at all stages in research careers, including for research assistants, early career researchers and established academic staff
 - ii. **Research students:** Submitting units are invited to provide evidence of the quality of training and supervision of postgraduate research students, including but not limited to:
 - information on PGR recruitment such as approaches to recruitment, and any discipline-specific issues
 - information on training and support mechanisms
 - information on progress monitoring.
- d. **Income, infrastructure and facilities:** Submitting units are invited to provide evidence including (but not limited to):
 - information on provision and operation of specialist infrastructure and facilities
 - evidence of investments (both current and planned) in infrastructure and facilities
 - information on the research funding portfolio, including future plans
 - information on consultancies and professional services.
- e. **Collaboration and contribution to the discipline or research base:** Submitting units are invited to provide evidence and information relating to contributions to the wider research base, including work with other researchers outside the submitted unit, whether locally, nationally or internationally, and indicators of wider influence or contributions to the discipline or research base. This may include (but is not limited to):
 - information on support for and exemplars of research collaborations, including national
 - evidence about the implementation of the Concordat to Support the Career Development of Researchers
 - information on staff with personal research fellowships won in an open competition such as Royal Society University Research Fellowships
 - information on international staff appointments (incoming and outgoing), international recruitment and visiting scholars
 - evidence of how the submitting unit supports equalities and diversity.

or international research collaborations, with academic, industry and other bodies

- information on support for and exemplars of interdisciplinary research
- information on how research collaborations with research users, including industry users, have informed research activities and strategy
- exemplars of leadership in the academic community such as national or international advisory board membership; leadership roles in industry, commerce, Research Councils, learned societies or professional bodies; conference programme chairs; invited keynote lectures; election to membership or fellowship of learned societies; journal editorships; and fellowships, awards and prizes.

92. Requirements for additional quantitative data to be included in REF5 are described below (paragraphs 96 and 97).

Environment data

93. 'Guidance on submissions' (Part 3, Section 4) sets out quantitative data relating to the research environment to be included in submissions (REF4a/b/c). Sub-panels will use the data in the context of the information provided in the environment template (REF5), to inform their assessment. Data on research doctoral degrees awarded (REF4a) will be used to inform the sub-panels' assessment in relation to 'research students' (section c.ii). Data on research income (REF4b/c) will be used to inform the sub-panels' assessment in relation to 'income, infrastructure and facilities' (section d).

94. Sub-panels within Main Panel B do not require quantitative data provided by institutions in REF4a/b/c to be reported by research group.

95. Some sub-panels have identified additional quantitative indicators that are particularly relevant to the assessment of the vitality and sustainability of the research environment in their disciplines. These sub-panels therefore request the following additional data items to be provided as part of the narrative submitted within the environment template (REF5), under the section headings stated below.

96. **People: research students.** In chemistry, higher proportions of funder investment are committed to postgraduate doctoral training than in other physical sciences, and there is wide acknowledgment of the doctoral degree as the professional qualification in the discipline. Doctoral research student numbers are

therefore an especially strong indicator of research vitality in chemistry submissions. Sub-panel 8 therefore wishes to receive information on doctoral research student populations to supplement the data on doctoral degrees awarded, to provide a fuller picture of the development of the postgraduate research profile throughout the assessment period. For **Sub-panel 8 only**, the total FTE postgraduate research students enrolled on doctoral programmes, broken down into the academic years of the assessment period (from 1 August 2008 to 31 July 2013), should be provided. Only students registered and conducting their research programme should be included (not, for example, students who are writing up their thesis outside the normal registration period, or visiting from other institutions). This information should be included in tabular format as part of the 'People: research students' section of the REF5 template.

97. **Income, infrastructure and facilities.** For **Sub-panel 9 only**, data should be provided on usage within the assessment period (1 January 2008 to 31 July 2013) of major national and international facilities not supported by the Research Councils, which was awarded to an investigator in the submitted unit after competitive review by a panel of internationally recognised experts. The information should be provided for each facility in terms of the time awarded together with the total cost, if the latter is available.

Environment criteria

98. The sub-panels will assess the environment according to the generic criteria and level definitions in 'guidance on submissions', Annex A, Table A4. The criteria will be understood as follows:

- **Vitality** will be understood as the extent to which a unit provides an encouraging environment for research, has an effective strategy, is engaged with the national and international research and user communities, and is able to attract excellent postgraduate and postdoctoral researchers.
- **Sustainability** will be assessed by considering leadership, vision for the future and investment in people and infrastructure and, where appropriate for the subject area, the extent to which activity is supported by a portfolio of research funding.

99. In assessing the environment element of submissions, panels will apply the criteria in terms of both the research environment within the submitting unit, and its participation in and contribution to its subject discipline and academic community.

100. In considering each section of the environment template, sub-panels will take account of data reported in the template, as well as the data submitted in REF4a/b/c, as stated at paragraph 93. Sub-panels will attach the following weighting to the assessment of the components within the environment template, in forming the environment sub-profile:

a.	Overview	For information only
b.	Strategy	20%
c.	People (staffing strategy and staff development; and research students)	30%
d.	Income, infrastructure and facilities	30%
e.	Collaboration and contribution to the discipline or research base	20%