BOOK OF ABSTRACTS

"DEVELOPING INTERNATIONAL COLLABORATIONS TO ADDRESS FIRE AND OTHER CONSERVATION ISSUES IN CENTRAL KALIMANTAN, INDONESIA"

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Borneo Nature Foundation

UNIVERSITY OF EXETER

THE BURNING ISSUE: FIRE AND CONSERVATION IN CENTRAL KALIMANTAN

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The peatlands and lowland forests of Central Kalimantan, Indonesia provide a multitude of important ecosystem services. This includes acting as a major terrestrial carbon store, preventing fire, maintaining water quality and quantity, providing timber and non-timber forest resources (including fish), plus their role in local culture, and as home for a huge variety of flora and fauna, many of which are globally threatened. Despite this importance, these ecosystems and the benefits they provide are currently at high risk, owing to unsustainable peat and forest management practices, in particular peat drainage and fire starting, conversion to drainage-based agriculture, plus timber and wildlife extraction. Among other impacts, this increases the frequency and severity of peat/forest fires, thus degrading peat, destroying forest and crops, releasing vast amounts of carbon and severely compromising local air quality. This has negative repercussions for both people and wildlife. While the causes and impacts of these fires are becoming better understood, many gaps in our knowledge remain, and workable solutions to the problem are thin on the ground.

The Borneo Nature Foundation (BNF) was established in 1999, with a mission to maintain and enhance Kalimantan's ecosystems, biodiversity and the benefits that these provide to human communities. Working with a variety of partners in Sabangau, Rungan, Murung Raya, Palanka Raya and villages throughout Central Kalimantan, we achieve this through developing, implementing and supporting locally-led conservation, research, outreach and education initiatives. As one of the gravest threats facing the region, understanding, preventing and mitigating fire and its associated impacts is a key focus of our work. In this collaborative workshop with the University of Exeter, we aim to bring together a cohort of friends and colleagues to discuss the causes, impacts, potential solutions and associated knowledge gaps relating to the "fire problem", from both an ecological and social perspective. We hope that this will enable potential research collaborations and research development/funding opportunities to be identified, thus developing new and strengthening existing partnerships to strengthen conservation efforts in the region.

BOLSTERING PEATLAND RESTORATION IN INDONESIA THROUGH 3RS APPROACH

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The Government of Indonesia affirms its serious endeavour to restore its degraded peatlands through the enactment of the Presidential Regulation Number 1 of 2016 concerning the establishment of the Peatland Restoration Agency (*Badan Restorasi Gambut*). The agency is tasked

to coordinate and facilitate restoration of degraded peatland of a minimum two million hectares located in seven provinces namely South Sumatra, Riau, Jambi, West Kalimantan, Central Kalimantan, South Kalimantan, and Papua during the period of 2016-2020.

To carry out and achieve its ambitious target, the Peatland Restoration Agency has developed a restoration plan based on landscape or peatland hydrological units (PHU) as well as adopting the 3Rs approach to realise its restoration target. The 3Rs stand for **R**ewetting of peatland (**R1**), **R**evegetation of bare peatlands (**R2**), and **R**evitalization of local livelihoods (**R3**). Rewetting of peatlands is implemented through the construction of peatland rewetting infrastructures such as canal blocking, canal backfilling, and deep wells; meanwhile, bare peatland revegetation is done though the promotion of natural regeneration, transplantation of seedlings, and enrichment planting. Finally, revitalization of local livelihoods is developed on the bases of land-based, water-based and ecosystem-services based. The R3 serves as supporting system to enhance implementation of both R1 and R2. This paper aims at outlining the current strategy and approach that has been implemented by the Peatlands Restoration Agency in implementing degraded peatland restoration in Indonesia.

THE TROPICAL PEATLAND FIRE DYNAMIC

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Peatlands play a significant role in the global carbon cycle, but they are increasingly at risk of destabilisation. Nowhere is the shift from long-term carbon storage to short-term carbon source happening more rapidly than in SE Asia. The links between deforestation, drainage and peat mineralisation and fire are now well established. Likewise, we have a developing understanding of the implications of forest and peatland fires for both the scale of carbon emissions to the atmosphere and their implications for human health, biodiversity and ecosystem and livelihood resilience. What is now urgently needed are land management options to reduce future fire risk as part of wider peatland and livelihood management strategies. Critically, all stakeholders need to be accept that peatland resilience to fire at the landscape scale has altered and that land management practices must adapt accordingly. At the same time, there are valuable lessons to be learnt from the SE Asian fire dynamic that could become increasingly relevant to northern peatlands in a warming world.

