Forestry Commission **Proposal for funding Agreement Number CFS 13-2011-15**

FORESTRY COMMISSION
Description of the Research Project or Services

1.	**Research Purchasing Manager (C&FS)**	**Vicky West & Marcus Sangster**
	Relevant PAG	**Climate Change**

2.	**Name of FR Programme Manager (PgM) or Project Manager (PM) and staff**	**PgM: Tony Hutchings** **PMs: Andy Brunt, Kieron Doick, Carl Foster** **Staff: Richard Jinks, Jake Morris, Vicki Lawrence, Ros Bryant, Gail Atkinson, GIS officer.**
	Name of Institution/company	**FR**
	Official address	Alice Holt Lodge, Wrecclesham Farnham Surrey, GU10 4LH
	Telephone No.	
	e-mail address	
	Programme Life (years)	**4 Years**
	Start Date	**1st April 2011**
	Completion Date	**31st March 2015**
	Revision Dates	**31st March 2012/2013/2014**

3. Title of Research Project or Service

Urban Trees and Greenspace in a Changing Climate

4. Abstract of proposed research (*Summary to be used on website/FRCC etc***) (200 words)**

Climate change represents a significant threat to urban infrastructure, environmental quality and the health of city dwellers. Green infrastructure is itself at risk through greater extremes in temperature fluctuation, consequent flourishing of tree pests and diseases, drought and perceived increased risk of subsidence leading to tree removal.

There is much evidence to suggest that urban trees, and the wider green infrastructure they are a part of, can considerably improve the quality of the environment and provision of a wide range of socio-economic, health and environmental benefits. However, there is no clear system for determining the biophysical interactions, benefits, or managing potential trade-offs within a risk-benefit context, so as to optimally support the protection and sustainable regeneration of UK towns and cities.

The Urban Trees and Greenspace in a Changing Climate Programme intends to develop such a system through consolidating and building upon existing work to provide the evidence base for urban trees, definition and communication of best practice guidance, and robust assessment, evaluation and dissemination tools so that the risks and benefits

of urban tree placement can be more fully assessed by society, policy makers and planners.

Furthermore, the Programme maintains the centre of excellence which FR has developed over several decades on land regeneration practices to establish and maintain urban greenspaces on former brownfield and contaminated sites.

5. Aims and objectives (word limit 500) – up to 1500

5.1 Aim of the research

The overall aim of the proposal is: to investigate critical biophysical interactions between trees and the built environment with a view to informing urban policy, planning and practice for improving climate change adaptation via urban tree green infrastructure.

Specific aims of the programme are to:

- investigate critical biophysical interactions between trees and the built environment in a changing climate
- inform urban policy, planning and practices for improving climate change adaptation via urban tree green infrastructure
- provide authoritative guidance on species and provenance choice, and planting and management considerations for trees in the built environment
- maintain state of the art knowledge on land regeneration practices and associated monitoring and evaluation practices
- provide evidence on the role of trees in the built environment
- work closely with other programmes and disciplines (economists/social scientists/ecologists) to demonstrate wider impacts and produce third party funded integrated proposals.

Drivers

- There is a significant lack of evidence in how climate change will affect the role, impact and resilience of trees in the built environment.
- Tens of thousands of trees are felled each year in city centres as a result of perceived risk to building stability[1].
- The value of urban trees as public assets is considerable[2] yet too few urban areas have produced convincing valuations of their tree resource to give mainstream acceptance and warrant significant buy-in or investment.
- There is a growing trend of replacing large urban trees with smaller species.
- In the UK a National Audit Office document reports that funding cut-backs over the last 20 years have led to a serious decline in parks and other urban tree plantings. Public spending cuts are likely to compound this in the future.

