

# Local causes, regional co-operation and global financing for environmental problems: the case of Southeast Asian Haze pollution

Luca Tacconi · Frank Jotzo · R. Quentin Grafton

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**Abstract** Lack of action on cross-border environmental problems in developing countries is often ascribed to gaps in local capacity and resources, failure of regional cooperation and lack of financial support from rich countries. Using the case of the Southeast Asian Haze pollution from forest and peat fires in Indonesia, we explore the challenges posed by environmental problems whose causes are closely linked to local development and livelihood strategies, and whose impacts are local, regional (haze) as well as global (carbon emissions). We assess whether there are real opportunities to implement effectively the recent Association of Southeast Asian Nations (ASEAN) Agreement on Transboundary Haze Pollution. To address the deep determinants behind haze pollution, we propose signatories to the Agreement refocus their efforts to controlling peat fires rather than to strive for a zero-burning regime. We also recommend a new approach to financing sustainable development based on rules and incentives, with a regional pool of funds, contributed by rich countries through the Global Environment Facility and countries in Southeast Asia.

**Keywords** ASEAN · Climate change · Fires · GEF · Haze pollution · Regional agreements

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L. Tacconi (✉) · R. Q. Grafton  
Crawford School of Economics and Government, The Australian National University,  
Canberra, ACT 0200, Australia  
e-mail: luca.tacconi@anu.edu.au

R. Q. Grafton  
e-mail: quentin.grafton@anu.edu.au

F. Jotzo  
Research School of Pacific and Asian Studies, The Australian National University,  
Canberra, ACT 0200, Australia  
e-mail: frank.jotzo@anu.edu.au

## Abbreviations

|       |  |
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| ASEAN | Association of Southeast Asian Nations |
| GEF   | Global Environment Facility            |

## 1 Introduction

Regional agreements and organizations have a significant role to play in improved environmental governance (Koh and Robinson 2002; United Nations Development Programme et al. 2003). We consider the challenges posed to the environmental effectiveness of regional agreements and organizations with the case of haze pollution in Southeast Asia. This pollution originates from fires (mainly in Indonesia) and is closely linked to local development and livelihood strategies. Despite the local causes of haze pollution, its transboundary effects and importance suggest that it requires regional initiatives supported by global financing for its mitigation. Countries in the region are affected through health impacts on their populations, and disruptions of economic activity. Global impacts are mainly through carbon emissions, and addressing the problem could have sizeable global benefits in mitigating climate change. It had been estimated that the 1997/1998 fires in Indonesia generated the equivalent of about 30% of the annual global average greenhouse gas (GHG) emissions from land use change, calculated over the period 1989–1995 (Page et al. 2002; Tacconi 2003). A report released at the meeting of the United Nations Framework Convention on Climate Change in November 2006 estimated total emissions from peatland in 1997 and 2002 at about 40% of *total* global CO<sub>2</sub> emissions, including those from fossil fuel combustion (Silvius et al. 2006).<sup>1</sup>

Past diplomatic efforts have so far failed to address the haze problem in Southeast Asia, as demonstrated by the fact that the Association of Southeast Asian Nations (ASEAN)<sup>2</sup> Cooperation Plan on Transboundary Air Pollution of 1995 and the ASEAN Regional Haze Action Plan of 1997<sup>3</sup> have not reduced the regular occurrence of the problem, with haze pollution in September and October 2006 probably being the worst since 1997/1998.<sup>4</sup> The more recent diplomatic effort at addressing haze pollution is the Agreement on Transboundary Haze Pollution (hereafter referred to as the Agreement) signed in 2002 by members of the ASEAN, which entered into force on 25 November 2003. Indonesia had not ratified the Agreement at the time of the 2006 haze event, a fact that shows the lack of political commitment in Indonesia to address the problem. We argue that there are problems with the Agreement approach that, if not addressed, will certainly reduce its effectiveness.

In discussing the effectiveness of regional environmental organizations and regimes it is important to clarify first its meaning in this context. A negotiation process may be said to be effective if it led to the establishment of an environmental agreement. An international organization with the mandate to support the implementation of the regime may be said to be effective if it contributes to the achievement of the goals of the agreement.

<sup>1</sup> That publication reports that the oxidation of degraded peatland results in average annual emissions in Southeast Asia of about 600 million tones of CO<sub>2</sub>. Carbon emissions are exacerbated by fires and in 1997, 1998, and 2002 they may have been between 3,000 and 9,400 million tones. The highest figure is 21 times and 11 times the level of emissions reported by Tacconi (2003) and Page et al. (2002) respectively.

<sup>2</sup> Member countries include Brunei Darussalam, Cambodia, Indonesia, Laos, Malaysia, Myanmar, Philippines, Singapore, Thailand and Viet Nam. Seven countries had ratified the Agreement as of July 2005.