FLAMING PEAT: A PALAEOECOLOGICAL PERSPECTIVE ON BURNING IN TROPICAL PEATLANDS

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Fires within degraded tropical peatlands are now commonplace; whilst fires within *intact* peat swamp forests are thought to be rare events. Yet little is known about the long-term natural fire regime in these landscapes. Using fossil pollen and charcoal data from three peat cores collected from Sarawak, Malaysian Borneo, we looked at the incidence and impact of local and regional fire on coastal peat swamp forests over the last 7000 years. Results show that burning *has* occurred in these wetland ecosystems throughout their history. However, prior to the Colonial era *c.* 1839, when human presence in the peat swamp forest was comparatively limited, neither local nor regional burning significantly impacted on the forest vegetation. After the mid 19th Century, at the onset of intensified land-use change, fire incidence elevated significantly within these coastal peat swamp forests. Although fire does not correlate with past vegetation changes in these ecosystems, the long-term data reveal that open vegetation, a proxy for human forest clearance, does to a greater extent. However, results suggest that human activity may be strongly influencing and acting synergistically with fire in the recent past, leading to the enhanced degradation of these peatland ecosystems. These findings support present-day concerns about the increase in fire incidence and combined impacts of fire and human disturbance on peat swamp forests, with serious implications for biodiversity and global climate change.

CONSERVATION AND RESTORATION STARTEGIES FOR THE NATURAL LABORATORY OF PEAT SWAMP FOREST (NLPSF) SABANGAU – CIMTROP – UNIVERSITY OF PALANGKA RAYA, CENTRAL KALIMANTAN

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In 1992, Dr. Jack Rieley (Nottingham Univ.), Dr. Bambang Setiadi (BPPT-Jakarta), Dr. Hidenori Takahashi (Hokkaido Univ.) and the late Dr. Suwido H. Limin (Palangka Raya Univ.) formed the research group "Kalimantan Peat Swamp Forest Research Project (KPSFRP)", which is now the "Center for International Co-operation in Sustainable Management of Tropical Peatland (CIMTROP)". The Natural Laboratory of Peat Swamp Forest (NLPSF) in Kereng Bangkirai-Sabangau was established as a Research Site. This reflects the conviction that tropical peatlands are important to the environment and sustainability of local livelihoods.

Tropical peatlands are the largest terrestrial carbon storage in the world, yet their existence is very threatened , including the flora and fauna that live therein, especially in the Natural Laboratory of Peat Swamp Forest (NLPSF) from illegal logging, forest fires and animal hunting.

Forest fires are the most dangerous threat because the impact is greater than illegal logging. Peat and plants are burned and the animals are also threatened. The impact of fire is also very dangerous in terms of the smoke and greenhouse gas emissions produced.

CIMTROP has developed a strategy for conservation and restoration in the NLPSF. This includes forming a Patrol Team (first in 1999, and second in 2003 to present), blocking canals to restore

hydrological status, reforestation, environmental education for school children and designing / creating environmentally-friendly businesses for communities (traditional fish pond/beje).

LESSONS FROM HABITAT PROTECTION AND RESTORATION IN THE SABANGAU FOREST, CENTRAL KALIMANTAN

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The Sabangau peat-swamp forest in Central Kalimantan is the largest lowland rainforest block remaining in Borneo and is of critical importance for biodiversity conservation, containing the largest remaining contiguous populations of *Pongo pygmaeus* and *Hylobates albibarbis*, and providing important ecosystem services to local people. Forest loss and habitat degradation resulting from rapidly developing, unsustainable economic activities is rampant in Central Kalimantan and demands urgent conservation efforts to protect the remaining tropical forests. Here we describe conservation efforts underway in the northern Sabangau Forest. These efforts represent a holistic and locally-led habitat conservation strategy to prevent and mitigate ongoing threats in Sabangau, which include fire, peat drainage and illegal logging. Our ultimate aim is to protect the forest from ongoing threats, restore degraded areas, engender conservation support within the local community, and monitor the impacts of these activities on the forest and its wildlife, to maximise their effectiveness. In this paper, we summarise the results of this work, including the prevalent threats and trends identified by the Community Patrol Team, the positive change in hydrological conditions following dam construction in ex-illegal logging canals within the swamp, and some lessons from our reforestation activities. Ongoing implementation of these conservation activities, research monitoring and the protection role provided by the local Community Patrol Team are vital for continued forest protection in the area.