[1] In the past five years London councils have chopped down almost 40,000 urban trees, including some more than 100 years old. Some were just old or dying but 40 per cent were removed because of insurance claims. A report commissioned by the London Assembly challenged this figure and said that only 1 per cent of tree removals were justified. (http://www.timesonline.co.uk/tol/news/environment/article3792556.ece)

[2] In London alone the value of trees is estimated at £6.4 billion. Planes, oaks, horse chestnuts and beech trees are considered the most valuable species.

- The FC is advising on, facilitating, co-ordinating, managing and supporting urban tree planting programmes through schemes such as The Big Plant, Community Forests, NHS Forest Initiative, Newlands, the London Mayor's Street Tree Initiative, Woodlands In and Around Towns, Central Scotland Green Network, 'The Plant!', Heads of the Valleys, Growth Points and Ecotowns.
- There is increasing interest from health professionals in how trees and greenspace can directly improve human health, itself under threat from climate change.
- Land regeneration and contaminated land remediation is a continuing high government priority.
- Diversion of organic waste streams from landfill represents both a risk and opportunity to the land regeneration, waste and greenspace sectors.
- Urban planners and developers in many areas (examples in Wales and England) are also actively discouraging the planting of larger tree species on the basis of 'risk of subsidence'. Large tree species can have such negative impacts if planted in the wrong place, yet when in the right place they have the potential to provide the greatest benefits. Right tree, right place principles need developing and disseminating to ensure that benefits are optimised whilst risks minimised.

In this proposal we are concerned with the critical biophysical interactions between the natural and built environment which bear directly on urban tree and climate change impacts; and land regeneration activities. FC offices and urban planners, designers and practitioners have moved beyond generalities and are asking fundamental questions about how to demonstrate, protect, enhance and maximise the positive effects of urban trees.

Research Scope and Methodology
The Programme is organised in five work areas:

Work Area 1: Resilience of urban trees to a changing climate
Climate change threatens urban trees through increased risks of a) early flushing and increasing risk of frost damage, b) heat stress c), drought stress. This WP will:
a) Establish an index of risk for the most prominent urban species
b) Assess and map the resilience of existing and planned tree stock to determine species 'suitability' for climate change induced stresses.
c) Establish provenance trials for a range of species to assess whether resilience is improved. These trials will be performed as part of urban tree-planting schemes (Supplemented where necessary with laboratory trials).

Work Area 2: Role of urban trees in regulating heat and UV exposure.
Heat and UV exposure represent a significant risk to the human population, for example >20,000 additional attributable deaths in France and the UK were caused by the heat-wave of 2003. The frequency and impacts of these events are likely to be compounded by climate change.

Heat islands form as towns and cities replace natural vegetation with paved areas, buildings and other structures. The displacement of permeable and vegetated surfaces, and trees and shrubs eliminates the natural cooling effects of evaporation, shading and evapotranspiration. Measures to reduce this 'urban heat island' effect include strategic planting of shade trees, such as on the west, south and east facing sides of buildings as well as along streets and walkways. Research has shown that a reduction of >12^{o}C in surface

temperatures of tree covered areas can be attained, but, no work has been conducted on air temperature, human thermal comfort and health. Urban trees also have an inherent shade value which is invaluable for moderating UV exposure and providing energy savings.

WP2 will examine how urban trees can best be placed in the built environment to improve such values. Results will be presented with respect to air temperature so as to inform on air quality, people's thermal comfort, morbidity and mortality risks as well as energy savings. Quantitative modelling will be combined with empirical measurement, and with building and landscape design analysis at four geographical scales: individual tree/building, street, neighbourhood, and city.

Work Area 3: Trees and water management in urban areas

It is predicted that climate change will result in increased winter and decreased summer precipitation, and that precipitation events will be more intense. These events cause severe problems in urban areas, where impermeable surfaces result in high levels of stormwater runoff, which can result in flooding. Urban greenspace can intercept rainfall, and reduce the amount of stormwater runoff by increasing the area of permeable surfaces which retain or slow the movement of water through the environment by allowing increased infiltration into the soil. WP3 will investigate and provide evidence on the way that trees, permeable surfaces and structural soils (as part of wider green infrastructure) can ameliorate against the effects of severe precipitation events.