<sup>3</sup> The two Plans can be viewed at <http://www.aseansec.org>

<sup>4</sup> See ASEAN 'Haze Watch', various issues, <http://www.haze-online.or.id>

Unfortunately, this need not necessarily result in significant improvements in environmental management if the agreement is not well designed (Kutting 2000). Incorrect specification of the environmental problem could lead to agreements and institutions that appear to be environmentally effective, yet do not address the most relevant problems. We will exemplify this issue in the case of the fires and haze in South East Asia by showing that the impacts of haze do not necessarily imply preventing *all* land and forest fires (as specified in the ASEAN Agreement), but the implementation of the Agreement should certainly be focused on preventing peat fires.

The focus of this paper on peat fires differs from that of other studies that have dealt with the haze pollution problem. Recent papers have instead focused on the need to improve forest management broadly defined, that is forest on peat and mineral soils alike (Barber and Schweithelm 2000; Tan 2005; Mayer 2006). The emphasis of this paper on peat fires does not imply that concerns about overall forest management in Indonesia are not justified. Deforestation and forest degradation have implications for climate change and for biodiversity conservation. Our argument is that peat fires are the main source of pollution relevant to the Agreement, which should therefore focus on them as a matter of priority. Separate initiatives, such as the ongoing East Asia Forest Law Enforcement and Governance process,<sup>5</sup> are required to address broad forest management issues.

To deliver positive environmental outcomes, environmental regimes and organizations also have to put in place effective incentives and to adopt appropriate tools to address the environmental problem of interest. We argue that financial incentives need to be used to address the haze problem and that regional and global environmental benefits from the mitigation of peat fires need to be reflected in the design of mechanisms seeking to address their local causes.

We begin with an overview of the ASEAN approach to multilateral environmental problems, describe the deep determinants of the problem and discuss what might be done to improve environmental outcomes in the region in terms of haze pollution. We then explore how global financing and incentive mechanisms might be used to alleviate these causes in the context of regional cross-border collaboration. We conclude with a discussion of the implications for addressing the fire and haze problem in Southeast Asia and lessons for the effectiveness of regional and global responses to transboundary environmental problems in developing countries more generally.

## 2 ASEAN environmental management and the Transboundary Haze Agreement

The structure of ASEAN and its approach to environmental management have been comprehensively described by Koh and Robinson (2002). The 'ASEAN Way' of regional cooperation involves three fundamental standards: (i) non-interference in national government policies, (ii) consensus building and cooperative programs are preferred over legally binding treaties, (iii) implementation of programs is carried out at the national level instead of creating a regional bureaucracy. The third standard has led to the establishment of a small ASEAN Secretariat based in Jakarta with the mandate to facilitate cooperation.

ASEAN has been active in biodiversity conservation and the control of haze pollution from land and forest fires. In these areas, the ASEAN Way has led to cooperation focused on activities such as networking, national institution building, data and information management, coordination of research activities, and education and training (Koh and

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<sup>5</sup> See <http://www.worldbank.org/eapfleg>

Robinson 2002). ASEAN has helped shape a common regional environmental policy framework, contributed to stable relations among its members, and a consensus building process that has created a sound foundation for implementation. Koh and Robinson (2002) note that ASEAN also faces several limitations to its effectiveness, including the principle of non-intervention which could undermine the adoption of practical measures aimed at addressing regional problems; lack of expertise, data, funding and internal organizational support; lack of monitoring and surveillance mechanisms that hamper ASEAN's ability to gather information on environmental issues and to address them effectively; and the absence of an effective dispute settlement mechanism, as a result of ASEAN's emphasis on decision-making through consensus building.

In relation to haze pollution, these weaknesses are of concern because despite years of discussions at the regional level, a consensus-based approach has not mitigated the problem. In fact, a significant haze event occurred as recently as September–October 2006—3 years after the Agreement entered into force.

The 2002 Agreement seeks to "... prevent and monitor transboundary haze pollution as a result of land and/or forest fires ... through concerted national efforts and intensified regional and international co-operation ... and pursued in the overall context of sustainable development ..." (ASEAN 2002, p. 4). Thus the Agreement explicitly recognizes the primacy of nation states and their need to balance mitigation with other needs, but it also seeks to promote greater international co-operation. The general obligations of the parties to the Agreement are to co-operate in developing and implementing measures to prevent and monitor haze pollution, respond to requests from other parties for information and consultation on the transboundary nature of the problem and for national governments to take legislative, administrative and other relevant measures to implement the Agreement (Article 4).

The detailed obligations of the Agreement include the development and implementation of legislative and other regulatory measures, programs and strategies to promote a zero-burning policy (Article 9.a), and ensuring that legislative, administrative and/or other relevant measures are taken to control open burning (defined as any fire, combustion or smouldering that occurs in open air) and to prevent land clearing using fire (Article 9.g).