IMPACT OF RESTORATION ON ORANGUTAN POPULATION SUSTAINABILITY IN SEBANGAU NATIONAL PARK

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Sebangau National Park (540,000 ha) is one of the last big peat-swamp forests in Borneo. With almost 5,800 individuals, it is also home to one of the largest orangutan populations in the world. This species is listed as critically endangered on the IUCN Red List of Threatened Species. Before being declared a national park in 2004, several logging concessions existed in the peat forests of Sebangau. From this era, not only were 66,000 ha of forest seriously degraded, but 467 canals with a

total length 797,504 km were dug, criss-crossing the national park and leading to peat drainage. The Sebangau NP Authority and WWF have developed and are currently implementing an approach to restore the water balance of drained peat areas through canal blocking and forest restoration. Since 2007, the park authority and its partners built 1,600 dams in five catchment areas to raise the water level and installed 600 water level monitoring stations.

Measurement of the impacts of canal blocking were obtained through monthly monitoring of surface water level (SWL) in 16 locations and groundwater level (GWL) in 112 pipes for the period June 2013 to July 2015. Canal blocking effect is significantly positively correlated with water level controlled by rainfall. Canal blocking has a positive impact on SWL (mean: before = -33.97 cm, after = -26.10 cm) and GWL (mean: before = -19.44 cm, after = -11.93 cm).

In the last 10 years, although the open area in Sebangau NP has increased from 66,000 ha in 2006 to 74,000 ha in 2015, owing to the major El Niño-related fires that occurred in 2015, the orangutan's habitat of secondary or primary forest is still in a good condition. These fires occurred in the open areas and several areas near the river. Compared to adjacent areas, hot spot occurrence inside Sebangau NP was less than that from outside. Monthly patrol and community involvement through local fire-fighters and ecotourism guides are also supporting protection of the orangutan's habitat from fire, illegal logging and poaching.

Our analysis indicates that the orangutan population in Sebangau National Park has increased by 7.8% from 2006 to 2016, based on annual nest counts obtained from line transect surveys. By promoting restoration, including peat fire prevention, reforestation, patrols and community involvement, we aim to maintain the sustainability of the orangutan population in Sebangau National Park.

PROTECTING PRIMATES: CONSERVATION RESEARCH IN BORNEO, 1996-2017

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Borneo's tropical forests are home to 18 species of non-human primates, nine of which are found in Central Kalimantan, where the Borneo Nature Foundation works. Since 1995, we have collected extensive data on orangutan and gibbon population density, distribution and behavioural ecology, contributing to conservation strategy for these endangered species in Indonesia. This includes demonstrating the importance of Sabangau and Rungan for conservation of these species, and documenting the serious negative impacts of illegal logging on orangutans, the ability of populations to (gradually) recover from this disturbance, and impacts of fire on populations in peat-swamp forest. The expertise of BNF's Indonesian field researchers has subsequently been applied to support ape conservation in multi-use landscapes in Kalimantan.

RESCUING ORANGUTANS TRAPPED IN PALM OIL PLANTATIONS AND OTHER PLANTATION PROJECTS : A CASE STUDY FROM BKSDA IN KALIMANTAN TENGAH PROVINCE

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Orangutans have a significant importance for forest ecosystems. Nowadays, a primary concern for the Bornean orangutan, which occupied a suitable forest habitat area of around 253,153 km² in 1973, is that 61.5% of that baseline forest area is forecast to disappear by 2025, due to habitat clearance. Furthermore, Utami-Atmoko *et al.* (2016) stressed that fires and forest conversion for industrial agriculture are main threats to the orangutan. The Bureau of Statistics for Central Kalimantan (BPS, 2017) reported that in 2016, palm oil represented more than 76% of the plantation area in the province. Meanwhile, in Central Kalimantan Province, 327 palm oil companies hold permits covering an area of more than 3.9 million hectares.