Work Area 4: Land Regeneration of Brownfield and Contaminated Sites

This work package will maintain and expand (primarily through external funding) the FC's ability to offer best practice, facilitate and sustainably regenerate brownfield and contaminated sites to greenspaces. Current priorities include: a) establishing best practices for appropriate and effective use of emerging organic waste streams (e.g. Municipal Solid Waste derived Compost Like Output (CLO), and anaerobic digestates); b) demonstrating the establishment of biomass crops on brownfield sites; c) use of biochars for contaminated materials remediation; d) further system development and dissemination of evidence accrued from monitoring and evaluation.

Work Area 5: Knowledge Transfer

Knowledge developed and accumulated in previous work packages will be synthesised and translated (with strong input from end users) into a format that can be easily utilised by national offices, policy makers, urban and landscape planners and designers. Where appropriate, the findings from WPs 1-3 will be integrated into a GIS based framework to demonstrate to decision makers across scales and across the built environment including policy makers, RDAs, LAs, health and arboriculture professions. This work package will therefore focus on providing evidence and guidance for implementing and facilitating key findings into on-the-ground actions and delivery.

Activities will include:

- Extend and promote the *Right Tree in the Right Place* database
- Extend the evidence notes and case study series on the benefits of urban trees and GI
- Provide and disseminate guidance on genetic diversity and provenance, and the choice of climate change resistant species to use in urban areas.

- Provide guidance and support on best practice in urban woodland, planting and maintenance.

A specific component of this WP will draw upon results of the former WPs as part of a wider review to demonstrate the relative importance and value of large tree species as opposed to smaller species when planted in an urban setting.

As an early priority we will work both with GB and National Offices to ensure that Knowledge Transfer activities are clearly related to their individual strategic needs.

Dissemination activities on land regeneration aspects of work will be both expanded and maintained.

5.2 Work Areas

Please list your work Areas as shown in the table below and show how they further sub-divide. Work Areas should be individually costed and be time bound – see 13. below. Please state key desired outcomes from each work area. First two years should be detailed, the next two in outline. See also Note for this Section below.

Work Area 1	**Resilience of urban trees to a changing climate (PM Carl Foster; Tony Hutchings, Richard Jinks, Andy Brunt, Ros Bryant, Vicki Lawrence, GIS Officer (to be confirmed), collaboration/liaison with CHES & CFCC staff and programmes – Adaptation, Provenance, Tree Breeding)**
Work package 1.1	Develop a drought tolerance index for urban tree species based on cavitation, water use, water deficit; determine high risk species/soil/condition critical interactions [using desk-based research approach].
Work package 1.2	Determine use of provenance/genetic variation on enhanced drought tolerance of selected 'urban' species [Using 'real life' planting programmes]
Work package 1.3	Perform 'climate matching' of proxy urban regions and trialling to identify species and provenance that currently experience and tolerate climate similar to that projected for urban areas of the UK in the future [including Urban Heat Island effect].
Work package 1.4	Utilise scenario simulations on selected urban areas to highlight at risk areas/species under different drought scenarios and to demonstrate the associated ecological, environmental and economic risks of tree failure
Work Area 2	**Role of urban trees in regulating heat and UV exposure (PM Kieron Doick; Tony Hutchings, Richard Jinks, Andy Brunt, Ros Bryant, Vicki Lawrence, GIS Officer (to be confirmed), collaboration/liaison with CHES & CFCC staff and programmes)**
Work package 2.1	Direct assessment and demonstration of air temperature reduction afforded by trees of different species, age/size and structural classes within an urban area [following on from the 2010 successful pilot]
Work package 2.2	Utilise results of 2.1 to better parameterise existing GI and heat models and run scenarios to demonstrate heat impacts of current and planned/optimised tree planting by directive shading, evaporation and evapotranspiration.
Work package 2.4	Utilise valuation models/methodologies to demonstrate the value of trees in heat amelioration, morbidity and mortality, UV exposure and an investment/return ratio of GI intervention.
Work Area 3	**Trees and Water Management in Urban Areas (PM Andy Brunt; Tony Hutchings, Richard Jinks, Kieron Doick, Ros Bryant, Vicki Lawrence, GIS Officer (to be confirmed),**