The Agreement also has provisions for the establishment of the ASEAN Transboundary Haze Pollution Fund designed to support the implementation of the Agreement (Article 20). The Parties to the Agreement are expected to make voluntary contributions to the Fund in accordance with the decisions of the Conference of the Parties and, where necessary, to mobilize additional resources from relevant international organizations. The fund was established in November 2006 with initial funding of a mere \$100,000.<sup>6</sup>

Florano (2003) assesses the 'theoretical strengths' of the Agreement and compares them with those of other international environmental agreements on the basis of the strength index developed by Chasek (2001). The Agreement is ranked eighth out of 13 considered.<sup>7</sup>

<sup>6</sup> See 'Asean sets up anti-haze fund', 12 November 2006, ASEAN Haze-online, <http://www.haze-online.or.id>

<sup>7</sup> The 13 environmental agreements are: Convention on Long-Range Transboundary Air Pollution (1979), Convention on the Prevention of Marine Pollution by Dumping Waste and Other Matters (1975), Protocol to the International Convention for the Prevention of Pollution from Ships (1978), Convention on International Trade in Endangered Species (1975), Convention for the Protection of the Mediterranean Sea Against Pollution (1978), Convention on the Conservation of Antarctic Marine Living Resources (1982), International Tropical Timber Trade Agreement (1983), Montreal Protocol on Substances that Deplete the Ozone Layer (1989), Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal (1992), Framework Convention on Climate Change (1994), Convention on Biological Diversity (1993), Kyoto Protocol to the Framework Convention on Climate Change (2005), and Cartagena Protocol on Biodiversity (2003).

The Agreement is ranked in the bottom half because it does not have provisions for monitoring, compliance and inspections. The latter problem is also noted by Tan (2005) who suggests that the inclusion of stronger compliance mechanisms would have foreclosed Indonesia's ratification of the Agreement. It is worth noting that among the environmental agreements considered by Florano (2003) there are eight other agreements that do not have monitoring provisions, six that do not have compliance provisions and ten that do not have inspection provisions. Therefore, the Agreement's lack of monitoring and compliance mechanisms is not necessarily determined by the 'ASEAN Way'. Rather, it is more likely due to the fact that Indonesia would not ratify the Agreement, as noted above, because it would have to shoulder most of the costs arising from its implementation. This is a key issue discussed at length later. It is worth anticipating, however, that to provide a significant contribution to the effectiveness of the Agreement, the Fund will need to address the capacity and incentives to prevent haze pollution faced by Indonesia.

The adoption of zero-burning to address the haze problem is another problematic issue for the Agreement. This approach implicitly assumes that any fire is undesirable from the perspective of haze pollution reduction. We argue that this view is incorrect and that preventing and managing the fires that cause most of the haze pollution should be the central aspect of haze pollution management. In the following section we outline in more detail the nature of the fire and haze problems and document the contribution of peat fires to haze pollution. The adoption of a zero-burning policy raises two concerns: (i) impacts on slash and burn farmers, and (ii) lack of prioritization of activities and funding aimed at reducing haze pollution.

The view that slash and burn farmers are responsible for most of the fires in Indonesia, and hence most of the haze pollution, has led to suggestions that the use of fire by farmers should be banned and alternative methods such as mechanical clearing should be promoted and subsidized (Varma 2003). These claims have been rebutted on the basis that forest fires are not the main source of haze pollution and that there is no solid evidence that slash and burn agriculture is the main cause of catastrophic fires such as those that affected East Kalimantan<sup>8</sup> in 1997/1998 (Tacconi and Vayda 2006). In recognition of the problems faced by shifting cultivators and smallholders in adopting a zero-burning approach, the Agreement recognizes the need to develop appropriate techniques for controlled burning and to facilitate the exchange of experiences. This is certainly a useful provision but it does not go far enough in acknowledging that there needs to be a more informed and nuanced approach to the management of fires.

Malaysia allows small-scale farmers to burn for shifting cultivation on non-peat soils and sugarcane and rice bagasse during low-hazard periods, while banning large-scale burning on plantation land and on all peat soils (Mayer 2006). However, this is not the approach adopted by Indonesia which has a blanket ban on burning. If implemented, the ban would negatively affect small-scale farmers (Tacconi and Ruchiat 2006). Tan (2005, p. 682) remarks that the Indonesian Government Regulation on fires (PP 4/2001) is 'too general in its proscription of burning activities'. For one thing, the Regulation does not discriminate between the different contexts within which fires can be started, e.g., in peat-rich lands, during El Niño occurrence or otherwise, for clearing plantations or for shifting agriculture. Without differentiated provisions to deal with the varied situations in which fires can be used, the 'Regulation's blanket ban on fires is wholly unrealistic and doomed to fail' (Tan 2005, p. 682). Tan (2005) goes on to support the revision of the fire regulatory

<sup>8</sup> Kalimantan is the Indonesian part of the island of Borneo.

framework proposed by Tacconi (2003), which involves a focus on managing fires (e.g. banning them in high fire risk periods) rather than banning all fires.

