**INVITATION TO TENDER**

**Invitation to tender for the analysis of pathways to maximise emissions reduction in the agriculture and land use sectors beyond 2050, while taking account of the need to prepare for a changing climate. These will contribute to the ambition to achieve economy-wide net zero emissions beyond 2050.**

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# Part A

**Invitation to tender for the analysis of pathways to maximise emissions reduction in the agriculture and land use sectors beyond 2050, while taking account of the need to prepare for a changing climate. These will contribute to the ambition to achieve economy-wide net zero emissions beyond 2050.**

**INSTRUCTIONS FOR Submission of TENDERS**

1. The CCC project managers will be Indra Thillainathan and Kathryn Brown, lead analysts on mitigation and adaptation respectively.
2. Address: 7 Holbein Place, London, SW1W 8NR. Tel: 0207 591 6247 (Indra), 0207 591 6083 (Kathryn). Email: [Indra.Thillainathan@theccc.gsi.gov.uk](mailto:Indra.Thillainathan@theccc.gsi.gov.uk), Kathryn.Brown@theccc.gsi.gov.uk

Indra Thillainathan should be contacted with any queries on the content of the project.

Further information and clarification about the tendering process can be obtained from:

Sean Taylor, e-mail: [sean.taylor@theCCC.gsi.gov.uk](mailto:sean.taylor@theCCC.gsi.gov.uk) Tel 020 7591 6093.

1. Bidders are required to submit two copies of their bid via email to the [finance@theccc.gsi.gov.uk.](mailto:finance@theccc.gsi.gov.uk.) also copying in [sean.taylor@theCCC.gsi.gov.uk](mailto:sean.taylor@theCCC.gsi.gov.uk) One version should contain no pricing information. The other version must be costed and identified as **"PRICED"**. The email subject should read:

“**INVITATION TO TENDER for the ANALYSIS of PATHWAYS ON FUTURE UK LAND USE’’**

Bidders are also required to submit four copies of their bid. One of these must be costed and identified as **"PRICED"**. Bids should be submitted in a sealed envelope, marked as follows:

“**INVITATION TO TENDER for the ANALYSIS of PATHWAYS ON FUTURE UK LAND USE’’**

Envelopes should bear no external indication of the sender's identity. All bids should be addressed to:

Business Manager

Committee on Climate Change

7 Holbein Place

London

SW1W 8NR

**Bids should be sent in time in time for receipt by 10am on 21 November 2016.**

1. If required, interviews will take place in London on the **24th or 28th November**. If you are invited for interview, you will be notified of the address and time in the letter of invitation, sent out by email.
2. In practice, we welcome suggestions from consultants around what is feasible within the available timescales and budget (up to £100,000 including VAT).

# Part B

**Invitation to tender for the analysis of pathways to maximise emissions reduction in the agriculture and land use sectors beyond 2050, while taking account of the need to prepare for a changing climate. These will contribute to the ambition to achieve economy-wide net zero emissions beyond 2050.**

**SPECIFICATION**

1. **Preamble**

The Committee on Climate Change (CCC) is an independent, statutory body established under the 2008 Climate Change Act. The Adaptation Sub-Committee (ASC), which is part of the CCC, is also established under the Act to support the CCC in advising and reporting on progress on adaptation to climate change. The CCC and ASC are tasked with:

* Providing independent advice to Government on setting and meeting carbon budgets in line with the UK’s longer term target to reduce greenhouse gas (GHG) emissions by at least 80% by 2050 compared with 1990 levels, and preparing for the impacts of climate change. and
* Reporting to Parliament on progress made in reducing GHG emissions and preparing for climate change.

To do this the CCC and ASC conduct independent analysis into climate change science, economics and policy, and engage with a wide range of organisations and individuals to share evidence and analysis. The CCC and ASC’s past reports are available from <http://www.theccc.org.uk/publications/>.

1. **Background**

Land excluding built-up areas (referred to here as ‘non-developed land’, which include agricultural land, woodlands and semi-natural habitats) is an important and finite resource. It provides a wide range of sometimes competing goods and services such as food, water, wildlife habitats, carbon storage, flood attenuation and green spaces for recreational activities. Choices on how non-developed land is used have a significant influence on reducing GHGs emissions and preparing for the impacts of climate change. Therefore, the way that this land is managed and used is relevant to the CCC’s advice and analysis on both reducing GHGs (mitigation) and preparing for climate change (adaptation):

* Carbon budgets have been legislated for 5 five-year periods from 2008 to 2032, at levels recommended by the CCC. In setting carbon budgets, we have estimated the contribution in emissions reduction from the two land based sectors: agriculture and land use, land use change and forestry (LULUCF).
* The Adaptation Sub-Committee has assessed the level of preparedness to climate change in England across a range of uses and related services, including agriculture, forestry, biodiversity, and flooding and water management.

1. **The UK’s GHG reduction target and the Paris Agreement**

The UK statutory target requires GHG emissions to fall by at least 80% by 2050 on 1990 levels, consistent with a global emissions path aimed at keeping global average temperature to around 2°C above pre-industrial levels.

The Paris Agreement reached in December 2015 reinforced the target to limit warming to well below 2°C and introduced a more ambitious aim to pursue efforts to limit it to 1.5°C. To achieve this aim, the Agreement additionally sets a target for net zero global emissions in the second half of this century.

