Notes on Completion: Please refer to the appropriate NIA Governance Document to assist in the completion of this form. The full completed submission should not exceed 6 pages in total.

NIA Project Registration and PEA Document

Date of Submission

Mar 2017

Project Reference Number

NIA_WWU_035

Project Registration

Project Title

Climate Change Impact Mapping

Project Reference Number

NIA_WWU_035

Project Licensee(s)

Wales & West Utilities

Project Start

March 2017

Project Duration

3 years and 5 months

Nominated Project Contact(s)

Morgan James, LTS Pipelines Asset Manager

Project Budget

£413,333.00

Summary

Taking the learning from the pilot study, the climate change impact mapping data will be tested across a wide geography to demonstrate the benefits, both known and not yet known, against a network of assets. This stage of delivering climate change impact mapping will test the solution to demonstrate the prototype in a fully operational environment, with testing and development proving the product works in its final form and under expected conditions. The project scope intends to:

1. Develop the modelling output for the whole WWU network geography;

2. Develop case studies to share the learning of using the data via multiple engagement avenues, including the Smarter Networks Portal; and to

3. Feed back to the Smarter Networks Portal at the closure of the project

The themes will be made available as data layers in a variety of formats to allow easy integration with existing Geographical Information Systems and straightforward commencement of understanding risk, developing a maintenance strategy and delivering timely intervention to existing assets. Additionally, the data will allow, thorough planning, to future-proof new assets against climate impacts.

Nominated Contact Email Address(es)

innovation@wwutilities.co.uk

Problem Being Solved

Responding to UK Government concerns on climate change we want to take a leading role, embracing new ideas and innovative thinking, to look for solutions to the problems caused by climate change. We have sought ways to avoid damage to our network and reduce the risk of inconvenience and higher costs for customers.

Communities across the UK are already experiencing and dealing with the consequences of extreme weather events and the impacts of a changing climate. As one of the greatest environmental challenges facing our planet, a holistic approach to mitigation and adaptation is required.

Our stakeholders have told us that they feel that utilities industries need to take action to protect valuable assets from flooding. We consider that issues such as those listed below are important:

1. Flooding of above ground assets (river, tidal and surface water flooding);

2. River erosion exposing pipelines (erosion of the river bed and bank);

3. Impact on over-river crossings (flash flood waters, debris and bridge structure collapse); and

4. Impact on coastline assets (flooding and saline corrosion from sea level rise).

By developing a system of obtaining, accessing and presenting this data we will be able to deliver the world's first climate change impact modelling and mapping tool that will support the management of assets.

Method(s)

We have successfully completed a pilot study with our partners to investigate the potential of creating a technical innovative solution to link climate change forecast data to actual physical impacts on the ground. The project was delivered on a small scale across a defined area of EU Water Framework Directive River Catchments around the town of Machynlleth. The work was carried out iteratively, involving review, challenge, feedback and model adjustments to allow the development of data layers to overlay with live gas infrastructure and the transport network. This self-funded project took a solution through Technology Readiness Levels 3 to 6, with analytical proof of concept, a prototype system validation of integrated concepts and testing data from a sophisticated modelling prototype in a simulated operational environment.

This Project will investigate and report on the capability and full benefits of the mapping tool by uploading the data and carrying out a series of case studies for each climate change data theme.

The Project will also look at the potential use of the data in terms of diversion requests and incident responses. The demonstration project draws upon the best available information and will involve billions of calculations in one of the world's fasted super-computers to generate the model outputs. The modelling method uses best-practice methodologies and provides the most detailed flood risk mapping available in Great Britain. LiDAR technology is used to capture topographical input data with a vertical accuracy of approximately ±15cm. This data is further enhanced by over two years of detailed manual calibration so as to ensure the underlying digital terrain model is optimised for precision flood modelling. Current Ordnance Survey mapping is used to derive land cover characteristics, determine surface roughness and model spatial and temporal variability in landscape infiltration. Incorporating the latest river flow, rainfall and climate change predictions available, this tool addresses all major sources of flooding – including river, surface water and tidal. This approach allows the creation of unique, innovative new layers, providing insight into flood hazards and the resulting impacts on river banks, transport networks, bridges and other specific assets, infrastructure and properties.