A zero-burning approach also distracts from the main sources of haze pollution. For instance, current monitoring of fires during haze pollution events does not clearly differentiate between fires that may be in agricultural and forest areas, thus causing limited haze pollution, and those fires that occur on peatland and that may burn for weeks or even months. A further and probably more significant problem is that a zero-burning approach implies that funding should be allocated to the prevention and mitigation of all fires. However, most of the funding should actually be allocated to the most polluting fires, that is, peat fires.

To summarize, we argue that the problem with the Agreement is not simply in terms of the process of cooperation it puts in place. The key shortcomings are its objectives, that is, the focus on zero-burning and a lack of attention to the economic incentives Indonesia faces to prevent haze pollution.

### 3 The nature and deep determinants of fires and haze pollution<sup>9</sup>

The ASEAN focus on zero-burning regards all fires as undesirable and to be prevented and suppressed. This view of fires is also common in much of the literature that has dealt with fire management in Indonesia. Various policy recommendations have been proposed including: restricting or freezing forest conversion until improved land allocation policies and fire control procedures are in place, the adoption of reduced impact logging, strengthening rules and penalties against fire use for land clearing in plantations, and land use rationalization with community participation to promote consensus on land use and establish community responsibility and commitment (Applegate et al. 2001; BAPPENAS-ADB 1999; Barber and Schweithelm 2000; Glover 2001; Koh and Robinson 2002; Qadri 2001; Siegert et al. 2001).

However, it is misleading to think about fires as *the* policy problem, and indeed as a *single* problem, and to provide generalized recommendations to address it. The impacts of fires are the actual problem and a failure to recognize this point poses two significant risks:

- (a) all fires might be perceived as problematic rather than considering in what circumstances fire may be an appropriate land management tool;
- (b) fires may, and often do, have differentiated impacts (e.g., according to the location and impacted areas) that need to be addressed with different policies.

Although there has been considerable discussion in Indonesia about the extent of the fires, it has not been clarified which fires are considered problematic, in the sense that they have undesirable impacts and at what geographical scale those impacts are undesirable. In the case of Indonesian fires, the main fire-related policy problems are:

- (1) haze pollution, which affects Indonesia and its neighbours—these regional issues are the focus of the Agreement;
- (2) carbon emissions, which have global impacts, but are not the focus of the Agreement;
- (3) forest degradation and deforestation, and loss of products and services (including timber, non-timber forest products, soil erosion, biodiversity)—these issues are of

<sup>9</sup> This section is based on Tacconi (2003) unless otherwise stated.

- concern to the Indonesian nation and local communities; additionally, loss of biological diversity is a global concern;
- (4) rural sector losses from escaped fires and fire induced weather anomalies—this problem concerns the Indonesian nation and local communities.

The first and second problems are most relevant to the Agreement. Haze pollution occurs every year during the dry periods in February–March and August–October and it has been recognized as a major problem over the past two decades. The most significant events took place during drought periods associated with El Niño years, the most important one in 1997/1998. Significant transboundary haze pollution also occurred in 2002, 2005 and 2006. In Indonesia, peat fires are by far the largest contributor to haze pollution. In 1997/1998, peat fires may have contributed between 60% and 90% of the emissions that caused haze pollution, and they were also the major source of carbon emissions (BAPP-ENAS-ADB 1999).

In 1997, the main contributors to the haze pollution that affected Singapore, mainland Malaysia, and Sumatra (Indonesia) were fires in the peatlands of Jambi, Riau,<sup>10</sup> and South Sumatra provinces, mainly due to land clearing for oil palm and timber plantations and, in the South Sumatran wetlands also due, to a yet unclear degree, to livelihood activities such as rice cultivation, fishing, grazing and logging (Anderson and Bowen 2000; Barber and Schweithelm 2000, Map 2; Tapper et al. 2001; Chokkalingam et al. 2007). In non El Niño years, land clearing for oil palm and timber plantations on peatlands appears to be the main source of haze (Sargeant 2001).

Oil palm development is, however, an increasingly popular activity among smallholders in Indonesia, which account for up to 50% of oil palm plantations (Barlow et al. 2003). While the role of large companies has been clearly documented, the extent to which the increasing significance of smallholder activities contributes to haze pollution is only starting to be contemplated. It is worth noting that many small-holders are closely linked to the larger plantation companies who contract them to grow oil palm. The extent to which smallholders can afford non-burning methods (independently of plantation companies) needs to be researched.

In 1997, peat fires in the area of the Suharto-government initiated 1 Million Hectare Rice Project<sup>11</sup> in Central Kalimantan appear to have been the main source of haze pollution in Kalimantan (Barber and Schweithelm 2000; Page et al. 2002) also affecting Sarawak (Malaysia). Again in 2002 and 2006, fires in the same area contributed significantly to the haze pollution that engulfed Central and West Kalimantan and the Sarawak during the dry periods of August to November. Fires with much smoke had also affected the same area in August 2001 (Anderson 2001).