In a recent report[[1]](#footnote-1), the CCC considered the broader implications of the 2015 Paris Agreement on whether the UK should strengthen its long-term 2050 ambition. In considering the domestic actions that the UK Government should take as part of a fair contribution to the aims of the Agreement, we advised:

* A new UK emissions targets should not be set now, but that the setting of a target to reduce domestic emissions to net zero should be kept under review.
* To vigorously pursue the measures required to deliver on existing UK commitments and maintain flexibility to go further.
* Setting out a strategy for developing options to remove greenhouse gas emissions from the air that can be deployed at scale by 2050.

The UK contribution to this more ambitious goal is likely to involve reaching net zero emissions in the UK sometime beyond 2050 and could imply UK reductions of at least 90% below 1990 levels by 2050 and potentially more ambitious efforts over the timescale of existing carbon budgets.

We expect that the use and management of non-developed land will play a crucial role as part of a global and UK pathway to net zero emissions given its current uniqueness amongst all sectors to remove carbon dioxide from the atmosphere and the possibility of combining it with technologies such as carbon, capture and storage (CCS) to deliver negative emissions. Whilst the CCC has not explored emissions pathways for stronger ambition in the UK, it is likely that the contribution required from the UK agriculture and LULUCF sectors will need to increase significantly and may need to reach net negative in the second half of the century.

It is against this background that we want to explore further how the use and management of land and livestock could deliver longer-term deeper emissions cuts and increased GHG removals in the UK agriculture and LULUCF sectors by 2100. In considering different scenarios of land use and management practices that deliver increased ambition, we are also interested in how the choices made affect the resilience of affected sectors to future climate change. The aim is to identify land use scenarios that can achieve deeper emissions reductions, which may reach net negative, whilst also taking into account resilience.

1. **Context**
2. ***CCC’s land use advice to date***

How land is allocated, used and managed represents a complex set of interactions between a range of biophysical, market, policy, technological and institutional drivers, including the motivations of land managers. On the supply side, the biophysical properties of land (e.g. climate and soil type) - which are affected by climate change - play an important role in determining the supply of land and its suitability for particular uses. Furthermore, technological change can, by improving resource efficiency (of land and water for example) and yields enhance the potential supply and productivity of land. Simultaneously, on the demand side, land is required to provide a diverse range of goods and services for people and the wider natural environment. Some of these have a market value (e.g. food, timber), whilst others do not have a market price but still provide a value to society (e.g. biodiversity, soil quality, recreation services).

Work already undertaken by both the CCC and ASC has implications for the way land is used in the UK. On the mitigation side, our focus is on assessing cost-effective potential to reduce emissions in the agriculture and LULUCF sectors and to track progress to the long-term 2050 climate target. Ambition to the fifth budget period (2028-2032) in these sectors is relatively modest compared with other sectors, and more will need to be done longer term:

* Our most recent estimates[[2]](#footnote-2) suggest that changes in farming practices through a range of measures largely targeting nitrous oxide and methane, combined with an increase in afforestation rates could deliver annual savings of 11 MtCO2e by 2030 and a further 7.5 MtCO2e by 2050.
* Agriculture and land use emissions are projected to account for a larger share of UK emissions by 2032 as other sectors of the economy decarbonise at a faster rate. Therefore it is important that further options are explored to deliver deeper emissions reduction to contribute to the economy-wide cost-effective path to 2050 and the more stretching reductions needed to deliver the Paris ambition.
* Work is on-going to improve the GHG inventory, and an expected key change will be the inclusion of GHG emissions from peatlands from 2018. Latest Government estimates[[3]](#footnote-3) indicate annual UK peatland emissions of around 21 MtCO2e. Limiting damaging practices and wider restoration will be crucial for reducing peatland emissions.

On the adaptation side, the ASC has evaluated the level of preparedness to climate change impacts in England as set out in the National Adaptation Programme (2013). In its first report to Parliament in 2015, it found that vulnerability to climate change was not yet being effectively managed in a number of areas related to land use:

* Residual flood risk to properties.
* Fertility of agricultural soils.
* Ecological condition of the farmed countryside.
* Ecological condition of wetland habitats.
* Surface water flood management.

There were however positive trends in the management of vulnerability in other areas:

* Water demand in the built environment.
* Diversity of tree species planted.
* Ecological condition of coastal habitats.

The analysis that supports the ASC’s conclusions includes a number of indicators to measure trends in adaptation action and risk (both vulnerability and exposure) over time. These metrics can also be used as part of this project to describe resilience in the future scenarios created.

In July 2016, the ASC also published the second UK Climate Change Risk Assessment Evidence Report. This report provides the evidence base on risks and opportunities to the UK from climate change, including on sectors related to land use. The report provides an assessment of how urgent further action would be in the next five years across approximately sixty risks and opportunities. The report includes some future scenarios of changes in land use with climate change.

1. ***Phase one of the CCC land use project***

This project represents the second phase of the CCC’s overall land use project. The first phase was completed earlier this year with an initial scoping study that assessed the current evidence on UK land use. The study by ADAS[[4]](#footnote-4) identified different drivers of land use at the local and national levels, in addition to the relevant metrics and indicators needed to monitor changes in land use and land use management, spatially and through time.

