Idea Template
Highlight Topic

Your idea should be written in language that is clear to a broad section of the NERC community and be up to 2 sides of A4 (not including the classification questions) using size 11 font and margins no less than 2cm.

Title: Rain Rivers Reservoirs – Influences and Linkages over Decades to Millennia

Statement of the idea:

Rain Rivers and Reservoirs (RRR) are undoubtedly linked in the terrestrial environment but in a scientific respect the effects of Rain (Civil Engineers, Hydrologists), Rivers (Geomorpholgists, Geobiologists, Environmentalists, Soil Scientists, Social Scientists) and Reservoirs (in the sense of surface and aquifer; Hydrologists, Hydrogeologists, Geologists, Geochronologists) are not necessarily addressed in a continuum over timescales of 50 to 5000 years. By tackling problems associated with fluvial source-to-sink in a holistic way whilst focusing on various linked catchments (such as the Amazon and Pantanal), in a virtual catchment environment, we can help define cross-disciplinary research agenda and protocols. The effective linking of the deep historical, palaeoclimatic, Holocene geological records frames new scientific challenges (perhaps by exploitation of big data) linking rivers and their floodplains. The link between the 3R's is sediment - and so production, transport and accumulation of sediment and its wider impacts are of strategic importance. New measurement technology feeding in to high resolution temporal models over longer time-scales, and for bigger spatial models over shorter timescales. This project is a step on the way to developing an integrated digital catchment model. As climate change forces changes on rivers, the resulting societal impacts are going to be increasingly significant.

Research Question(s):

Series of research issues coming from the first RRR workshop in Sao Paulo (Sept 2015) with specific relevance to Brazil which form the basis of this RRR HT

1. The River: Scale (in)dependence of rivers.

Knowledge of river bed dynamics is derived from small rivers and flumes, and may not be appropriate for large systems (such as the Amazon which commonly has contrasting behaviour)

- Large river dunes are not the same as small dunes, which affects roughness predictions (flood heights)
- Large river bar & bank dynamics differ due to large magnitudes of discharge and sediment transport, with large dams & floods creating singular legacies
- Large-river deposits can be used to test & constrain the validity of small-river knowledge
- World-wide geological preservation is different for large rivers
- Impact water transport and communities along river banks

2. The Floodplain: Wetlands: sensor for climatic variability

Use of past and present wetlands as analogues for future changes.

- Importance of Wetlands: Biodiversity, Ecosystem services
- Identifying geological record of change
- Understanding current wetland dynamics
- Predicting potential for future ecosystem change
- Sustainability of farming and tourism industries

3. The Flooding: Multi-level management system to Flood Resilience

- Understanding flood frequency under changing climate (Big Data)
- Risk Assessment and Management, Risk reduction
- Optmization of Flood Control Infrastructure
- Multi-level and Multi-Purpose Flood Forecasting and Warning
- Comunicating flood Risk

Challenges:

Benefiting from natural resources: Better river/floodplain measurement and modelling, river management.

Resilience to environmental hazards: Better Flood Plain Modelling, planning against longer term trends and shocks.

Managing environmental change: Changing water courses, sedimentation.

UK Relevance: The Sherwood Sandstone in the UK is a major aquifer in fluvial sediments http://www.bgs.ac.uk/research/engineeringGeology/ggpp/sherwoodSandstoneGroup.html and better links of how microstructure relates to the channel/floodplain processes enable better models for groundwater, pollution and CO2 storage studies. Sherwood Sandstone has calcrete which links into the wetland study.