One of the adverse impacts of forest conversion is a 100% direct forest habitat loss that results in conflict between humans and wildlife, and may increase encounters between them. Humans often experience damage of their plants and crops, while irresponsible conflict resolution might lead to animal death. Therefore, as a government institution, BKSDA must collaborate with various parties to conduct orangutan rescue projects, especially from oil palm and other plantations. The scope of these collaborations are rescue, rehabilitation, orangutan release and campaign strategies. Since 2010 to August 2017, BKSDA has conducted rescues of 176 individual orangutans, with 191 others handed over voluntarily. Further work is required to develop the project through institutional strengthening, comprehensive orangutan rescue, and awareness campaigns to specific target audiences, as well as effective monitoring and evaluation.

PRODUCTIVITY AND SUSTAINABILITY OF UMP'S EDUCATION FOREST MANAGEMENT

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UMP's Education Forest was designated by the Minister of Forestry (no. SK 611/Menhut II/2014) on July 2014, as a 4,910 ha area consisting of lowland and peatland forest, to be owned by the Palangkaraya government and managed by Muhammadiyah University of Palangkaraya. The purpose of UMP's Education Forest is for education, research and to deliver ecosystem services to local communities through collaborative, sustainable forest management. Our vision and mission is to bring into reality for the Education Forest information exchange in international forums, including activities for scientific utility, beneficial values for the university and sustainable community forest management.

UMP's Education forest is a primary forest with some damaged sections caused by illegal hunting, illegal mining, illegal logging and forest fire. The effective solution to solve these problems involves many activities through forest community approach programmes, plus forest rehabilitation. Specific activities also include peatland area management to protect and enhance the area's carbon stock.

The Education Forest management must not only be ecologically sustainable, but must also provide benefits to the local community, because if neighbouring communities feel that they derive benefits from the forest, they will be more incentivised to protect it. Communities surrounding the forest then become forest stewards, if able to increase their economic gains without damaging the forest through for example, harvesting non-timber forest products (NTFP), working as ecotourism guides, participating in research activities and conducting forest patrols.

UMP's Education Forest is a high biodiversity area, as demonstrated through collaborative research since 2016 by UMP, the University of Exeter and Borneo Nature Foundation (BNF) regarding the area's biodiversity. NTFPs with international markets include *jelutong*, *plepek* and *pilau*; traditional forest medicines with cultural value can be bred to provide economic benefits to communities; plus breeding of ornamental plants such as pitchers and orchids all exhibit potential. Plant enrichment activities are also carried out by planting various commercial tree species in former forests in and around the Education Forest.

Many collaborative activities have already been completed with the Department for Nature Conservation and Natural Resources (BKSDA) in Central Kalimantan to protect the forest from wildlife hunting; with BPDAS Kahayan for rehabilitation and reforestation activities; with the Kalaweit Foundation for forest patrols; with Friends of the Orang Utan from Canada for pitcher plant and orchid project development; with USAID IFACS, EIA, LP3SEKPI KLHK, YCI, SIMPUL SHK and BNF for further activitis centred around protecting the traditional forest of Mungku Baru; CIFOR for developing an Agroforestry base on bioenergy research; and USAID IFACS/Lestari for developing a community approach program for conservation in Palangka Raya area since 2013; and BNF for more collaborative research since 2015.

CATS OF KALIMANTAN: CONSERVATION AND CONNECTIVITY

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Since 2008, Borneo Nature Foundation has been leading research and conservation efforts for clouded leopards in Indonesian Borneo. We have conducted landscape-wide surveys, both short and long-term in partnership with local and international universities, funders, local and international NGO's and local government. At 9 years duration, at our Sabangau site we have the longest continuous camera trap project in Kalimantan, which is complimented by data from 7 additional

study sites ranging from 2-5 months duration. We initiated another long-term camera trap project in the Mungku Baru Education Forest in 2016. We have identified possible refuges and strongholds for clouded leopards and identified areas where increasing habitat connectivity is a priority.

While focusing our camera trap work on clouded leopards, Borneo Nature Foundation is enabling accurate assessment of the status of the 4 endangered and protected small cat species of Kalimantan and determining areas of High Conservation Value. Additionally, we are working to ensure community-engagement with these objectives to enable *in-situ* community-led conservation. Through this work, we recommend measures to NGO's and local government for the sustainable development of landscapes for Borneo cat conservation. By incorporating flagship cat species behavioural ecology, we demonstrate how grass-roots conservation actions can lead to direct and positive change in landscape conservation. This method also provides important evidence for how a multi-stakeholder approach can work to fully realise and maximise the conservation potential of landscapes for small cats and other biodiversity.