The ADAS study also reviewed the available land use and land use impact models, which we intend to use for this part of our work. ADAS identified a number of integrated models where the decision on how land is used, based on different objective functions, is coupled with land use impact models which estimate the effect of land use choices on a range of indicators such as carbon emissions, food production, and the value of recreation services. A significant advantage of an integrated modelling framework is that there is a direct link between land allocation (how land is used), the resultant impacts and associated feedback mechanisms.

As part of the first phase, and with the Paris Agreement setting the context, potential land use pathways to achieve net zero emissions in the UK agricultural and LULUCF sectors beyond 2050 were explored in a workshop with key specialists in the agriculture, forestry, land use modelling and ecosystem services sectors. This identified four pathways to deliver deeper emissions reduction:

* **Improved technological efficiency of agriculture** (e.g. improved yields, crops with lower fertiliser requirements);
* **Multi-functional land-use** (e.g. permacultures, agro-forestry);
* **Increasing carbon sinks** (e.g. afforestation and peatland restoration); and
* **Diet change** (primarily reducing consumption of carbon-intensive red meats).

Both the scoping study by ADAS and the write-up of the workshop are published on the CCC website.

**5. Detailed project specification**

1. ***Overview***

The main aim of the current project is to identify and quantify the impact of plausible future land use pathways that:

* Maximise reductions in emissions and increase sequestration in the UK agriculture and LULUCF sectors, consistent with reaching net negative emissions in the second half of the century.
* Take account of the need to prepare for the impacts of climate change and ensure the future land uses are resilient to the effects of climate warming projections under a 2°C and 4°C world.
* Take account of other land uses that provide economic and social benefits to the UK.
* Take account of other constraints on land use e.g. changes in climate and bio-physical properties of land over time.

The output will be a series of scenarios of future land uses and management options that allow deep emissions reduction consistent with economy-wide scenarios for net zero emissions whilst remaining resilient to the impacts of climate change. The scenarios should identify potential trade-offs and synergies between land uses that deliver emissions reductions and other benefits or costs. These should include uses that preserve a given level of food and timber production, recreation and other eco-system services important to ensuring land is resilient to the changing climate.

The outputs should inform CCC work to develop a long-term strategy for the use of non-developed land that meets both its mitigation and adaptation aims, which may require follow-up work to this study.

***Methodology***

This is a complex area, with many drivers of land use and metrics to consider and evaluate. It is likely that some of the variables, for which there is already a market, can be measured directly, whilst others may be inferred indirectly or assessed qualitatively. The aim of this project is to use land allocation and impact models to develop the scenarios, supplemented if necessary by other analyses or data.

As part of your tender, you should set out your preferred modelling approach. Specifically:

* **Model type:** A brief description of the type of model that will be used. For example is it agent-based, integrated framework or spatio-econometric or other approaches? The key features of the model should be set out, for example if it assumes profit maximisation by agents with perfect information, or if land use decisions are made through probability functions and constraints or imperfect knowledge.
* **Resolution:** State the temporal (e.g. annual), geographical (e.g. UK, England and each devolved administration) and spatial coverage (e.g. kms, hectares) of your model. Does the spatial boundary of the model extend beyond the UK? If not, can outputs from other (global) models be input into the UK based model (e.g. population growth, global demand for food and forestry)?
* **Drivers:** Outline the range of drivers of land use that the model considers (e.g. socio-economic, agronomic, behavioural, biophysical, climate change, policies, global).To what extent does the model consider climate change both as a driver of land use and as an impact?
* **Inputs:** Outline main inputs and quality of data e.g. land cover, economic data, farming practices, mitigation options.
* **Outputs and metrics:** The extent to which the model can assess a range of impacts from a mitigation and adaptation perspective (e.g. GHG emissions, flood alleviation and biodiversity) and the metrics used to measures these (e.g. MtCO2 for GHG emissions, M3 for water availability, tonnes for food output and number of visits for recreational use). Does it include economic valuation of these metrics? What outputs are you able to quantify, and where you are unable to, what qualitative assessment do you use?
* **Costs and benefits:** What approach is used to quantify and value the costs and benefits e.g. NPV, cost-effectiveness of mitigation measures against a carbon price, cost-benefit ratios? Please indicate the discounting approach used, if any (e.g. private vs social) and whether these can be varied in the model.
* Can your model be run under different scenarios regarding **global temperature rise** (e.g. 2°C and 4°C)?