	collaboration/liaison with CHES staff & CFCC staff and programmes)
Work package 3.1	Critically analyse the models identified in the 'Review of trees and urban water management'; Review structural soils and their potential for use in the UK
Work package 3.2	Improve parameterisation of selected models to more fully understand species, form, age and surface impacts on interception and infiltration
Work package 3.3	Establish research scenarios to determine and demonstrate impacts of current infrastructure, use of novel practices (e.g. structural soils), tree losses, expansion of infrastructure on flood prevention.
Work package 3.4	Utilise valuation models/methodologies to demonstrate both the value of trees in SUDS and an investment/return ratio of GI intervention.
Work Area 4	**Land Regeneration of Brownfield and Contaminated Sites (PM Tony Hutchings; Kieron Doick, Jake Morris, Andy Brunt, Ros Bryant, Vicki Lawrence, Frans de Leij (contractor), collaboration/liaison with Michael Wall – TD (land regeneration, M&E), and Ian Tubby (?) – BEC (SRF)**
Work package 4.1	Assessments and demonstration of emerging organic wastes (e.g. MSW dervived Compost Like Output; Anaerobic digestates) for use in greenspace establishment on brownfield land
Work package 4.2	Assessment and demonstration of biochars for the remediation of contaminated soils, spoils, and waters.
Work package 4.3	Establishment of biomass crops on brownfield sites for renewable energy, nutrient recovery, organic waste utilisation.
Work package 4.4	Determine risks (and risk mitigation) of climate change on brownfield restoration to woodland/greenspace
Work package 4.5	Disseminate findings of the contribution of Trees, Woods and Forests to the nations Quality of Life (FC England QoL Project; FC Scotland M&E Project)
Work Area 5	**Knowledge Transfer (TH, CF, KD, AB; All)**
Work package 5.1	Demonstration of the relative importance and value of large tree species as opposed to smaller species when planted in an urban setting.
Work package 5.2	Continued expansion of the Right Tree, Right Place database and Green Infrastructure Knowledge portal
Work package 5.3	Development of GIS climate scenario maps to demonstrate the impacts of climate change on urban tree populations; the benefits of tree planting to environmental improvements; potential of provenance and genetic diversity to minimise risk and maintain rewards.
Work package 5.4	Expansion of the GI Evidence Notes and Case Study Series; Land Regeneration Best Practice Guides; CLAIRE Bulletins; URGP website; promotion of the monitoring and evaluation (Methuselah) package.
Work package 5.5	Develop and disseminate a succinct package describing and promoting an urban greenspace research network

- Links will be made (and where appropriate formalised) with the Adaptation, Provenance (Tree Breeding), Ecosystem Services, and related SERG projects and programmes to ensure complimentary and synergistic working.
- Add new work areas and packages as required
- Note: 12.5% of time under Work Areas 1 to 4 will be utilised for Programme Development (Equivalent of 10% of total funding)

6. Please indicate which of the FC's 6 Climate change priority actions this work fits into

Protect what we already have	☒	Reduce deforestation	☒
Restore the world's forest cover	☒	Use wood for energy	☐
Replace other materials with wood	☐	Plan to adapt to our changing climate	☒

7. Comment on how this research will address Country Strategy needs/targets (175 words)

This research programme underpins the national forestry strategies in relation to sustainable delivery and protection of trees, woodlands and forests and their roles within climate change adaptation and resilience, green infrastructure in urban areas, quality of life and quality of place, land regeneration, community engagement, and neighbourhood renewal. Furthermore it aims not just to support current policies but to inform future policies made across government on climate change adaptation and greenspace, housing, regeneration, growth and sustainable communities.