PEATLAND RESTORATION COLLABORATIVE ACTIONS IN CENTRAL KALIMANTAN

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Peatland Restoration aims not only to manage water appropriately, but also to manage their vegetation and conservation features effectively to achieve a favourable condition. There are four steps for Peatland Restoration: planning, implementing, monitoring & reporting, and evaluation. A strategic approach is required to successfully execute Peatland Restoration, including unity of peat hydrology mapping, rezonation & zone determination, restoration prioritisation, restoration plan preparation, restoration implementation, and monitoring & evaluation. The triple-bottom line for peatland restoration activities are Rewetting (R1), Revegetation (R2), and Revitalization of local Livelihoods (R3). The focused activity of these programs which will be discussed in this paper is Rewetting (R1). Canal blocking, Canal backfilling, and Deep wells are the executions of Rewetting.

Target areas for Canal Blocking or artificial drainage canal are those designated for conservation/protection and cultivation. Drainage canals in conservation and protection areas should be blocked for the purpose of water conservation using a rigid design without spillways. Drainage canal in cultivation areas must be blocked for water management objectives using flexible designs with spill-up and/or open-close systems. Furthermore, drainage canals in the conservation and protection areas require a combination of canal blocking and canal backfilling. The purpose of canal backfilling is water conservation through increased sedimentation in the canal so that drainability of the canal is reduced. Determination of the locations of Deep Wells is based on a fire-prone history, very low availability of water surface, and very limited accessibility. Total activity of Deep Wells is 5,225 units, while Canal Blocking activity is 1,066 units, and Canal Backfilling has 96 unit activities. The indicative peatland area for rewetting is: 16,564 ha for Deep Wells, 16,768 ha for Canal blocking, and 20,993 ha for Canal backfilling. In additional, the revitalization of local livelihoods has involved 26 villages in total by land management without burning and development of local commodities, honey bees, fisheries, and livestock.

DRONES TO MONITOR WILDLIFE AND HABITAT

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Land-cover change and hunting are leading to major declines in tropical biodiversity. The fast changes occurring in the tropics place an urgent need on rapid and affordable techniques to monitor wildlife and its habitats. Recently the use of drones in conservation has increased markedly. Drones allow for the acquisition of very-high resolution imagery in a flexible low-cost system. A variety of sensors can be used to obtain images that can be used to determine the distribution and density of animals and allow for land-cover mapping and change detection. In this talk I will go over some recent examples of how drones have been applied to conservation. These will include the counting of orangutan and nests to determine their distribution and density, automatic detection of species, land-cover classification and change monitoring, and some thoughts on the future of technology and conservation.

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INTERDISCIPLINARITY, ECOSYSTEM SERVICES AND RESILIENCE: EXPLORING PEATLAND FUTURES

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Sustainable futures in Indonesia's peatlands increasingly demand interdisciplinary and multistakeholder collaborations in understanding local priorities and in shaping effective and equitable decision-making over livelihood and conservation issues. The ubiquitous Ecosystem Services framework and associated valuation practices continue to marginalise issues of culture and 'cultural services', whilst the full potential of social science and especially arts and humanities research to inform policy-making, as part of interdisciplinary approaches, often remain, arguably, somewhat underdeveloped. Furthermore, concepts such as 'resilience' increasingly inform policy aspirations as well as research agendas, but similarly lack interdisciplinary approaches and critiques. This presentation draws on the author's recent experiences with interdisciplinary research in diverse global contexts, through some of the first projects funded by the flagship UK Global Challenges Research Fund (GCRF), in order to explore these challenges. Specifically, it highlights methodological innovations, challenges and potentials of these projects' approaches, with due attention to ES evaluation and issues of 'resilience', though case studies within and beyond the Indonesian context. It highlights challenges, ruptures and disconnects in attempts to enact 'interdisciplinarity' through

these projects. It further explores issues of policy impact and the ways in which interdisciplinary approaches may speak to the impact agenda. It concludes with consideration of future potential for innovative, interdisciplinary collaborations In Central Kalimantan.