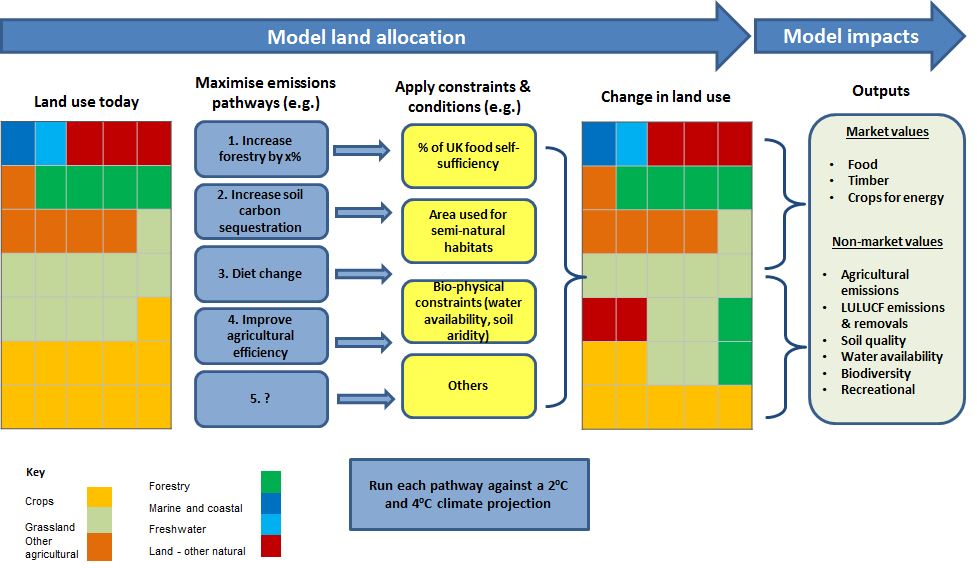
1. ***Detailed objectives and tasks***

The project will require modelling a series of complex tasks. We have broken these down into a series of steps that are likely to be needed to deliver the project aims. These are illustrated in Figure 1. These tasks and key questions we are trying to answer for each of these are:

1. **What is land use likely to look like in the absence of any action to mitigate GHG emissions or adapting to climate change?** This will require the construction of baselines of non-developed land use beyond 2050. These should take account of climate warming projections of 2°C and 4°C as well as other key drivers e.g. population growth.
2. **What are the pathways to future emissions reduction and what do these imply in terms of the metrics that measure resilience to climate change?** This step will identify measures that contribute to significant emissions reduction from these sectors up to 2100, and assess their costs. It should also ensure that models are set up to be able to measure resilience outcomes.
3. **What constraints should be taken into account when modelling future land uses?** This task should identify and apply appropriate constraints that need to be taken into account in the modelling. These could cover for example, maintaining a given level of food supply or preserving a given level of land for semi-natural habitats.
4. **Is there a way to pull together the mitigation pathways and constraints together around different scenarios?** Given the large number of potential pathways and constraints, and a limit on the number of different model iterations that we can sensibly analyse, can these be brought together in different combinations so as to highlight different trade-offs and synergies.
5. **What is the impact of the scenarios on both land use and land use impacts?** This task will analyse the outputs of the modelling so that we can assess changes in land uses and resultant impacts. This is likely to require a mix of qualitative and quantitative metrics, including those that will measure the resilience of the system to climate change.

These tasks are set out in more detail in the next section.

**Figure 1. Illustrative modelling framework**

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**6. Detailed description of work for consultants and key tasks**

This work is focused on modelling land use allocation and assessing resultant impacts, and as such consultants will have to demonstrate strong modelling expertise that captures both the mitigation and adaptation impacts of changes in land use. The modelling work will need to cover the following key areas:

**Task one. Develop baselines of non-developed land use beyond 2050 to 2100**

The starting point of the modelling will be to define a baseline or baselines for key indicators we are interested in modelling such as emissions, food production, biodiversity etc. This could be in the form of scenarios where key drivers of these factors are identified and ranges quantified, or construction of central case estimates for key variables. Your bid should consider and justify which approach you favour.

The baseline to 2030 and 2050 should assume that the statutory 2050 climate change target has been reached, and that emission reductions in agriculture and LULUCF are consistent with estimates from our fifth carbon budget work. The CCC will make available its analysis of emissions reduction needed in these sectors to 2030.

Beyond 2050 and to 2100, baseline(s) will have to be constructed to assess how land use is likely to change in the absence of any ambition to deliver deeper emissions cuts beyond the 2050 statutory target. This should:

* Take account of other key land-use drivers such as population growth (UK and globally), economic growth, demand and technological change.
* Two outcomes for a climate warming projections of a 2oC and 4oC world, with associated climate impacts.
* Set out the implications for emissions in the agriculture and the LULUCF sectors, other ecosystem services and resilience indicators in these two scenarios.

We envisage that baseline scenarios will have to be developed to take account of high, central and low estimates of the key variables (e.g. population growth) and differences in warming projections, but we would welcome your views on this in the tender.

Determining a 2050 baseline and ‘central’ scenario beyond that is less important for the resilience part of the project as there is no set goal to be reached by 2050 for adaptation. Rather, any changes in resilience described under future scenarios will be compared to the present day.

**Task two (part a). Identify and define land use & land management patterns or pathways that maximise emission reductions and sequestration.**

This task should identify a number of pathways that could potentially deliver deeper emissions reduction and increased removals in the UK agricultural and LULUCF sectors in the second half of the century. We envisage that the starting point should be the drawing up of a long-list of potential pathways, which will be short-listed for more detailed consideration.

The pathways must reflect current and future mitigation opportunities capturing both supply and demand-side options. On the supply-side, measures would include land use change, land management and livestock management practices (as opposed to land use change). Diet-change and reducing consumer food waste are key demand-side options. Pathways should capture more radical and transformative approaches that with time, R&D and consumer acceptability could become feasible (e.g. perennial wheat crops and production of synthetic meat). Options can be characterised by these four broad actions[[5]](#footnote-5):

* **Reduce and prevent emissions:** reducing non-CO2 emissions in agriculture from the main sources: agricultural soils, enteric emissions, and waste & manure management and storage; and conserving existing carbon stocks in soils, grassland, forests and peatland etc.
* **Enhance carbon sequestration from the atmosphere:** increasing the uptake of carbon in terrestrial reservoirs (e.g. growing more trees, converting arable to grassland, peatland restoration, and agricultural management practices on existing land).
* **Reduce emissions by using biomass products** to displace fossil fuels in energy and energy-intensive products such as concrete in construction. Bioenergy if used with CCS may deliver negative emissions.
* **Modify demand-side factors** through diet change and reduce food waste, which can impact land use and emissions on-farm.