In West Kalimantan in 1997, extensive burning probably for land clearing in oil palm and timber plantations (Potter and Lee 1999) in peat areas, and from livelihood activities in

<sup>10</sup> In normal years, Riau probably has more land clearing fires (as detected by satellite) than any other province in Indonesia. From historical rainfall records, it does not suffer severely from El Niño droughts. In Riau, there were many fires and haze pollution from plantation fires on peatlands in early 1997 and early 1998 but no wildfires such as in Jambi and South Sumatra during the peak haze months of September to mid-November 1997 (I. Anderson, pers. comm. to Luca Tacconi, Nov. 2002).

<sup>11</sup> President Suharto ostensibly promoted the project to allow the transmigration of up to 1 million settlers. Environmental impact assessments had shown it was not viable and it has been abandoned. It is the largest area of degraded peatland in Indonesia and therefore the most significant source of haze emissions in the country and one of the most significant, if not the most significant source of carbon emissions in Indonesia (Silvius et al. 2006).



the peatland of the Danau Sentarum protected area (Dennis et al. 2000) contributed to haze pollution in West Kalimantan and Sarawak.

In January–April 1998, fires in the peatlands of the Central Mahakam Lakes area, which seems to be linked to a large degree to livelihood activities such as hunting and fishing (Chokkalingam et al. 2005), as well as large scale fires in other parts of East Kalimantan contributed to haze pollution in the province. These fires did not result in significant transboundary pollution.

Fires in Southern West Papua contributed large amounts of haze (and carbon emissions) in 1997. This fact went almost unnoticed because the haze spread westwards at sea (Legg and Laumonier 1999; Tapper et al. 2001) and the affected area in West Papua itself has low population density and no major city. These fires did not contribute, however, to the transboundary haze pollution relevant to the Agreement.

The above description of the distribution of the fires and haze pollution mainly refers to 1997/1998. This is due to the fact that most studies available have documented those fires, partly because they were the most significant ever experienced in the region. We have indicated, however, that similar haze pollution patterns have occurred in more recent and relatively dry years, that is, 2002, 2005 and 2006. The fires and related haze pollution of 1997/1998 could be considered an unusual occurrence because 1998 was the hottest year of the last millennium (Pittock 2005).<sup>12</sup> The now evident increase in temperatures associated with climate change—which have resulted in several recent years being the hottest on record after 1998 (Pittock 2005)—implies however that fires and haze pollution can be expected to occur regularly and probably more frequently than in the past (Running 2006).

### 3.1 Deep determinants, costs and benefits

The costs of fires and related haze and carbon emissions have been estimated as follows by Tacconi (2003). Indonesia may have lost between \$1.7 and \$2.7 billion as a result of the negative impacts of fires on timber production, non-timber forest products, plantation crops, flood protection, erosion and siltation, and biodiversity, with most of these costs arising from fires outside peatland. The indirect impacts of haze pollution on primary and secondary sectors (which mainly occur as a result of peat fires) are estimated at \$0.3–0.4 billion in Indonesia, and another \$0.4 billion in Malaysia and Singapore. The global cost of greenhouse gas emissions, which may have been at least 400 million tones of carbon,<sup>13</sup> may be as large again and greater than the total cost in the region. For example, Tacconi (2003) assumed damage costs of 7\$/tC, putting the cost from carbon emissions at \$2.8 billion; if current carbon prices under the EU emissions trading system (discussed below) were used for this evaluation, the cost would be much higher still.

There are also significant economic benefits associated with the fires, at least for Indonesia. Let us first consider the case of the 1997/1998 fires in East Kalimantan, because they were the largest forest fires in Indonesia, thus being relevant to the arguments focusing on the need to improve overall forest management and relate to the costs of fires outside peat areas noted above. If preventing the fires in East Kalimantan implied maintaining the forest in its ‘pristine’ state, this would have required forgoing decades of log production.<sup>14</sup>

<sup>12</sup> Pittock (2005) cautiously notes that data are available only for the Northern Hemisphere. That a similar condition applies to the Southern Hemisphere can only be inferred.

<sup>13</sup> It is possible that carbon emissions were much higher, see footnote 1.

<sup>14</sup> The financial and economic aspects of fires presented here are derived from Tacconi et al. (2007).



This assumption may seem to be extreme. It could be argued that sustainable forest management would allow logging while minimizing the risk of fires. However, this assumption reflects the forest management conditions prevalent during the period considered below and arguably they still apply: sustainable forest management, which would reduce (but not eliminate) the risk of fire, is not implemented in Indonesia, as it is the case in many other tropical forest countries (see ITTO 2006). Furthermore, once a forest has been opened up by (sustainable or unsustainable) logging, a range of activities take place in the forest resulting in fires during periods of drought (e.g. Chokkalingam et al. 2005). Controlling or stopping these activities, which are often carried out by local rural people, is particularly difficult because of the large areas to be policed and it is also politically difficult.