Flooding and sea level rise data themes are presented as 10 separate layers representing 10 different climate scenarios taken from Defra's UKCP09 (UK Climate Projections 2009) model, with flexibility for a user to compare current conditions with future best case, central case and worst case conditions in 2020, 2050 and 2080 using a range of carbon emission scenarios and probabilities. Erosion, transport and bridge impact data themes are provided as a single layer containing information from all modelled scenarios.

Each chosen scenario can then be used to query interaction with live gas infrastructure of varying degrees of criticality to assess imminent and future potential for impact, develop risk management and maintenance strategies for different asset groups and plan appropriate intervention over the shorter (RIIO-GD1), medium (RIIO-GD2) and longer (beyond RIIO-GD2) timeframes.

Scope

Taking the learning from the pilot study, the climate change impact mapping data will be tested across a wide geography to demonstrate the benefits, both known and not yet known, against a network of assets. This stage of delivering climate change impact mapping will test the solution to demonstrate the prototype in a fully operational environment, with testing and development proving the product works in its final form and under expected conditions. The project scope intends to:

1. Develop the modelling output for the whole WWU network geography;

2. Develop case studies to share the learning of using the data via multiple engagement avenues, including the Smarter Networks Portal; and to

3. Feed back to the Smarter Networks Portal at the closure of the project

The themes will be made available as data layers in a variety of formats to allow easy integration with existing Geographical Information Systems and straightforward commencement of understanding risk, developing a maintenance strategy and delivering timely intervention to existing assets. Additionally, the data will allow, thorough planning, to future-proof new assets against climate impacts.

Objective(s)

To develop and demonstrate the technology for the geographical area of WWU to better understand the benefits and opportunities that the availability of such data can provide when making future investment decisions.

Consumer Vulnerability Impact Assessment (RIIO-2 Projects Only)

n/a

Success Criteria

To collect a body of evidence to support this technical innovation. that delivers the intended result & is a useful tool to meet our obligations as a responsible business.

Project Partners and External Funding

n/a

Potential for New Learning

n/a

Scale of Project

This project will focus on the provision of mapping data that will be used to create up to 2 case studies that documents the suitability and benefit of the data in various circumstances. A small number of site visits will also be required to test the data and assess its suitability in the field.

Technology Readiness at Start

TRL6 Large Scale

Technology Readiness at End

TRL8 Active Commissioning

Geographical Area

Wales & South West England

Revenue Allowed for the RIIO Settlement

None

Indicative Total NIA Project Expenditure

The total External project cost - £310,000

Internal project cost - £103,333

Total NIA Expenditure - £413,333

Project Eligibility Assessment Part 1

There are slightly differing requirements for RIIO-1 and RIIO-2 NIA projects. This is noted in each case, with the requirement numbers listed for both where they differ (shown as RIIO-2 / RIIO-1).

Requirement 1

Facilitate the energy system transition and/or benefit consumers in vulnerable situations (Please complete sections 3.1.1 and 3.1.2 for RIIO-2 projects only)

Please answer **at least one** of the following:

How the Project has the potential to facilitate the energy system transition:

n/a

How the Project has potential to benefit consumer in vulnerable situations:

n/a

Requirement 2 / 2b

Has the potential to deliver net benefits to consumers

Project must have the potential to deliver a Solution that delivers a net benefit to consumers of the Gas Transporter and/or Electricity Transmission or Electricity Distribution licensee, as the context requires. This could include delivering a Solution at a lower cost than the most efficient Method currently in use on the GB Gas Transportation System, the Gas Transporter's and/or Electricity Transmission or Electricity Distribution licensee's network, or wider benefits, such as social or environmental.

Please provide an estimate of the saving if the Problem is solved (RIIO-1 projects only)

The demonstration project across the whole WWU asset geography will identify, throughout its duration, a range of benefits of efficient asset management which can be implemented to deliver savings to consumers. The data is expected to highlight any future asset impacts from climate change. The risks identified by the model will need to be validated in site specific field assessments prior to confirming intervention requirements.