Metrics (units) will need to be agreed with the CCC in order to describe these pathways and quantify the impact on the range of outputs (e.g. MtCO2e for GHG emissions, M3 for water availability, tonnes for food output and number of visits for recreation). In turn, these metrics will need to be converted into monetary values where possible, in order to evaluate the costs and benefits of each pathway.

In assessing mitigation measures and technologies, contractors should include those pathways identified in the first phase as discussed in Section 3 (ii) and set out in further detail in the ADAS report. Final pathways for modelling should be agreed in consultation with the CCC.

The tender should set out the measures that the modelling framework will be able to consider and which are likely to be key in delivering emissions reduction and removals in the two sectors.

Criteria for short-listing the pathways for more detailed modelling will need to be developed. Criteria for selecting a plausible mitigation pathway should include that beyond the reduction of emissions, a pathway should also deliver a range of other benefits important for climate change adaptation (or at the least maintain resilience), and does not (significantly) displace emissions overseas, or lead to production emissions for export.

The modelling will need to calculate the abatement costs of each measure against the carbon price to assess cost-effectiveness, using both a central and high carbon price. In addition, the wider costs and benefits to society (e.g. flood management) of each measure will need to be calculated, and which can be used to consider the case for deploying measures that are not cost effective from a carbon perspective.

The modelling should also consider the particular points in Box 1.

| **Box 1.** Points to consider in the modelling |
| --- |
| * **Carbon Capture and Storage (CCS)** in the power sector is important for meeting the 2050 target. A key benefit of CCS is the ability to generate negative emissions savings when using biomass feedstock. Although emissions savings generated by bio-CCS will be accounted for in the power sector, its use implies a lower level of abatement is required in other sectors. If CCS bioenergy products are sourced in the UK, this would require a lower level of tree planting or other bio-products in the land-use sector than would have been the case without CCS. In constructing the different pathways, the project should construct a scenario in which bio-CCS is available to meet the 2050 target and, for the purpose of this project, emissions savings generated are offset in the land-use sector. * In addition**, substitution of wood** from sustainably managed UK forests for non-wood material in construction such as concrete and steel should also be modelled. As wood in construction locks the carbon into the product over a long-time, it will be a more preferable option to bioenergy without CCS technology. Both options could become particularly attractive when dealing with trees that have reached carbon saturation, and potentially at risk of carbon release due to fires, pests and diseases. * We would also like to consider pathways that **enhance carbon stocks in peatland** through restoration practices and the reduction in damaging land management practices. While the LLULCF inventory does not capture all sources of peatland emissions, their expected inclusion in 2018 could potentially make the LULUCF sector a net emissions source.Consideration will need to be given on your approach to estimating peatland emissions and sequestration from restoration practices given these are not accounted for in the LULUCF inventory, and whether this pathway is quantifiable. * Pathways that include afforestation should take account of the **impact on albedo**[[6]](#footnote-6), and the implications this has on the selection of tree species for planting (e.g. broadleaves versus conifers). |

Any assessment must take into account how the impacts of climate change, which for certain cases could be positive with modest warming (e.g. longer growing season for crops), will affect land use in terms of its bio-physical properties and the services it provides. Therefore, each scenario should be run against a different climate warming projection of 2°C and 4°C.

Where possible, pathways should include regional, spatial and temporal delivery of land use change and management practices. For example, an afforestation pathway should identify where and how many trees should be planted to maximise carbon benefits subject to other benefits and trade-offs.

**Task two (part b). Identify metrics that characterise each pathway in terms of the change in resilience to climate change**

Each of the pathways constructed in task 2 (part a) should be set up so that they can also be assessed in terms of the level of resilience to the climate scenarios chosen, in the following sectors; flood management, water management, agriculture, forestry and biodiversity.

Measuring the resilience of different sectors to future climate change is challenging. The Adaptation Sub-Committee has constructed a set of about 180 indicators that it uses to look at how adaptation action, vulnerability and exposure to climate hazards are changing through time across a range of sectors including those related to land use.[[7]](#footnote-7) Some examples of metrics that the ASC consider particularly important for this project include:

* Area of land by type (cropland, grazing land, heathland, well-functioning upland and lowland peat, developed land)
* Area of agricultural land by Agricultural Land Classification grade
* Total water demand for agriculture
* Area of agricultural land losing soil organic carbon
* Area of agricultural land under minimum/no tillage
* Area of woodland being sustainably managed
* Diversity of tree species planted in publicly owned forests
* Proportion of woodland in active management
* Proportion of [different habitat types] in favourable condition
* Area of blanket bog with consents for burning
* Number of [different species types] declining or increasing
* Proportion of water bodies meeting good ecological status

The project team should consider how it can set up its model to present results using these metrics. Bids may also wish to consider how the recommended indicators in the ADAS report to measure future resilience in the different pathways can be used alongside the ASC’s indicator metrics.

The two parts of task 2 should run concurrently.