Official log production in East Kalimantan over the period 1969–1997 was about 172.7 million m<sup>3</sup> (Hinrichs and Solichin 1999). The net present value of those logs in 1997 was roughly US\$25.4 billion. To err on the conservative side, it may be assumed that the value of the timber produced in the area burnt is equivalent to one quarter (i.e. about US\$6.3 billion) of the total production, which is the ratio of the area burnt to total forest in logging concessions. Meanwhile, the costs of the fires in East Kalimantan have been estimated at a maximum of about US\$1.7 billion (Tacconi 2003). Therefore, comparing the net present value of log production with the costs of fires indicates that it may not be desirable from an Indonesian national economic perspective to maintain ‘pristine’ forests in order to avoid the costs of fires. This conclusion holds even if a share of the haze related costs is attributed to the fires in East Kalimantan because the benefits of log harvesting are significantly larger than the cost of fires and the total costs associated with haze pollution.

Let us now focus on the economics of peatland conversion, which is the most relevant aspect in relation to the focus of this paper. Financial interests drive peatland fires for land clearing in plantations of oil palm and timber. In Indonesia, forest clearing to establish timber plantations on peat soil is estimated to cost \$US 180/ha with burning, whereas zero-burning methods (i.e. mechanical clearing) may cost as much as around \$US 800/ha (Gouyon and Simorangkir 2002). Plantation companies have therefore a clear incentive to continue using fire to clear land. There is therefore a clear need for further research considering whether the private benefits derived by companies from burning do or do not exceed the social costs faced by Indonesian society as well as neighbouring countries from haze pollution and global society from carbon emissions. On the basis of the limited information available we would expect that the global costs arising from burning on peatland are higher than the private benefits. Silvius et al. (2006) indicate that the oxidation of peat results in the release of 65 tones of CO<sub>2</sub>/ha/year and fires would obviously generate much higher emissions. The global costs of that amount of carbon emissions are about \$455/ha/year, if we adopted the same price of carbon (\$7/tonne) used for the estimation of the cost of fires in 1997/1998 by Tacconi (2003). However, that carbon price has already been widely exceeded in actual trading as noted below and global costs can be expected to be significantly higher than the private benefits. There would appear to be a case, therefore, for global and regional society to subsidize mechanical land clearing by large-scale plantations. This is an issue that is addressed in detail in the following section.

The above discussion puts significant emphasis on the role of plantations in generating emissions. We certainly do not intend to minimize their role, but we also think that only emphasizing their contribution is counterproductive. We have already noted that much of the pollution is generated by fires in degraded peatland, at least in the driest years when these emissions also reach their peak. We have also noted that the activities of rural people are thought to play a significant role in those fires. These points indicate that particular attention should be given to the economic and social aspects of regenerating degraded

peatland. This may or may not involve addressing pollution from plantations. The focus of those activities will depend on who are the stakeholders actually using those lands. In this respect we wish to point out that there is still lack of sufficient knowledge about the direct causes of fires in degraded peatland which mirrors that pointed out in relation to production forests on mineral soils (Vayda 2006).<sup>15</sup>

Various measures have been identified that could help reduce the likelihood, spread and severity of future peat fires (see Applegate et al. 2001; Tacconi 2003; Dennis et al. 2005). These include upgrading of drought and fire information systems to reduce the incidence of burning in dangerous weather conditions; institutional strengthening and development of local administrations' and plantation companies' capacity for fire management; incentive payments to regional governments to implement and enforce zoning provisions and other land use regulations; and buying off formal or informal property rights from plantation companies. Many of these measures would require substantial financial resources in order to be implemented at a large enough scale to make future peat fires appreciably less frequent and severe. Local and regional administrations in Indonesia are generally unable or unwilling to allocate large resources to the peat fire issue. This is because a substantial proportion of the damages occurs elsewhere and the current practices bring significant local development benefits. There is also a limited coordinated approach to land and fire management between Indonesian government agencies, and coordination has further suffered through recent devolution of responsibility for natural resource management to the district level implemented under administrative reforms for greater regional autonomy (Resosudarmo 2004). The central government in Indonesia has not taken significant steps to address the peat fires, other than a largely ineffectual (and in part misconceived) legislative ban on using fire for land clearing. Financial resources at the central government level are very limited, and there is a reluctance to spend money on natural resource management in the provinces to fulfil their resource management responsibilities.

To summarize, the reasons and incentives people have to start the fires constitute the deep determinants of the problem. Only by effectively addressing these determinants can the causes, and ultimately the problems, be resolved. The fundamental issue is that at the local level there exist very few resources to address the challenges of haze pollution. Thus progress on haze pollution (and associated carbon emissions) requires financial and human resources to regenerate degraded peatland, support the adoption of mechanical clearing in large-scale plantations on peatland, effectively monitor and enforce appropriate regulations and provide assistance to improve fire management where fire may be a useful land management tool. Given that such financial resources and capacity are not provided by ASEAN to the party that generates almost all of the haze pollution, Indonesia, it is not surprising that there has been little progress on mitigating the problem.