The FC recognises, and has demonstrated, that facilitation, partnership and direct engagement within the urban environment targets areas which have the highest densities of population and can have a highly significant impact in improving the quality of place and quality of life within some of the most deprived and least greened areas of the UK. This makes the potential of the urban environment for demonstration of well-informed policy delivery highly significant to society, government and other stakeholders and partners.

All three countries have significant urban programmes, some directly involving urban and amenity trees, yet our knowledge on the placement of trees, species choice, benefits and risks, are still limited in a tree and climate change context. This research will inform and assist the national offices so as to facilitate actions which enhance, protect and promote urban trees, promote regeneration, demonstrate their value, and climate-proof both the green infrastructure itself, the urban areas they are part of, and policies which drive them.

As a priority we will work with the GB and National Offices to develop a strategy for both research outputs and dissemination (knowledge transfer) to ensure the programme meets their specific needs.

8. Identify and comment on any associated business risk of undertaking/not undertaking the research and how that will be managed

Project Risks

- Delivery of a broad interdisciplinary programme: - minimised by clear project management responsibilities, clearly defined targets and reporting timelines, and a clear understanding of milestone dependencies. Secured external funding covers large components of the work (see section 12); strategy for increasing external funding opportunities will be maintained to offer further collaborative opportunities both internally within FR/FC and wider stakeholders.

- Complex research results which may be potentially antagonistic in terms of risks vs. benefits where criteria/impacts are difficult to weight as priorities and disseminate accordingly. Risk minimised by development of a simple yet robust knowledge transfer methods employed in consultation with users.
- Poor engagement and dissemination with key policy and delivery bodies. Minimised through formation of a project stakeholder group made up of representatives from FC and key external organisations; further supported by the wider URGP.

Risks of not undertaking the project

- Insufficient scientific evidence base excludes the inclusion of vital information relating to urban trees, green infrastructure protection and promotion, and climate change adaptation within policy and delivery plans at national, regional and local levels.
- The FC makes poor policy or business decisions and/or is unable to receive or give quality advice, or act as an effective advocate or facilitator of urban trees.
- Lack of provision, co-ordination and dissemination of urban tree expertise, research and advisory knowledge would result in the FC missing a significant opportunity to demonstrate and maintain its central role as a leading advocate of climate change adaptation, land regeneration, and sustainable urban greenspace creation and management.

9. Research impact (economic, social, or biodiversity)

Who will benefit from this research? Society, public sector, industry, charities, academia
How will they benefit from this research? Society will benefit if green infrastructure is protected and enhanced; through reduced impacts of heat and flood events; economic savings in post event clean-up; energy savings through well-positioned green infrastructure; reduced dereliction leading to socio-economic revival of places; improved health and well-being; better use of public resources through better planning; reduced spending in-view of clean-up costs of disaster events and contaminated sites; better protection of a significant ecological resource; removal of contamination; expansion of green networks.
What will be done to ensure that they have the opportunity to benefit from this research? Knowledge will be transferred at a range of technical levels from peer review papers through to public documents to raise awareness. FR will support both the GB and the National Offices in ensuring maximum take-up of research findings by national through to local levels.
Potential for innovation and new markets? Potential development of modelling IP; remediation techniques; waste utilisation/minimisation.