**Task three. Identify and apply appropriate constraints and conditions to each scenario.**

The degree of land use change under each scenario should be subject to a set of conditions and constraints. Applying these constraints may reduce the ability of particular pathways to deliver deeper emissions cuts or higher removals in the UK agriculture and LULUCF sectors. However, the constraints and condition are intended to recognise:

* Land delivers some goods and services that are deemed to be essential (and perhaps, non-negotiable), such as food production and the preservation of wildlife habitats. Thus, setting a condition on the level of UK food self-sufficiency for example, would constrain the amount of arable land and grassland that could be converted to forestry. This constraint might be varied in different model runs.
* Other constraints pertain to biophysical properties of the land (which may arise due to climate change), that may constrain what the land can be used for and its potential productive capacity, with either positive or negative consequences for reducing emissions. For example, potential risks associated with aridity of arable land for crop production may lead to conversion to grassland or forestry, which would generate a positive outcome in terms of emissions savings. There may also be additional benefits in terms of wider ecosystem services.

As assumptions on constraints are subjective, it is important that contractors set out in the tender the kind of constraints and conditions that they think will be important to consider. As part of the project these will be discussed with the CCC before finally being specified and adopted in model runs. The modelling should undertake some sensitivity analysis in order to flex particular constraints and/or conditions to assess the impact on emissions savings and other outputs. For example, we may want to develop sensitivities based on differing levels of UK food self-sufficiency in response to global population growth and the impact of a changing climate on food production elsewhere[[8]](#footnote-8) which could impact UK food exports and imports. Contractors should therefore make allowance for the need for some iteration of these assumptions in the tender.

The modelling should evaluate the costs and benefits of applying a constraint(s) in order to assess the strength of the trade-offs, i.e. land retained for food production versus emissions reduction/sequestration and providing resilience to climate change.

**Task four. Developing scenarios of pathways and constraints**

This task should consider how different mitigation options, resilience impacts and constraints can be combined to produce different scenarios for modelling runs. This recognises that, given the large number of combinations of measures and constraints it will not be possible to model all possible permutations.

Pathways can be combined into different scenarios in recognition that achieving deeper emission cuts is expected to call upon more than one given pathway in order to maximise the synergies and minimise the trade-offs across multiple objectives. For example, a pathway focused solely on enhancing carbon sequestration through increased afforestation could adversely impact food production if trees are planted on arable land. However, this trade-off could be mitigated if combined with a technological pathway that for example improves crop yields, which could free up land for tree planting.

Ahead of any model runs being undertaken, consideration should be given to identifying the relevant constraints, conditions, trade-offs and synergies that could be applicable to each scenario short-listed in Task 2. This process would help identify which scenarios should be prioritised for the modelling, and ensure that all obvious trade-offs and synergies are explored. The development of scenarios is likely to be iterative, and close working with CCC is envisaged for this stage of the work.

In considering the types of scenarios to model, tenders should also consider the risks inherent in the modelling and potential sensitivities that might be useful and/or have a large impact on results.

**Task five. Produce outputs and analyse the impacts**

Having completed the above tasks, the model should, at a minimum, provide the following outputs for each scenario considered:

* Future **land use allocation**: what does each pathway/scenario imply in terms of land-use allocation relative to the baselines developed in Task 1 above, both spatially (by land use type and cover) and over time to 2100?
* Impact on **emissions** by GHG in the LULUCF and agriculture sectors. As a minimum, the impact on emissions should be disaggregated at the national scale (e.g. by each administration of the UK). Results should be modelled at five yearly intervals from 2050 to 2100 in order to assess the impact of pursuing a pathway of deeper emissions cuts, identifying the year when net zero emissions is reached. The cost-effectiveness (£/tCO2) of the mitigation options should be available.
* Impact on **resilience** of biodiversity, agriculture, forestry, water management and flood management using the ASC’s indicator metrics as described in task 2 (b).
* Impact on **other eco-system services** not covered above (e.g. recreational use).

Where possible, impacts including environmental ones, should be monetised in terms of costs and benefits. For services where this is not possible, other quantitative assessment, or failing that qualitative assessment, of the likely impact of different pathways is required.

The outputs of each scenario should be assessed based on the synergies and trade-offs between climate change mitigation, adaptation and other policy objectives. This will enable us to identify the best least cost options to achieving near net-zero emissions and resilience to climate change with the largest set of co-benefits.

**N.B. Please provide separate costing and number of days allocated for Tasks 1-5.**

**Other considerations**

As part of you bid, you should set out:

* Any challenges in meeting the specifications of this project to the timeline set out below. The uncertainties and gaps in knowledge, inputs, data, and applications of your current modelling capability to meet our specification, and how you intend to address this in the time required. It would also be useful to know if and how you are actively developing/improving your model.
* What you consider to be a feasible number of scenarios to model within the timeframe and budget of the contract. This should also take into account sensitivities around the flexing of certain conditions and constraints (e.g. varying the level of food self-sufficiency), and the need to run each scenario twice for different climate change projections (i.e. 2°C and 4°C)

The CCC and ASC recognise that this project covers a wide range of expertise, and therefore we welcome collaboration between parties across different disciplines and expertise.

1. **Deliverables and timetable**

Key deliverables include:

* Presentation of the interim and final results of the project to the CCC and ASC secretariats and other interested parties
* A report setting out the findings of Tasks 1-5, and a write-up of the workshop findings
* Transparent excel spreadsheets containing the outputs of the model runs. To be discussed at the kick-off meeting.
* Attendance at a workshop (to be arranged by the CCC) to present the main findings of the project with industry experts and possible next steps.