AN INTERDISCIPLINARY STUDY OF THE PEATLAND FISH OF BORNEO: ECOLOGY, VALUES, AND IMPLICATIONS FOR FUTURE CONSERVATION AND LIVELIHOOD PROJECTS

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The Sabangau tropical peat-swamp forest (TPSF) ecosystem in Indonesian Borneo is a vital habitat for numerous threatened species. TPSFs and their rivers are at high risk from human disturbance, however, making assessments of fish biodiversity and monitoring of water quality a high priority. The degradation of freshwater systems has serious repercussions for biodiversity and the human communities, who depend on the forest and river for their livelihoods, and on fish as a main dietary protein source. In this interdisciplinary project, over 13 months, we completed some of the first in-depth assessments of local fish biodiversity and abundance in the Sabangau catchment. Interviews and focus groups (40 interviews, 4 focus groups) were used in two villages to investigate different values provided by fish and fishing to local communities, as well as their perceptions of environmental change and challenges. The fish surveys resulted in a species list of 54 species from 16 different families, almost all of which are used by local people. River fish catches were negatively correlated with river depth and positively correlated with water turbidity, but not related to dissolved oxygen levels, pH, surface water temperature or nutrient levels. Fish surveys in the river were conducted both before and after the 2015 fires, with results showing increasing river acidity and reduced local fish catches following the fires. Together with the results from the human community that will be presented, these data form the baseline for future monitoring projects. In the long-term this information and the interdisciplinary approaches that we propose will be vital to improve understanding of these wetland habitats, their importance for community livelihoods, and ultimately to find ways of promoting ecosystem conservation alongside community development.

LIVING WITH(OUT) FIRES: A CASE STUDY OF LIVELIHOOD STRATEGIES AND ADAPTION AFTER LANDSCAPE BURNING IN 2015 IN THE COUNTRYSIDE OF KALIMANTAN TENGAH, INDONESIA

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Over the past few decades, forest fires in Indonesia have increased in frequency and severity. Land fires in 2015 resulted in the destruction of more than two million hectares of tropical forest, leading to serious impacts on public health, the economy, biodiversity and carbon emissions. Most of these fires were of anthropogenic origin, and so understanding the sociological aspects associated with these fires is essential for reducing these negative impacts.

During my still ongoing research, I have been studying the influence of the fires in 2015 on livelihood strategies in a highly affected rural village community in Central Kalimantan using an explorative approach. I aim to understand local people's perspectives of these fires, their consequences for local people and adaptation mechanisms to new challenges, such as Indonesia's new zero burning policy. A diverse field of actors is influencing the study area, some working on preventing future fires and looking at alternative livelihood strategies of communities, such as local and international NGOs, and others with economic interests, e.g. the oil palm company in the area. These different interests all have an impact on those people living in the area.

Through this research, I aim to contribute to the scientific discourse on the anthropology of man-made disasters. I hope that my findings will shed some light on the complexity and obstacles that have to be dealt with by rural communities in fire-affected areas. The needs of these communities must be adequately addressed if future incidences of large-scale uncontrolled peatland fires are to be prevented, with community members given key voices in the development and implementation of fire prevention policies and strategies.

LIFE IN THE BURNING ZONE

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In this paper, I provide an ethnographic account of rural livelihoods at a Central Kalimantan forest frontier in order to address some of the complexities behind the province's peat and forest fires. Concretely, it asks what does it mean to live in the realm of frontier development both in a material and emotional sense?

It is argued that the inconsistencies and contradictions of contemporary Indonesian forest management evoke a complex and interdependent set of adverse socioeconomic and environmental effects at different scales. Apart from harmful climate impacts, toxic smoke haze, and biodiversity loss, it will be shown that the on-going large-scale development leads to the dispossession and exclusion of local people, which not only causes economic hardship, but also raises feelings of frustration, injustice, anger, and despair.

And even though policies matter, the case discussed reveals how the agency of both the peat swamp environment and local people are crucial for landscape transformation as well, both aspects of which frequently remain unnoticed in studies of frontier development. The paper thus emphasizes the complexity and interdependence of capitalist development schemes, livelihoods, and local environments in order to understand socioecological transformations in general and Central Kalimantan's forest and peat fires in particular. In the burning zone, fire, peat, climate, and humans are deeply entangled.

UNIVERSITY OF EXETER RESEARCHER PROFILES

Frank van Veen

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I am an ecologist with a particular interest in the processes that determine the structure and dynamics of ecological communities and thereby patterns of biodiversity at different spatial scales. By gaining a mechanistic understanding of these complex ecological systems I hope to be able to make predictions on how they, and the services they provide, will respond to environmental change. Much of my work has focused on fundamental processes using temperate arthropod communities as model systems. More recently I have also increasingly started to apply this research to issues such as biodiversity conservation, sustainable agriculture and the impact of climate change on exploited ecological resources, with diverse study systems in the UK, New Zealand, South Africa and Indonesia.

Claire Belcher

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Claire is an Earth scientist specialising in the study of natural fires in the Earth system. Her research seeks to understand how evolutionary changes to ecosystems and wildfires have influenced the Earth system in the past, and integrates knowledge from cutting-edge modern experimental methods into studies of Earth's geological past. Her core research aims to understand the flammability of Earth's ecosystems where she considers flammability over a range of timescales, from instantaneous global change such as asteroid impacts, to global warming events occurring over 10 Kyr timescales, and variations in atmospheric oxygen over million-year timescales. Claire is PI of the wildFIRE Lab a European Research Council Funded Experimental wildFIRE Laboratory see https://sites.google.com/site/palaeofirelab/home.

Eduarda Santos

Environmental Biology Research Group, College of Life and Environmental Sciences, University of Exeter, Exeter, UK

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I am an environmental biologist investigating reproductive development and function and the susceptibility of these processes to disruption by environmental stressors. My research focuses on fish and has ranged from investigating the endocrine control of reproduction to addressing the population level effects of chemical exposure for wild fish, using systems biology strategies.

Ted Feldpausch

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Ted Feldpausch is a Senior Lecturer in Terrestrial Ecosystem Science, Geograph, University of Exeter, and an affiliated professor at the National Institute of Amazonian Research (INPA)-Brazil. His research focuses on the effects of land-cover land-use change, fire, and drought in tropical forests through field studies and experiments, remote-sensing, isotopic studies, and long-term ecological monitoring. He currently leads a study on the effect of centennial-scale historical fire on pyrogenic carbon and above-ground C cycling in old-growth forests and evaluates contemporary tropical forest degradation and recovery following logging and fire. He also studies the effect of lightning on tree mortality, studies the effect of drought on Amazon forests, and evaluates millennia-scale expansion and contraction of forest-savanna transitions.

Shari Mang

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I am a PhD student in Biological Sciences at the University of Exeter, studying under Dr Frank van Veen. I completed my Bachelors of Environmental Sciences with a Minor in Biology at the University of British Columbia (Canada) and my Masters of Applied Ecology at Exeter. I've previously participated in mammal conservation and ecology research in Panama and Malaysia. My masters research focused on the impacts of forest fires on Bornean orangutans in Sabangau National Park. For my PhD, I'll be carrying out my research in the Rungan, Central Kalimantan where I will quantify mammal diversity, evaluate the relationship between diversity and ecosystem structure, and map the Rungan's sub-habitats.

Lina Mercado

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I am a plant ecophysiologist & vegetation/biogeochemical modeller. I use observations and computer models to understand how plants respond to climate and in turn how cilmate is affected by vegetation. A current focus of my research is the response of plants to climate change, especially their response to increases in temperature.

My main areas of research include: carbon and H20 cycles, photosynthesis, transpiration, radiation interception, nutrient constraints on plant productivity, N and P cycles, plant responses to temperature both globally but also regionally. Current regional work has focus on Amazon, temperate and boreal ecosystems.

A primary aim of my work is to improve representation of plant physiological processes within earth system models (ESMs) in order to improve predictions of present and future land surface -climate

interactions and climate. I have been working with the JULES land surface model of the UK ESM for the past ten years for which I am vegetation theme leader.

Of particular interest for this project is the role of biomass burning aerosols on forest carbon uptake. Current work includes quantifying the impact of changes in diffuse radiation via increased biomass burning aerosols on Amazon forest photosynthesis. We have used eddy covariance observations to demonstrate this effect and JULES simulations (coupled to a regional model but also to a global climate model) to quantify this effect at regional level.

Angela Gallego-Sala and Dan Charman

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I am a biogeochemist with primary research interests in climatic regulation of peatland function and extent and of methane emissions from peatlands. My broader interest is on greenhouse gas balances, integrity of carbon stores, upland conservation and tropical peatlands. My methodology is a mixture of observations and modelling.

I am currently funded by South West Water to monitor methane emissions from restored peatlands and to carry out sphagnum re-introduction in restored peatlands. I am also involved in a NERC project: "Identifying Tipping Points in the benefits derived from UK's land ecosytems", in which we will look at threshold for peatland survival under climate change. I am supervise a Marie Curie fellow working on peatland modelling.