It is difficult to distinguish an annualised saving, however the following asset-specific savings could be realised:

Proactive river bank/mains protection rather than urgent reaction to an event: ~£100k

River bed protection rather than mains/river diversion: ~£300k

Avoiding a re-diversion by selecting an original climate resilient diversion: ~£350k

Proactive soft-protection of river bank rather than hard-protection methods: ~£90k

Conservatively, it is considered most likely that savings identified by the demonstration project would be greater than the cost of the product.

Please provide a calculation of the expected benefits the Solution

We have identified approx. 8 incidents per year where river bed erosion has affected the LTS pipeline.

The average associated cost in providing protection to the LTS pipelines, is £26,000 for each of these events,

Assuming the new mapping tool identifies the areas prone to current and future erosion of the river bed, in 25% of the cases, it will allow the opportunity for proactive intervention. We estimate a cost saving in carrying out pro-active intervention to be up to 50% per event.

Base cost - £26,000 * 8 = £208,000

Method cost – 2 events * £13,000 + 6 events * £26,000 = £182,000

Base cost – Method cost = £26,000

Please provide an estimate of how replicable the Method is across GB

The climate change impact mapping data is replicable across the whole of Great Britain (which is all covered by the UK Climate Projections) and 100% of GDN network of assets.

Please provide an outline of the costs of rolling out the Method across GB.

Separate commercial negotiations will need to be conducted between Landmark and other GDNs, however an estimate between £2m and £3m is realistic. Subject to the rate of take-up by others (wider utilities, local authorities, developers, finance institutions etc.), the cost of the modelling aspect of the product would likely reduce as this is shared across a number of parties covering the same geographical area.

Requirement 3 / 1

Involve Research, Development or Demonstration

A RIIO-1 NIA Project must have the potential to have a Direct Impact on a Network Licensee's network or the operations of the System Operator and involve the Research, Development, or Demonstration of at least one of the following (please tick which applies):

☑ A specific piece of new (i.e. unproven in GB, or where a method has been trialled outside GB the Network Licensee must justify repeating it as part of a project) equipment (including control and communications system software).

☐ A specific novel arrangement or application of existing licensee equipment (including control and/or communications systems and/or software)

☑ A specific novel operational practice directly related to the operation of the Network Licensees system

☐ A specific novel commercial arrangement

RIIO-2 Projects

☐ A specific piece of new equipment (including monitoring, control and communications systems and software)

☐ A specific piece of new technology (including analysis and modelling systems or software), in relation to which the Method is unproven

☐ A new methodology (including the identification of specific new procedures or techniques used to identify, select, process, and analyse information)

☐ A specific novel arrangement or application of existing gas transportation, electricity transmission or electricity distribution equipment, technology or methodology

☐ A specific novel operational practice directly related to the operation of the GB Gas Transportation System, electricity transmission or electricity distribution

☐ A specific novel commercial arrangement

Specific Requirements 4 / 2a

Please explain how the learning that will be generated could be used by the relevant Network Licensees

The learning will enable other GDNs to further develop their own climate change risk assessments and adaptation plans to plan a network of assets which is resilient to projected future impacts. It is envisaged that this data set will also become a common evidence base within other sectors and will be used to support reporting requirements to UK and devolved governments.

Or, please describe what specific challenge identified in the Network Licensee's innovation strategy that is being addressed by the project (RIIO-1 only)

n/a

☑ Has the Potential to Develop Learning That Can be Applied by all Relevant Network Licensees

Is the default IPR position being applied?

☑ Yes

Project Eligibility Assessment Part 2

Not lead to unnecessary duplication

A Project must not lead to unnecessary duplication of any other Project, including but not limited to IFI, LCNF, NIA, NIC or SIF projects already registered, being carried out or completed.

Please demonstrate below that no unnecessary duplication will occur as a result of the Project.

n/a

If applicable, justify why you are undertaking a Project similar to those being carried out by any other Network Licensees.

n/a

Additional Governance And Document Upload

Please identify why the project is innovative and has not been tried before

n/a

Relevant Foreground IPR

n/a

Data Access Details

n/a

Please identify why the Network Licensees will not fund the project as apart of it's business and usual activities

n/a

Please identify why the project can only be undertaken with the support of the NIA, including reference to the specific risks(e.g. commercial, technical, operational or regulatory) associated with the project

n/a

This project has been approved by a senior member of staff

☑ Yes