#### **4 International financing for regional cooperation and local action**

Given the magnitude of carbon emissions from peat fires, the global community should consider supporting the implementation of the ASEAN Agreement by contributing to the Haze Fund, or through other institutional structures. Any country concerned about the long-term impacts of climate change would have a potential interest to contribute to mitigating the peat fires because of the large carbon emissions from those fires. Given

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<sup>15</sup> However see Chokkalingam et al. (2005, 2007) and Suyanto et al. (2004) for detailed case studies in Sumatra.

current attitudes evident in the global climate change negotiations, the greatest willingness to pay could be expected on the part of the European Union and Japan. There are also indications that the United States and some large developing countries are willing to put significant resources towards long-term greenhouse gas mitigation strategies.<sup>16</sup>

Under the European Emissions Trading Scheme, emissions offset credits from projects in developing countries under the Kyoto Protocol are being traded at prices in the order of 100 \$/tC (around 20 €/tCO<sub>2</sub> in mid-2007), and longer-term technological options for greenhouse gas reductions in energy systems (such as carbon capture and storage) are likely to be even more expensive (Metz et al. 2005; Point Carbon 2006). Large reductions in future emissions from peat fires might be achieved at a cost that is only a fraction of such amounts if effective mechanisms were used to provide incentives locally. Peat fire prevention might thus be a cost-effective strategy as part of broader efforts to reduce global greenhouse gas emissions.

Addressing the peat fire issue effectively will require coordination of the global, regional and local level. Action needs to take place at the level of local and provincial governments in Indonesia with some coordination by central government agencies. Countries in the region are in the best position to negotiate and steer implementation. The most likely source for large-scale funding is at the global level.

Financing sustainable development with global environmental benefits under current institutional settings is the job of the Global Environment Facility (GEF). But the GEF in its current form is too narrow and arguably too inflexible to do the job at hand. Finance is only for specific project activities, only for global benefits (carbon emissions but not air pollution), lead-times for projects are long and projects are funded in response to local requests rather than for cross-border initiatives. A better recipe to make funds flow and to catalyze regional action is to provide funding from rich countries but leave it up to regional coalitions of governments and other groups to design and implement programs. Such financing would be complementary and entirely consistent with the Agreement.

Given the benefits Indonesia receives from using fire as a land clearing tool and in developing peatland, it needs to receive incentives to do something about haze pollution. We thus propose the creation of a pool of funds contributed to by rich countries as well as ASEAN countries,<sup>17</sup> to address the causes behind haze pollution through local action in Indonesia. Contributions could come out of an overarching global mechanism for financing sustainable development.

Such a mechanism (called CURES, Country Undertakings and Rights for Environmental Sustainability) was proposed by Grafton et al. (2004), and can also be seen as a blueprint for reform of the GEF. CURES would be a multinational mechanism to finance sustainable development. It would operate as a large fund into which rich countries would pay based on indicators such as their income per capita and environmental performance. Disbursements would be made to middle- and low-income countries on the basis of their income (poorer countries receiving more per capita), their need for funding (proxied by indicators of the level of sustainable development), and the existence of opportunities for programs to address poverty and environmental degradation. Entitlements to CURES funding would be transferable between recipient countries, providing greater flexibility for

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<sup>16</sup> In March 2007, the Australian Government announced founding of AUD 200 million for a Global Initiative on Forests and Climate that will also probably provide support to Indonesia to address peat fire management.

<sup>17</sup> Quah (2002) has convincingly argued that it is in the interest of neighbouring countries such as Singapore to provide financial support to Indonesia to prevent and mitigate fires.

recipient countries in allocating funds—under the GEF transferring funds to a regional fund such as that under the Agreement would not be allowed.

Funding under CURES would be outcome-based. Recipient countries would discuss agreed conditions, including a clear objective of what is to be achieved and a plan of how funds will be spent. To ensure accountability, funds would only be disbursed if they are spent on verifiable activities with measurable benefits. If benchmarks were not met, additional technical assistance would be provided and continued failure would lead to freezing of funds. The main differences to GEF in its current form are that CURES would have formula-based (and thus likely more reliable) contributions, and that recipients would have much greater leeway in how they use funding, so a wider range of initiatives could be supported more flexibly.

For peat fire mitigation, CURES could be used in a common effort by ASEAN nations that suffer from the haze and provide large amounts of funding fast and flexibly. Indonesia would use some of its CURES allocation as the principal program funding, and ASEAN countries affected by the haze would channel some of their CURES allocations to programs in Indonesia. They would get payoffs in the form of reduced air pollution. Depending on negotiations between these countries, the neighbours' CURES allocations could either be given to Indonesia, or loaned, for Indonesia to pay back allocations for use in other ASEAN countries in the future.