10. Communication Strategy

Publications:

- **Expand on the Green Infrastructure Evidence Note Series as 'Research Notes'**
- **Continue the Green Infrastructure Case Study Series**

Reports: • **Minimise grey literature reports.** • **Annual report demonstrating milestone achievement towards the aims of the proposal.** • **Annual report describing externally funded achievements**
Seminars/conferences: • **Present at a selection of key land regeneration conferences e.g. Brownfield EXPO, Sustainability Live, CIRIA Brownfield Conference** • **Present at a selection of key urban conferences e.g. Trees in the Built Environment**
Decision support systems: • **Expand and further promote the Right Tree Right Place database** • **Demonstrate the UK use of iTree and Stratum** • **Refine the use of UFORE for use in the UK context**
Website: • **Update FR Land Regeneration and Urban Greenspace webpages in collaboration with SERG, pests and diseases, and ecology** • **Expand and update the URGP website to further promote the benefits of GI**
Peer review papers: • **Publish in a range of high impact environmental journals e.g. Environmental Pollution, Urban Forestry and Urban Greenspace, Arboricultural Journal etc.**

11. Under government survey control procedures, Ministerial approval must be sought before statistical surveys of businesses or local authorities can proceed. Please indicate any intention to carry out a survey.

Yes ☒ No ☐ • If yes please give brief details Perhaps..... we need data on current urban tree species, size, location etc. So far we have managed to use FC offices and third parties to collate such data.

12. Details of support agreed or to be sought from funding bodies for project (*including in-kind support)*

13. Resources (times and fees) requested from the Forestry Commission

14. Deliverables and associated costs to Forestry Commission

Work Area number	Output	Year 1				Year 2				Year 3				Year 4				Output	Total Cost
		Q 1	Q 2	Q 3	Q 4	Q 1	Q 2	Q 3	Q 4	Q 1	Q 2	Q 3	Q 4	Q 1	Q 2	Q 3	Q 4	Unique Identifier	
1	**Resilience of urban trees to a changing climate**																		
1.1	Develop a drought tolerance index for urban tree species based on cavitation, water use, water deficit; determine high risk species/soil/condition critical interactions. **Output 1.1.1: Complete literature review to develop a drought tolerance index for urban trees** **Output 1.1.2: Write BPG based on 1.1.1 on choosing drought tolerance trees**			**1**			**2**												
1.2	Determine use of provenance/genetic variation on enhanced drought tolerance of selected species **Output 1.2.1 Complete literature review of existing provenance/genetic variation and drought**					**1**													
1.3	Perform 'climate matching' of proxy urban regions and trialling to identify species and provenance that currently experience and tolerate climate similar to that projected for urban areas of the UK in the future [including Urban Heat Island effect]. **Output 1.3.1 Design experimental work to assess the effect of drought** **Output 1.3.2 Establish provenance trials** **Output 1.3.3 Monitor and assess trials plus annual interim reports** **Output 1.3.4 Scientific paper on drought**				**1**	**2**			**3**				**3**			**3**	**4**		

	resilient and drought susceptible provenances																		
1.4	Utilise scenario simulations on selected urban areas to highlight at risk areas/species under different drought scenarios and to demonstrate the associated ecological, environmental and economic risks of tree failure **Output 1.4.1: Produce a predictive model linked to a GIS based DSS** **Output 1.4.2: Scientific paper cover the model's development**										**2**	**1**							
2	**Role of urban trees in regulating heat and UV exposure**																		
2.1	Assessment of air temperature reduction afforded by trees within an urban area [following on from the 2010 successful pilot]. **Output 2.1.1: Research note aimed at planners and practitioners on current state of knowledge** **Output 2.1.2: Establish experimental plots** **Output 2.2.3: Research note** **Output 2.2.4: Scientific paper**		**1**			**1**				**1**	**2**	**3**						
2.2	Utilise results of 2.1 to better parameterise existing GI and heat models and run scenarios to demonstrate heat impacts of current and planned/optimised tree planting												**1**			**2**			
2.4	Utilise valuation models/methodologies to demonstrate the value of trees in heat amelioration, morbidity and mortality, UV exposure and an investment/return ratio of GI intervention.													**1**					
3	**Trees and Water Management in Urban Areas**																		
3.1	Critically analyse the models identified in the 'Review of trees and urban water				**1**														