With **Dan Charman**, I have been involved in a NERC-funded project entitled “Peatlands and the global carbon cycle during the past millennium: an assessment using observations and models”. For this project, we carried out field work in Indonesia to get carbon accumulation rates for Sebangau peatlands for the last millenium (850-1850 AD). Earlier on, I worked at the University of Bristol, on a project entitled “Climate Change and the Uplands” commissioned by the Environment Agency, to study the implications of climate change for peatland soils in the UK and the effects on ecosystem services including carbon storage, flooding and water quality. Previously, I worked towards a PhD funded by NERC with a CASE studentship entitled “Temperature effects on trace gas production and uptake in aerobic and anaerobic soils” at the University of Bristol.

Rachel Turner

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I am an environmental social scientist focusing on marine resource governance and coastal communities. My research focuses on understanding how socio-economic and environmental contexts drive resource-use behaviour and have implications for management and governance systems. I am interested in the dynamics of social-ecological systems and how resource users respond to change, and am committed to interdisciplinary research addressing challenges of sustainable natural resource management. My recent research has explored marine resource dependence and the identification of supportive governance structures for effective Caribbean coral

reef management. In the UK, I have been working with local partners in Cornwall to investigate how cumulative change has implications for the health and wellbeing of fishing communities.

Lucy Rowland

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I am a lecturer and NERC independent research fellow at The University of Exeter researching plant ecophysiology in tropical vegetation. My research has focused on making detailed measurements of plant functional traits which control the carbon and water cycle in tropical ecosystems to understand how these cycles interact and are limited by changing environmental conditions. In particular I focus on how plant hydraulic strategies interact with other aspects of plant function to influence how the structure, function and mortality risk of tropical vegetation changes with environmental stress. Currently I have projects across Brazil, Borneo and Ghana, including at the world's longest running tropical rainforest drought experiment in north east Brazil. My research also extends beyond field collection to developing dynamic global vegetation models to help increase the accuracy of climate change predictions, through improving the representations of the carbon and water feedbacks between tropical vegetation and the atmosphere. Both my field and modelling research has a particular focus on trying to understand the role drought plays in altering ecosystem function and the interaction between vegetation and the atmosphere.

Karen Anderson

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I am a remote sensing scientist and my research is concerned with improving spatial estimates of ecosystem function and land-surface atmosphere carbon exchange from remote sensing observations. I work in ecosystems with typically low tree cover, where there are critical interactions between ecology, hydrology and carbon cycling and where traditional remote sensing approaches using satellite data have many uncertainties e.g. wetlands and drylands. My specialist area is in using data from proximal sensing (captured closer to the ground) to improve understanding of the satellite signal recorded at coarser spatial resolution. To provide some examples, I have undertaken research to address the carbon and hydrological assessment of degraded UK peatlands, using laser scanning and thermography to characterise fine-grained spatial patterns in near-surface hydrology. I have applied drone-based structure-from-motion photogrammetry approaches to characterise the above-ground biomass structure in water-limited dryland ecosystems in the south-west USA. We just won a new NERC-funded project that will link the drone-based biomass monitoring approach with global scale satellite observations, dynamic global vegetation models and replicated eddy covariance measurements to improve understanding of dryland carbon dynamics globally. I lead the University of Exeter's DroneLab research group where we are pioneering the use of drone platforms to capture new fine-grained measurements of plant canopy traits for improving understanding of the terrestrial carbon cycle (funded by an EU Marie Curie International Training Network). Beyond drylands and wetlands, I work extensively with airborne and ground-based laser scanning data and have developed new methods for signal processing the complex lidar waveform to retrieve canopy volumetric estimates from the tree-tops to the ground: we have, for example, pioneered the use of

such data for characterising highly heterogeneous urban landscapes to quantify how greenspace fragments can deliver ecosystem services in towns and cities. I'm keen to collaborate with scientists to realise the benefits of remote sensing data in a broad range of terrestrial ecosystem applications, particularly for improving understanding of the terrestrial carbon cycle. Further information on the DroneLab can be found in the video here: http://www.exeter.ac.uk/business/consulting/dronelab/

Ilya Maclean

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I am an applied ecologist whose research explores how species threatened by water shortage respond to environmental threats, for example climate change and habitat loss. My work aims to predict and understand the effects of climate change on wetland species on Cornwall's Lizard Peninsula. I am particularly interested in using my research results to identify priorities for conservation action and help species cope with changes to their habitats.