Capacity:

UK has good research base in palaeoclimate, fluvial sedimentology, geochemistry, civil engineers and some of the other disciplines that would be involved

Compliments shorter term climate modelling (El Nino effects, etc) with Holocene studies focusing on the terrestrial fluvial environment

Supports Lyell Centre development plans

Capacity building in Brazil with direct UK support (future expansion through Newton (ODA Funding).
Complimentary inks to other NERC-Funded projects in India (Indus) and Vietnam (Mekong)
UK relevance – Triassic fluvial sandstone aquifers and existing work on these in water, oil and CO2 storage

How the idea originated and has been developed:

HT Idea developed primarily through two key workshops (with the researchers (primarily ECR's attending the first workshop forming the bulk of the organizing committee for the second):

1. *RRR2015 Sao Paulo. Workshop primarily for Early Career Researchers funded by British Council from UK (Heriot-Watt, Bristol, Newcastle, Southampton, Hull, Leeds, Napier) and Brazil Universities (USP, UNICAMP) along with the BGS and CPRM (Brazilian Geological Survey). This workshop produced the research topics identified above. More details* http://www.hw.ac.uk/news/1st-rain-rivers-and-reservoirs-workshop.htm
2. *RRR2016 Edinburgh Workshop as part of The Geological Society's Year of Water supported by Heriot-Watt, BGS, ICE, Telford Institute and UK academic community. This workshop will have a specific session (2-4 hours) to sandpit the RRR HT Idea in preparation of bidding for the research themes/projects. More details of the workshop:* http://www.geolsoc.org.uk/RainRiversReservoirs

The focus of RRR was initially inspired by the consideration of the disciplines brought together by development of the Lyell Centre as a joint BGS/Heriot-Watt Initiative and consideration of the combined skills base presented by that opportunity.

Identify why this idea is a HT:

Three closely linked projects along a 10-5000 year timescale (ca., £1,300,000 per project with 2 UK Universities/Institutes working together with a Brazilian University, ideally ECR) coming together for annual meetings to interchange results, look for synergies and to scope out the development of a virtual digital catchment (river/floodplain/city system) that could effective link such diverse projects together in the future.

1. River: Scale (in)dependence of rivers (10-5000yrs). *(nominally led by Southampton Univ.)*
2. Floodplain: Wetlands: sensor for climatic variability (50-5000years) *(Heriot-Watt Univ.)*
3. Flooding: Multi-level management system to Flood Resilience (10-50yrs) *(Newcastle U.)*

Potential additional leveraged funders: EPSRC, AHRC, SSRC; in Brazil Newton Fund, CNPq, FAPESP, FAPMIG, FAPERJ, CONFAP; an European Commission, World Bank will allow the community represented in this proposal to take forward the longer term funding of the digital catchment model.

Submitter and classification questions (responses in this section will be used by the office to analyse the ideas. SPAG will not see submitted details, but will be informed of the nature of the ideas generation)

Submitter details: (name, organisation, email address) Patrick Corbett, Heriot-Watt University, p.w.m.corbett@hw.ac.uk		
Are you responding as an individual or on behalf of a group?	Individual	
	Group	Group
If group, other individuals involved: (name, organisation) UK Universities: Wagner, Corbett, Pla-Pueyo, Adeloye, Periera, Haynes (Heriot-Watt), Sinclair (Edinburgh), Barreto (Napier), Hackney, Reesink (Southampton), Liang (Newcastle), Guan (Leeds), Jenkins, Pu (Bradford), UK Geological Survey: Campbell (BGS) Brazilian Universities: USP, UNICAMP, UFPE, UFRGS, UNESP, UNIFESP. Brazilian Geological Survey: CPRM		
Which part of the environmental science community do you consider the idea to be mainly from?	Research base	X
	Public sector	
	Industry/commercial	
	Third sector	
	Other (please specify)	
Indicate the percentage relevance to one or more of the NERC challenges (multiples of 5%, totalling 100%)	Resilience to environmental hazards	35
	Benefitting from natural resources	30
	Managing environmental change	35
Indicate percentage relevance to the scientific areas in which your idea falls (multiples of 5%, totalling 100%)	Atmospheric	
	Earth	30
	Freshwater	35
	Marine	
	Terrestrial	35
Indicate the percentage relevance to any of the secondary classifications appropriate to your idea (multiples of 5%)	Earth observation	50
	Polar	
	Interdisciplinary (beyond NERC remit)	50

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Date:	ID: