



## Perceptions across scales of governance and the Indonesian peatland fires



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### ABSTRACT

Across leading environmental challenges—fire management, climate change, deforestation – there is growing awareness of the need to better account for diverse stakeholder perceptions across complex, multi-level governance arrangements. Perceptions often condition behavior, compliance and engagement in ways that impact environmental outcomes. We illustrate the importance of, and approaches to, examining perceptions across scales of governance (e.g. international, national, local) and sectors (e.g. civil society, government, corporate) through the example of Indonesian peatland fires. Peatlands are crucial global carbon stocks threatened by land use change and fire and subject to a range of policy interventions that affect many different stakeholder groups. Peatland drainage and conversion to plantation agriculture has been associated with severe, uncontrolled peat fires that present significant climate, public health and economic risks. Peatland fire management has become a domestic and international priority, spurring intensely contentious debates, policies and legal proceedings. Previous fire management interventions (FMI) are numerous yet have suffered widespread implementation failures. Against this backdrop, our manuscript provides a thematically and methodologically novel analysis of how diverse stakeholders, from local farmers to international policy makers, perceive peatland fires in terms of, i) how they prioritize the associated benefits and burdens, and ii) the perceived effectiveness of FMI. We adopt an innovative application of Q method to provide needed insights that serve to quantify the areas of contention and consensus that exist among the stakeholders and their multi-dimensional perspectives. We show that many of the contemporary FMI were perceived as among the most effective interventions overall, but were also the most controversial between groups. Clear consensus areas were related to the shared concerns for the local health impacts and the potential of government support for fire-free alternatives as a solution pathway. Improved understanding of stakeholder perceptions has potential to: give voice to marginalized communities; enable transparent mediation of diverse priorities; inform public education campaigns, and shape future policy and governance arrangements.

### 1. Introduction

Globally, the carbon stored in peatlands exceeds that stored in vegetation, and peatlands are one of the most vulnerable terrestrial carbon pools, presently threatened by agriculture and fire (Turetsky et al., 2015). While peat fires have recently affected the global north, they are particularly severe in Indonesia (Page and Hooijer, 2016). In 2015 alone the resulting daily emissions from Indonesian fires were inordinate, surpassing the average daily emissions from the entire USA (Huijnen et al., 2016; Van Der Werf, 2015). The magnitude of the event reflects the severity of tropical peatland fires, which now represent a significant global climate risk and a national and regional humanitarian

and economic threat (Page and Hooijer, 2016; Marlier et al., 2013; World Bank, 2016; Shannon et al., 2016; Kátia et al., 2017).

Since the late 1990s, recurrent large-scale peatland fires have affected Indonesia's Sumatra, Borneo and Papua islands (Miettinen et al., 2016). Once considered marginal agricultural land, peatlands are increasingly exploited for oil palm and pulp wood cultivation (Mccarthy et al., 2012; Miettinen et al., 2016; Persoon and Simarmata, 2014), necessitating land drainage and vegetation clearing – often through burning. South East Asia's peatlands have transitioned from carbon sinks to carbon sources through the release of significant carbon emissions during combustion and subsequent oxidation (Hooijer et al., 2012; Huijnen et al., 2016; Gaveau et al., 2014). Fires have positive

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feedbacks and, once burned, areas are likely to re-burn (Hoscilo et al., 2011) and wildfires are likely to increase in a context of extended fire weather seasons (Jolly et al., 2015; Kátia et al., 2017).

Severe peat fire events have spurred a range of Fire Management Interventions (FMI), forming a polycentric governance arrangement of interventions across scales, sectors and stakeholders. These FMI include new regulations (e.g. a moratorium on new oil palm concessions on peatland), technical innovations (e.g. cloud seeding to produce rain), developments in fire monitoring (e.g. ‘real-time’ civil society satellite-based monitoring, community fire brigades), and provision of incentives for improved land management (e.g. payments to communities to reward fire-free practices) (Tacconi, 2016). However, many FMI have suffered chronic implementation failures (Page and Hooijer, 2016). Like other global environmental change governance efforts, FMI epitomize the policy-practice gap and “wicked” governance challenges, in which management involves diverse actors with divergent interests operating across scales (Game et al., 2014; Mccarthy et al., 2012; Cash et al., 2006).

