Section A

Institution: University of St Andrews

Unit of Assessment: UoA 14: Geography and Environmental Studies

Title of case study: Enhancing resilience, improving livelihoods and protecting carbon stocks of intact tropical peatlands in the Amazon and Congo basins

Period when the underpinning research was undertaken: 2010 – 31 December 2020

Details of staff conducting the underpinning research from the submitting unit:

Name(s):	Role(s) (e.g. job title):	Period(s) employed by submitting HEI:
Nina D. Laurie	Professor	01 February 2016 - present
Ian. T. Lawson	Senior Lecturer	01 August 2014 - present
Katherine H. Roucoux	Senior Lecturer	01 August 2014 - present

Period when the claimed impact occurred: 2014 - 31 December 2020

Is this case study continued from a case study submitted in 2014? No

Section B

1. Summary of the impact (indicative maximum 100 words)

Our peatlands research group (Peatlands@St Andrews; P@StA) has played a leading role in the international research effort to understand tropical South American and African peatlands from an interdisciplinary, comparative perspective. Our research has shifted perceptions of the importance of peatlands in several political spheres and has led to: (1) the shaping of **an international environmental agreement** (the 2018 Brazzaville Declaration); (2) **intergovernmental climate mitigation investment** (e.g. the 2015 Green Climate Fund project); and (3) **Peruvian government actions regarding cultural and environmental** policy (National Cultural Heritage status awarded to indigenous textiles in Peru). Through these changes, our research has contributed to ensuring the **long-term protection of carbon stocks** in intact peatlands in the Amazon and Congo Basins, and has brought **environmental, ecological, and cultural benefits** to communities living around them.

2. Underpinning research (indicative maximum 500 words)

Lowland tropical peatlands play a critical and, until recently, under-appreciated role in the global climate system. The largest areas of peatlands in the tropics are in southeast Asia, western Amazonia, and the Congo Basin, all of which have accumulated large amounts of carbon below ground. The resources provided by these ecosystems also support the livelihoods of the rural communities living around them. Southeast Asian peatlands have been studied scientifically for many decades but are now extensively degraded and heavily affected by resource exploitation. Amazonian and Congolese peatlands, by contrast, remain largely intact, but little understood. Research by the St Andrews team has been instrumental in increasing understanding of and protecting these important, vulnerable places.

Our tropical peatland research has four key strands. The first has been to assess **the carbon storage of Peruvian peatlands. Roucoux** and **Lawson** used their expertise in palaeoecology and ecology (in collaboration with **Baker**, Leeds) to understand how Peruvian peatlands formed, typically thousands of years ago, and how they have subsequently developed to the present day. This fundamental research on peatland ecology and carbon accumulation was subsequently applied in peatland mapping, in collaboration with **Mitchard**, Edinburgh [R1]. In Amazonia, our estimate of 3,140,000,000t of carbon, about half as much as is stored above-ground in tree biomass in the whole of Peru, remains the most authoritative estimate of the amount of carbon

stored by these peatlands. At 35,000km^2, about the size of Belgium, they are the largest known in Amazonia [R1].

Building on the skills and techniques developed in Peru and in collaboration with Dargie *et al*. (Leeds), **Lawson** then co-led a second strand of research which **discovered, mapped and quantified the carbon storage of previously unrecognized peatlands in the Congo Basin** [R2]. This work revealed the existence of extensive, previously unrecognised peatlands: a swamp forest of 145,000km^2, an area slightly larger than England, which stores an estimated 30,000,000,000t of carbon. This is equivalent to 3 years' global anthropogenic carbon emissions, and the resulting paper, published in *Nature*, demonstrated the importance of our research in this area [R2].

The third strand of peatland research developed from **Roucoux's** concern to **understand the vulnerability of tropical peatlands** [R3]. The team undertook the first assessment of threats to the intact tropical peatlands in Peru, whilst also identifying opportunities for conservation, such as investment in carbon conservation schemes and establishing national nature reserves. They subsequently applied a similar approach to Congolese peatlands [R4].

This work prompted a fourth strand of research investigating **the value of Peru's peatlands to local communities from a socio-cultural perspective,** with **Laurie** bringing expertise in development, gender, and cultural geography to new projects on the human communities living in and near peatlands [R5]. In 2019, the team demonstrated for the first time that Peru's peatlands are highly valued for their resources by local communities, and that these resources are being depleted [R6]. By securing the designation of "National Cultural Heritage status" for the craft work produced by these peatland communities, the team have not only increased knowledge of these unique peatland environments and the people who live there, but also helped to put in place mechanisms to protect them.

3. References to the research (indicative maximum of six references)

All the underpinning research was carried out by University of St Andrews-based researchers as part of NERC, Scottish Funding Council, British Council Newton Fund and/or Leverhulme Trust funded research projects and has been published in highly regarded, peer-reviewed academic journals. Our publications have been highly cited and our top-cited paper is Dargie et al. (2017) [R2]. The publications listed have been selected to support the points presented above but are representative of a larger body of work.

[R1] Draper, F.C.H., **Roucoux, K.H., Lawson, I.T.**, Mitchard, E.T.A., Honorio Coronado, E.N., Lahteenoja, O., Torres Montenegro, L., Valderrama Sandova, E., Zaráte, R., Baker, T.R., (2014) The distribution and amount of carbon in the largest peatland complex in Amazonia. *Environmental Research Letters*. DOI: 10.1088/1748-9326/9/12/124017

[R2] Dargie, G.C., Lewis, S.L., **Lawson, I.T**., Mitchard, E.T., Page, S.E., Bocko, Y.E. and Ifo, S.A., (2017). Age, extent and carbon storage of the central Congo Basin peatland complex. *Nature*, 542(7639), p.86. DOI: 10.1038/nature21048.

[R3] **Roucoux, K.H., Lawson, I.T.**, Baker, T.R., Del Castillo Torres, D., Draper, F.C., Lähteenoja, O., Gilmore, M.P., Honorio Coronado, E.N., Kelly, T.J., Mitchard, E.T.A. and Vriesendorp, C.F. (2017). Threats to intact tropical peatlands and opportunities for their conservation. *Conservation Biology*, 31(6), pp. 1283-1292. DOI: 10.1111/cobi.12925

[R4] Dargie, G.C., **Lawson, I.T.**, Rayden, T.J., Miles, L., Mitchard, E.T., Page, S.E., Bocko, Y.E., Ifo, S.A. and Lewis, S.L., (2018). Congo Basin peatlands: threats and conservation priorities. *Mitigation and Adaptation Strategies for Global Change*, pp.1-18. DOI: 10.1007/s11027-017-9774-8.

[R5] Schulz, C., Brañas, M.M., Pérez, C.N., Villacorta, M.D.A., **Laurie, N., Lawson, I.T.** and **Roucoux, K.H.**, (2019). Uses, cultural significance, and management of peatlands in the Peruvian Amazon: Implications for conservation. *Biological Conservation*, 235, pp.189-198. DOI: 10.1016/j.biocon.2019.04.005

[R6] Schulz, C., Brañas, M.M., Pérez, C.N., Del Aguila Villacorta, M., **Laurie, N., Lawson, I.T. and Roucoux, K.H.,** 2019. Peatland and wetland ecosystems in Peruvian Amazonia. *Ecology and Society*, 24(2), 12. DOI: 10.5751/ES-10886-240212

4. Details of the impact (indicative maximum 750 words)

Since 2014, the P@StA team has worked with partners worldwide to map intact tropical peatland ecosystems and analyse their CO_2 stocks, whilst using this knowledge to ensure their successful long-term protection. As a result, the team's work has contributed to: (1) **the development of an international environmental agreement**, the 2018 Brazzaville Declaration; (2) **intergovernmental climate mitigation investment**, e.g. the 2015 Green Climate Fund project; and (3), **changes in government policy and actions regarding cultural and environmental development**, by the awarding of National Cultural Heritage status to indigenous textiles in Peru.

1) Shaping an international environmental agreement

In the Congo Basin, our discovery and mapping of peatlands the size of England and calculation of the amount and distribution of CO_2 stored [R2] had a substantial impact on international environmental policy, leading to the signature of the Brazzaville Declaration. The findings were shared in two important 2017 UNEP reports, 'Smoke on Water: countering global threats from peatland loss and degradation' [S1] and 'Carbon, biodiversity and land-use in the Central Congo Basin peatlands' [S2]. *"This work provided the basis for efforts by UNEP and other members of the Global Peatlands Initiative including the the CongoPeat project, to brief the governments of the Republic of Congo, Democratic Republic of Congo and Indonesia (three nations with the largest areas of tropical peatland) on the critical importance of keeping these peatlands intact"* [S3, Principal Technical Specialist, United Nations Environment Programme – World Conservation Monitoring Centre]. As a result of these communication efforts, the three countries developed and ratified the **Brazzaville Declaration in 2018, an inter-governmental agreement to protect the central Congo basin peatlands** [S4]. This agreement is of great importance because it specifically protects the newly discovered peatlands in the Congo Basin from unregulated land use change through *"the establishment of a transboundary collaboration agreement to preserve the future of these valuable natural peatlands and their ecosystem services, with the participation of communities and local stakeholders"* [S4, p. 8]. By preventing the imminent threat of unregulated exploitation, the largest intact tropical peatland complex in the world is protected from the drainage and degradation which has been the fate of many peatlands elsewhere. This means that "*the equivalent of 3 years of global CO_2 emissions [R2], or 20 years of US emissions, are prevented from being released into the atmosphere where that carbon would contribute significantly to global warming*" [S3].

2) International climate mitigation investment and improvement

By working with regional and national policy-shapers including NGOs, regional and national government bodies, by establishing stakeholder networks [S5], and by generating international press coverage through direct engagement with environmental journalists [S6] the St Andrews team has **changed government policy and public discourse about the impact of peatlands on climate change mitigation and global biodiversity** and **improved the livelihoods of poor and marginalised communities.**

The Peruvian Ministry of Environment used the team's research to develop the first formal national definition of 'peat', and also as a basis for the first technical guide (Maldonado, M. & Peña, N. (en revisión) Propuesta de Guía de Identificación de turberas peruanas. Dirección de Diversidad General de Diversidad Biológica del Ministerio del Ambiente) [S7, p. 2] to enable practitioners to identify and describe peatlands across Peru [S8]. The guide is underpinned by 5 of our publications including [R1 and R6]. The commissioning of this guide demonstrates the Peruvian government's commitment to protecting its national peatland CO_2 store, habitats and biodiversity, newly recognized largely because of our work. The lead scientist commissioned by the Ministry of Environment to produce the technical guide states that the team's work on peatlands has been *"necessary to establish proper policies about peatland conservation and management in the country […] The St Andrews peatlands research team have undoubtedly played a significant role in this increasing awareness and knowledge of the ecology, hydrology, distribution and long-term*

history of Peruvian peatlands in the Amazon, as well as about the close relationship of indigenous communities with these ecosystems" [S8, Director Plant Ecology Division, CORBIDI, Peru].

Our work [R1] also supports investment in carbon conservation and sustainable development more widely, and our results have leveraged substantial international funds to enhance climate resilience and improve livelihoods in the Peruvian Amazon in the **first UN Green Climate Fund (GCF) sustainable development project.** A successful application by Peru's National Parks trust to the UN Green Climate Fund [S9] in 2015, entitled, '*Building the Resilience of Wetlands in the Province of Datem del Marañón, Peru'* (USD9,100,000), is enhancing the climate resilience and livelihoods of 120 indigenous wetland communities (around half of the total number of indigenous communities in this province) by enabling economic development that is compatible with environmental protection, while reducing greenhouse gas emissions from deforestation and peatland degradation [S9]. "*The project will avoid deforestation of an estimated 4,861 hectares [48.61km^2] of palm swamp and terra firme forests … and enhance resilience and conservation of 343,000ha [3,430km^2] of peatlands and forest*" [S10, p. 1]. Without the justification provided by our research, specifically our peatland mapping of the region concerned [R1], the project would have been ineligible for this funding. Thus far, the GCF project has succeeded in establishing new international commodity chains linking remote indigenous Amazonian communities to international markets, by "*support[ing] bio-businesses, including for business plans, marketing and management, equipment and supplies, and the development of solar energy for operations*" [S10, p. 1]. For example, the project supported the development of a new business, a legally inscribed indigenous association, involving 5 communities, of around 60 people each, that produce organic-certified oils from palm fruits. These high-quality oils are since being produced to strict sustainability and organic criteria and are sold to a fair-trade NGO in Lima, which markets the oils to international customers. Through this kind of intervention, the project is improving peatland community livelihoods by providing more reliable and sustainable incomes [S11].

3) Underpinning government policy and actions regarding cultural development

Members of the team inspecting Urarina textiles during collaborative fieldwork, Chambira Basin Feb. 2019 (Photo: N. Laurie).

Based on our research on the cultural value of peatlands [R5, R6], the Peruvian Ministry of Culture awarded **National Cultural Heritage Status** in 2019 to the textiles produced by the indigenous Urarina [S12]. The Peruvian Ministry of Culture's Director of Intangible Heritage recognised that the team's research documented the Urarina's desire to have their textiles, which are made from peatland plant fibres, formally valued as cultural heritage [S12]. Having National Cultural Heritage Status is important for Peruvians, more specifically, the Urarina indigenous people, who number between approximately 4,000 and 6,000 (individuals), because "*recognition at the national level, of the value of products made by Urarina craftswomen, of their skill and capacity to produce useful and beautiful products, [offers] these communities a stronger voice in Peruvian society, from which [they have been] marginalised"* [S12].

5. Sources to corroborate the impact (indicative maximum of ten references)

[S1] UNEP 2017 report *'Smoke on Water: countering global threats from peatland loss and degradation'*, our work is cited on p.11, 26, 29, 50, 63, 65.

[S2] UNEP 2017 report '*Carbon, biodiversity and land-use in the Central Congo Basin peatlands'*, our work is cited on p. 3.

[S3] Supporting letter from the Principal Technical Specialist, United Nations Environment Programme – World Conservation Monitoring Centre].

[S4] The Brazzaville Declaration (03/18). The quote is from p. 8.

[S5] Director of the Forests Group at Instituto de Investigaciones de la Amazonía Peruana, Iquitos (IIAP), Peru (ddcastillo@iiap.gob.pe).

[S6] Major international news outlets (BBC Online, New York Times, The Guardian), and in the environment and science media (Mongabay Latam, Yale Environment 360, Eco-Business, The Conversation).

[S7] Opening pages of Maldonado, M. & Peña, N. (in revision) Propuesta de Guía de Identificación de turberas peruanas. Dirección de Diversidad General de Diversidad Biológica del Ministerio del Ambiente. 46pp.

[S8] Supporting letter from, Director Plant Ecology Division, CORBIDI, Peru.

[S9] Successful funding proposal to the Green Climate Fund

[S10] Green Climate Fund Project summary for Building the Resilience of Wetlands in the Province of Datem del Marañón, Peru: https://www.greenclimate.fund/project/fp001

[S11] De Jongh, T. (2018) Indigenous reshaping of institutions to govern forest resources in the Peruvian Amazon: A case study of the Awajún community Chapís in Datem del Marañón. MSc Thesis, University of Wageningen, Netherlands. pp. 43 – 53. Research is cited on pp. 3 and 31; the project is referred to throughout.

[S12] Supporting letter from the Head of Intangible Heritage, Ministry of Culture, Peru.