The proposed timetable for the project is set out in the following table:

* At least 60-70% of the project should be completed by end March 2017, with the remainder to be completed by the end of July.
* Interim results and/or final results for a limited number of scenarios to be completed in time (i.e. late April) to feed into the CCC’s annual progress, end June 2017.

In addition to the formal reporting points, the CCC would expect to have regular scheduled discussions to ensure the work is progressing as expected. This may also require interim meetings to be scheduled to consider a long-list of scenarios, to agree criteria for selecting a short-list for modelling, and to agree scenario constraints.

|  |  |
| --- | --- |
| **Table 1: Deliverables and timetable** | |
| **Date** | **Action/Deliverable** |
| 21st November 2016 | Deadline for response to ITT |
| 24th or 28th November 2016 | Interviews |
| 5th or 6th December | Kick-off meeting |
| Mid-March 2017 | 1st Interim meeting (presentation on progress and initial results) |
| Late-April 2017 | 2nd Interim meeting (further progress and results) |
| Mid-May 2017 | Circulate write-up of interim results |
| Late June/early July 2017 | Final meeting (present and discuss results and findings) |
| Mid-July 2017 | Attend workshop with CCC, ASC and other experts (date can be changed so workshop is held at the interim stage) |
| Late July 2017 | Circulate write-up of workshop findings, and final report |

**Quality of analysis and outputs**

All research tasks and modelling must be quality assured and documented. Contractors should:

* Include a quality assurance (QA) plan that they will apply to all of the research tasks and modelling
* Specify who will take lead responsibility for ensuring quality assurance and ensure that this responsibility rests with an individual not directly involved in the research, analysis or model development,
* Provide QA log to demonstrate the QA undertaken, including who undertook the QA and the scope, type and level of QA that has been undertaken (e.g. a log entry only stating ‘the data was checked’ will not be sufficient)

Sign-off for the quality assurance must be done by someone of sufficient seniority within the contractor organisation to be able take responsibility for the work done. Acceptance of the work by the CCC will take this into consideration. The CCC reserves the right to refuse to sign off outputs which do not meet the required standard specified in this invitation to tender.

The successful bidder will be responsible for any work supplied by sub-contractors and should therefore provide assurance that all work in the contract is undertaken in accordance with the quality assurance expectation agreed at the beginning of the project.

For primary research, contractors should be willing to facilitate CCC research staff to attend interviews or listen in to telephone surveys as part of the quality assurance process.

The consultant must demonstrate their ability to produce deliverables of quality, in particular following best practice regarding economic analysis and presentation of results.

To this end, the CCC expects that:

* Economic analysis must be delivered in a simple, transparent Excel (or similar) spreadsheet, where key assumptions (agreed with the CCC) can be varied. All assumptions and figures should be adequately referenced, and include any supporting workings. This spreadsheet will be the property of the CCC.
* Existing analysis and work regarding technical challenges and deployment constraints should be reviewed (e.g. including technology options and barriers developed by the CCC) and incorporated into this assignment.
* Analysis should appropriately reflect uncertainty regarding model inputs, and in particular costs, by specifying ranges on uncertain figures. Where appropriate, a sensitivity analysis of key parameters should be conducted.

**Evaluation Criteria**

We will assess bids on the following criteria as set out in the supplier questionnaire:

* Understanding of the project specification and key requirements
* Approach to meeting the requirement
* Understanding of challenges and risks to delivery, and clearly articulated strategies to deal with these
* Relevant experience
* Management process including quality assurance
* Project team

# Part C

**SUPPLIER INFORMATION**

Please complete the following information:-

All information supplied will be treated as **Strictly Private and Confidential**. The information will be reviewed by the Evaluation Panel only and will not be divulged to other parties during the de-briefing stage, or at any other time.

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| Supplier Information  Concerning the provision of ………………………………………………………………………………… | | |  | |
| **Name of Company:** |  | | | |
| **Address:** |  | | | |
|  |  | | | |
|  |  | | | |
|  |  | | | |
| **Contact Name:** |  | **Telephone Number:**  (Including STD Code) | |  |
| **Contact Title:** |  | **Facsimile Number:**  (Including STD Code) | |  |
| **Email and website Address:** |  | | | |
| **Signed:** |  | **Dated:** | |  |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **SECTION C1 : ORGANISATION, MANDATORY AND FINANCIAL INFORMATION** | | | | |
| **Note: Where a consortium bid is proposed, please present the information for each consortium member individually.** | | | | |
| GENERAL INFORMATION  **Please enclose details of your organisation’s internal structure. A diagram would be helpful to support your answer.** | | | | |
| 1. **Is your organisation: (Please tick a box)** | | | | |
|  |  |  |  | |
|  | i) a public limited company; |  | Registration No: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ | |
|  |  |  |  | |
|  | ii) a limited company; |  | Registration No: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ | |
|  |  |  |  | |
|  | iii) a sole trader; |  |  | |
|  |  |  |  | |
|  | iii) a partnership; |  |  | |
|  |  |  |  | |
|  | iii) other, please specify; |  |  | |
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| **SECTION C2: MANDATORY INFORMATION REQUIREMENTS** |
| Note: The information required in this section is a mandatory requirement for this quotation. Failure to provide the information may result in your bid being eliminated.  Where a consortium bid is proposed, please present the information for each consortium member individually. |
| **FINANCIAL REQUIREMENTS**   1. **Please note we will request from the proposed winner a set of the last year’s audited accounts (if these accounts are required under the law of the state in which your organisation is established) for your own organisation and the holding and/or ultimate parent and your organisation’s subsidiaries (if applicable). If you cannot provide the last year’s audited accounts, please provide a copy of your most recent business plan, budget or similar document.**   **OR**  **If the audited accounts are available online, please provide details of the web page address where the accounts are held so that the Authority can access the information.**  **Web address: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ (your organisation)**  **Web address: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ (holding / ultimate parent company)** |