Stakeholder perceptions of governance arrangements, including FMI, are critical to improving their design and on-the-ground implementation (Adgar et al., 2005; Game et al., 2014; Reed et al., 2016; Tschakert et al., 2016). Articulating stakeholder perceptions is fundamental to ensuring legitimacy and buy-in, enabling transparent boundary management, incorporating knowledge and interests across scales (Adgar et al., 2005; Bennett, 2016; Biggs et al., 2011; Game et al., 2014; Law et al., 2017; Achyar et al., 2015). Clearly defining the diverse stakeholder subjectivities solicits information valuable to knowledge brokers (e.g., where to target actions, baseline information on positions) and can serve as a boundary object available to boundary organizations that aim to mediate and navigate conflicting perceptions (Cash et al., 2006). Transparent dialogue allows points of consensus and controversy to be identified, building trust to facilitate negotiation when addressing inevitable trade-offs (Adgar et al., 2005; Game et al., 2014; Reed et al., 2016). Social acceptance and perceptions are not the only determinants of policy performance, yet this type of clarity is particularly critical in decentralized governance systems such as in Indonesia. Fire management interventions in peatlands constitute national, regional and local priorities that are widely debated and involve contested accounts of blame for fire-setting, instances of conflict, legal proceedings, asymmetric interest pathways and little consensus or productive negotiation among actors (Forsyth, 2014; Harwell, 2000). While national and provincial level government articulate laws and regulations, sound, practical FMI design and implementation will also need to address the perceptions and preferences of the diverse groups they engage if they are to generate behavioral change and policy uptake (Game et al., 2014; Gaveau et al., 2016; Mccarthy et al., 2012; Goldstein, 2016; Biggs et al., 2011).

Through an innovative application of Q method, we illustrate the diverse stakeholders' perceptions of peat fires and FMI across sectors (private, government, civil society, individual) and scales of governance (international ASEAN level, national, provincial, local). We focus on peatlands in Riau Province, Sumatra, since Riau exemplifies the region's rapid land-use change, has extensive fires, and landscapes in which multiple stakeholders intersect (Gaveau et al., 2016, 2014; Miettinen et al., 2016). We define perceptions on two key aspects of peatland management: (1) how stakeholders prioritize the benefits and burdens associated with peatland fires (and the resulting haze), and (2) which FMI are perceived as most effective. We show significant distinctions among groups of perceptions, clear areas of agreement and controversy, and discuss the implications for future FMI design and the polycentric governance challenges of global environmental change.

## 2. Methods

Q is a semi-qualitative methodology used to identify a detailed view of the subjective perceptions held across a diverse group of people on a

given topic (Watts and Stenner, 2012). It aims to balance the qualitative depth of interviews with the advantages of quantitative enquiry, allowing for systematic comparison of perceptions.

In Q, respondents provide a relative ranking of pre-formed statements (a Q-set). These statements are a representative selection of all possible opinions about the topic (the *concourse*). This approach reduces compliance bias and is appropriate for sensitive topics because respondents are not obliged to orally articulate their opinion (Mckeown and Thomas, 2013). Responses are summarized through factor analysis into a number of perceptions (Q-factors), each of which is the average perception of respondents with similar views. Each respondent is related to a given perception through a coefficient (the Q-factor loading; with value 1 for high positive relations, 0 for no relation). Q does not solicit results which are generalizable to the entire population (applies purposive sampling frames), but rather gives an indication of the diversity of perceptions held by a particular population of policy relevance, regardless of their predominance.

### 2.1. Respondent and site selection

Respondents in this study were selected using purposive sampling and identified through actor mapping informed by field scoping in Dumai, Riau over 6 weeks in early 2015, expert consultation (with donor, NGO, scientist representatives), and literature review (including journal publications and grey literature in Indonesian and English). Twelve stakeholder groups were defined (Fig. 1). We sampled respondents from multiple spatial and governance scales, including policy communities based in Pekanbaru (Riau), Jakarta and Singapore. Policy communities were broadly defined, and included civil servants, researchers (e.g. from universities and think tanks), CSOs and government representatives with an interest and a role in the policy arena of peatland fires. Within the stakeholder group categories, the respondents selected represented different viewpoints and backgrounds to ensure maximum representation of possible perspectives. The large majority of respondents were at the farm-level (small-scale farmers, landless residents, agro-industry) and included both men and women.

Site selection at the local level was done using spatial analysis of MODIS derived hotspots, Landsat imagery of land cover and available maps of land tenure types, to identify three sites with a diversity of land uses (rubber, acacia, oil palm and idle land), fire dynamics, land tenure arrangements and actors (Fig. 1a) (Gaveau et al., 2016).

Sample sizes for the policymakers were as follows: i) Singapore- (8 respondents); ii) Jakarta- (9) and iii) Riau-based policy communities (11) and iv) local public figures (15). Respondents with connection to land use included; v) large scale land holders (15); vi) medium absentee investors (15); vii) industrial agriculture (30); viii) small scale farmers (42); ix) medium land holders (34); x) laborers/share croppers (15) and xi) landless (15) and vii) non-governmental organizations (NGO, 10) (Fig. 1b).

### 2.2. Statement selection

Perceptions on peatland management were explored with two separate Q-sets in which respondents ranked the benefits and burdens (BB) associated with peatland fires in Riau and the effectiveness of FMI. The statements of each Q-set were formulated iteratively based on the same methods as the actor mapping – literature review, expert consultations, and field scoping (Section 2.1). We selected 30 statements on benefits and burdens of fire and 40 statements reflecting FMI options. The statements were kept short to avoid redundancies, ensure clarity and comprehension by all participants (from policymakers to landless farmers), and avoid double-loading (i.e. ensure each response related to only one item). Statements and scales were translated from English into Indonesian and extensively piloted in the field. Images were printed on each card to “flag” the statement card in the respondent's memory and

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