	management'; Review structural soils and their potential for use in the UK **Output 3.1: Structural soils review (internal report), to be used as part of introduction to paper on structural soils after fieldwork**																	
3.2	Improve parameterisation of selected models to more fully understand species, form, age and surface impacts on interception and infiltration **Output 3.2.1: Design and implement experimental work to assess top 5 UK urban tree species for a) interception b) infiltration capacity and c) reducing runoff** **Output 3.2.2 : Scientific paper based on results from output 1 above**													**1**		**2**		
3.3	Establish research scenarios to determine and demonstrate impacts of current infrastructure, use of novel practices (e.g. structural soils), tree losses, expansion of infrastructure on flood prevention. **Output 3.3.1: Research note (possible scientific paper)**								**1**									
3.4	**3.4.1. Utilise valuation models/methodologies to demonstrate both the value of trees in SUDS and an investment/return ratio of GI intervention.**														**1**			
4	**Land Regeneration of Brownfield and Contaminated Sites**																	
4.1	Assessments and demonstration of emerging organic wastes for use in greenspace establishment on brownfield land **Output 4.1.1: MSW derived Compost Like** **Output 4.1.2: Anaerobic digestates (subject to external funding – timing to be confirmed)**																	
4.2	Assessment and demonstration of biochars for						**1**						**2**					

	the remediation of contaminated soils, spoils, and waters. **Output 4.2.1: Patent** **Output 4.2.2 Peer review paper**																	
4.3	Establishment of biomass crops on brownfield sites for renewable energy, nutrient recovery, organic waste utilisation **Output 4.3.1 Establish plots** **Output 4.3.2: Evidence note** **Output 4.3.3: Peer review paper** **(subject to external funding – timing to be confirmed).**																	
4.4	Determine risks (and risk mitigation) of climate change on brownfield restoration to woodland/greenspace **Output 4.4.1 Peer review paper** **Output 4.4.2 BPG/Evidence Note**										**1**		**2**					
4.5	Disseminate findings of the contribution of Trees, Woods and Forests to the nations Quality of Life (FC England QoL Project) **Output 4.5.1: Final report on QoL** **Output 4.5.2: Webinar**	**1**	**2**															
5	**Knowledge Transfer**																	
5.1	Demonstration of the relative importance and value of large tree species as opposed to smaller species when planted in an urban setting. – **Output 5.1.1: evidence note** **Output 5.1.2: peer review paper**							**1**		**2**								
5.2	Continued expansion of the: **Output 5.2.1: Right Tree, Right Place database** **Output 5.2.2: Green Infrastructure Knowledge portal**			**1**	**2**		**1**	**2**			**1**	**2**			**1**	**2**		
5.3	Development of GIS climate scenario maps to:								**1**				**2**			**3**		

	Output 5.3.1: demonstrate the impacts of climate change on urban tree populations; Output 5.3.2: the benefits of tree planting to environmental improvements; Output 5.3.3: potential of provenance and genetic diversity to minimise risk and maintain rewards.																	
5.4	Expansion of the: GI Evidence Notes and Case Study Series; Land Regeneration Best Practice Guides CLAIRE Bulletins; URGP website; promotion of the monitoring and evaluation (Methuselah) package. **All as required and after consultation with the Programme Steering Group**																	
5.5	Develop and disseminate a succinct package describing and promoting an urban greenspace research network						**x**											
5.6	Annual report to CFS on CFS funded research			**x**				**x**			**x**				**x**			
5.7	Annual report to CFS on externally funded research			**x**				**x**			**x**				**x**			

Signed…….Research Provider/HOD

Date……..

Signed…….C&FS Advisor

Date……..

Proposal Approved  CFS Date 31st August 2011

15. Agreed Changes

Description of change:
Signed……..Research Provider Date……. Signed……..C&FS Date…….
Signed……..Research Provider Date……. Signed……..C&FS Date…….
Signed……..Research Provider Date……. Signed……..C&FS Date…….

16. Detailed communications plan:
Year 1
Year 2
Year 3
Year 4