ASEAN countries, through the ASEAN Secretariat, could have a strong role in planning programs in collaboration with the Indonesian government. The regional neighbours are the best principals as they have a direct self interest in making programs work. As such, they would also act in line with the interests of rich donor countries who want to see reductions in carbon emissions but without direct involvement in regional affairs. Disbursements would be to activities for peat fire prevention, such as those discussed earlier in the paper, with expenditures prioritized for programs that show the greatest promise of practical outcomes, with the rehabilitation of degraded peatland being a prime candidate. Performance would need to be reviewed at regular intervals, with funding to underperforming projects and activities cut or discontinued, and increased for successful ones.

In designing the programs, it would be crucial to provide incentives for local actors to help implement them. Local and regional governments as well as relevant businesses and other stakeholders need to be supported financially in the implementation of projects and activities that reduce peat fires and haze pollution. Thus, if projects reduce local people's access to peatland and other resources, there need to be ample funds available for supporting alternative livelihoods (see Noor et al. 2005). Similarly, plantation companies clearing shallow peatland may need to be subsidized if they experience higher land clearing costs. Thus monetary incentives would be used together with law enforcement mechanisms to help achieve environmental policy objectives. It could be argued that plantation companies should be taxed if they pollute, rather than being subsidized. However, this approach faces a political constraint. The costs would be born by Indonesia and the benefits would accrue mostly to neighbouring countries. It should be noted that the approach we propose is similar to the case of renewable energy sources. They are subsidized to support their adoption rather than relying only on taxation of non-renewable energy sources.

## 5 Conclusions

Haze pollution in Southeast Asia is a major and on-going regional and global socio-economic and environmental problem. The proximate cause is peat fires primarily in

Indonesia. Recognition of the problems led the ten members of ASEAN to sign an agreement in 2002 to co-operate to mitigate them. However, the Agreement has yet to achieve its environmental goals in terms of controlling haze pollution. To effectively address the haze problem, ASEAN countries need to bring into sharper focus the nature of the problem they are seeking to resolve. They should focus on preventing peat fires rather than trying to prevent all fires. It should also be recognized that a zero-burning approach to fire management is not the most reasonable approach, given existing practices for land management and pressures for development. Many fires are useful and do not necessarily contribute to haze pollution. Controlled burning should be promoted for fires that have the potential to contribute to haze pollution. Zero-burning should be promoted only for those activities that pose a significant risk of haze pollution, such as those in relatively deep peat.<sup>18</sup>

Despite the best of intentions, the Agreement has done little to address the deep determinants of haze pollution and related environmental problems. We argue that, by itself, the Agreement does not provide the appropriate incentives for Indonesia to act. Large benefits would accrue to neighbouring countries by way of reduced health impacts and economic disruption, and globally through reducing the great amounts of carbon emissions from peat fires; but these transboundary effects are not translated into incentives to reduce the incidence and severity of peat fires in Indonesia.

To address the incentives issue we propose to provide global financing funded by rich countries and also ASEAN countries most affected by haze pollution (e.g. Quah 2002). If appropriately financed, designed and managed, such a fund offers a possibility of changing the deep determinants of the fires and mitigating their substantial environmental and economic impacts. An important requirement will be to allow for greater flexibility in how funds are used than under the GEF, including transfer and pooling of funds between developing countries.

The implementation of on-the-ground activities supported by global funding faces significant challenges. At the local level, the actions of large commercial companies are technically easier to regulate, monitor, and provide incentives to than the activities of the thousands of rural people who depend on fire use in peatlands for their basic livelihood. Providing incentives and options for alternative livelihood strategies typically incurs large transaction costs. At the regional level, the ASEAN approach of non-intervention and the lack of an effective dispute settlement mechanism could hamper the effective implementation of activities funded through global financing. The implementation of agreed measures should also be closely scrutinized, particularly if large financial flows are involved. This needs to be backed by conflict resolutions mechanisms. Effectively addressing the Southeast Asian haze problem may therefore need a rethink of ASEAN regional cooperation, alongside more effective regional and global mechanisms for planning and financing environmental strategies. We also recognize that the provision of financial incentives is not sufficient in itself to solve the haze problem. Limited reform of the legislation regulating fire use is required (e.g. Tan 2005). However, the regulatory reform needed is certainly simpler than reforming the whole forestry sector (e.g. Barber and Schweithelm 2000; Mayer 2006). It is possible that to implement sustainable forest management in Indonesia such a reform is needed. However, that is an issue that although important does not exactly overlap with the haze problem.

<sup>18</sup> Indonesian legislation forbids the development of peat deeper than 3 m. Consideration needs therefore to be given to the preparation of guidelines for the development of peat up to 3 m of depth, including guidelines on conditions under which controlled burning may take place.

Similar lessons can be drawn for the broader issue of international co-operation on transboundary environmental problems in developing countries. To ensure the greatest chance of success, strategies for mitigation need to be focused on the core issues. The root causes of environmental problems need to be clearly identified in designing mechanisms to deal with environmental challenges, local pressures for development and requirements for livelihoods. Finally, any transboundary benefits of mitigation should be translated into effective local incentives, which may require innovative international mechanisms for financing sustainable development.

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