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| **SECTION C3: Evaluation Criteria and weighting** |
| **RELEVANT EXPERIENCE / DEMONSTRATION OF CABABILITY - 20%**  **1. Please describe the relevant principal areas of business activity of your organisation and the number of years you have been involved in this activity. Describe in detail, giving dates of your current and previous experience of comparable projects you have been awarded by public and private sector Clients and undertaken by your organisation in the past 5 years.** |
|  |
| **MANAGING YOUR RELATIONSHIP WITH THE CCC – 10%**  **2. Please describe how your organisation will manage its relationship with the CCC, including attendance at meeting and/or provision of progress reports and how communication between all levels of staff will be maintained.** |
|  |
| **QUALITY ASSURING THE SERVICES YOU PROVIDE – 10%**  **3. Please provide a brief plan of how you would monitor and maintain the quality of the services delivered (e.g. relevant Key Performance Indicators, risk management arrangements), including a statement of how you would ensure the key dates and deliverables are met. Please indicate whether in your opinion our timescales can be achieved.** |
|  |
| **MANAGEMENT STRUCTURE – 10%**  **4. Please briefly describe your proposed management and organisational structure for providing the services.** |
|  |
| **PROJECT TEAM – SKILLS AND KNOWLEDGE – 20%**  **5. Please provide details of the full project team, including a team structure, with an outline of roles and responsibilities and copies of proposed project team CV’s. Please also confirm whether project team members would be full time or part time on this contract and if part time, please specify time contributed to this project.** |
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| **SECTION C4: METHOD, ABILITY AND TECHNICAL CAPACITY – 10%** | | | | | | |
| **Note: The purpose of the Method Statement is to enable us to evaluate your understanding of our requirements and the quality of your proposals for meeting them.** | | | | | | |
| **UNDERSTANDING OF REQUIREMENTS – 10%**  **1. Please provide a detailed statement of your understanding of the CCC’s requirements for this contract.** | | | | | | |
|  | | | | | | |
| **RISK AND CHALLENGES – 10%**  **2. What do you consider are the specific challenges for this project over the life of the contract and how do you propose to overcome these?** | | | | | | |
|  | | | | | | |
| SECTION C5: SIGNATURE AND DATE | | | | | | |
| I hereby declare that the information provided herein is complete and accurate: | | | | | | |
| Signature: |  |  | Date: |  |  |  |
| Name (PRINT): |  |  |  |  |  |  |
| Job Title: |  |  |  |  |  |  |
|  | | | | | | |

# Part D

**Pricing Information to be provided by bidder**

Please provide a pricing schedule for the following:

1. Consultancy Charge per day - Please indicate here staff level (i.e. junior consultant, partner etc.), rate per day, the number of days the individual would be allocated to the contract and the number of hours worked per day.
2. Any other costs – (please specify).
3. Any discounts offered.
4. Total cost of the Contract.

Notes:

1. Please note that all Travel and Subsistence will be as per the Civil Service Standard i.e. standard class.
2. V.A.T. will be separately indicated

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# Part E

**CCC CONDITIONS OF CONTRACT FOR SERVICES**

(see other attachment)

1. [CCC (2015) *'UK climate action following the Paris Agreement'*](https://www.theccc.org.uk/wp-content/uploads/2016/10/UK-climate-action-following-the-Paris-Agreement-Committee-on-Climate-Change-October-2016.pdf) [↑](#footnote-ref-1)
2. [CCC (2015) *'Sectoral scenarios for the fifth carbon budget'.*](https://www.theccc.org.uk/publication/sectoral-scenarios-for-the-fifth-carbon-budget-technical-report/) [↑](#footnote-ref-2)
3. [Environmental Audit Committee (2016) *‘Soil health: Government Response to the Committee’s First Report of Session 2016–17*](http://www.publications.parliament.uk/pa/cm201617/cmselect/cmenvaud/650/650.pdf)’ [↑](#footnote-ref-3)
4. [ADAS (2016), ‘*UK land use projections and implications for mitigation and adaptation*](https://www.theccc.org.uk/publication/adas-for-ccc-uk-land-use-projections-and-implications-for-mitigation-and-adaptation/)’ [↑](#footnote-ref-4)
5. As identified by the IPCC AR5 [↑](#footnote-ref-5)
6. Surface albedo refers to the fraction of shortwave solar irradiance that is reflected by a surface. [↑](#footnote-ref-6)
7. See link at bottom of page: https://www.theccc.org.uk/publication/reducing-emissions-and-preparing-for-climate-change-2015-progress-report-to-parliament/ [↑](#footnote-ref-7)
8. ‘*For the major crops (wheat, rice, and maize) in tropical and temperate regions, climate change without adaptation will negatively impact production for local temperature increases of 2°C or more above late-20th-century levels, although individual locations may benefit (medium confidence)*’ IPCC AR5 (2014) [↑](#footnote-ref-8)