

INDONESIA HAS RATIFIED THE ASEAN AGREEMENT ON TRANSBOUNDARY HAZE POLLUTION: WILL THE HAZE DISAPPEAR?

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ABSTRACT

Land and forest fires and haze have become one of the biggest environmental challenges in the ASEAN region. Indonesia has become the major source of transboundary haze in the region. By mid-September 2014, Indonesia had ratified the ASEAN Agreement on Transboundary Haze Pollution (AATHP). This paper makes two major contributions: first, the paper quantitatively revisits the causes of hotspots in Indonesia; and second, the paper identifies and discusses the national efforts that have been made and policy handicaps that need to be removed. The government needs to focus on rehabilitating critical land, promoting reforestation, and protecting peatland ecosystems. Although there is a trend for the number of hotspots to decline, there are no guarantees that transboundary haze can be eliminated. There is hope that by ratifying the AATHP, Indonesia can have better resources to conduct preventive, mitigating and monitoring activities, but there is a need to develop streamlined coordination, law enforcement, and capacity building at national and local level that can promote common interests in fighting the haze, and land and forest fires.

Keywords: AATHP, hotspots, land, forest, fire, peatland

JEL: Q53, Q58, C23

INTRODUCTION

The World Bank (2005) records that Indonesia is among the top 35 countries that have high mortality risks from multiple natural hazards (earthquakes, tsunami, volcanic eruptions, floods, landslides, droughts and forest fires). About 40 per cent of the population is at risk; more than 90 million lives (World Bank, 2014). The poor have the highest exposure to environmental degradation and climate change. According to the World Bank (2006),

27.8 per cent of poor people depend on forests for their livelihood. Land and forest fires and haze are still one of the biggest environmental challenges in the ASEAN region.

Peatland fires have become one of the major sources of transboundary haze pollution in ASEAN. Peatland is found across the ASEAN countries, such as Indonesia, Malaysia, Brunei Darussalam and Thailand but about 70 per cent of the peatland in Southeast

Asia is in Indonesia (ASEAN, 2014). Draining peatland for agriculture, forest plantations, timber harvesting, and other purposes is the root cause of peatland fires (ASEAN, 2014). This indicates that Indonesia has a significant role to play in mitigating the haze problem by conserving peatland.

Peatland, land and forest fires have caused significant losses. According to the World Bank (2014), the estimated damage and loss caused by forest fires in Riau, between February and March 2014, reached USD935 million and, in

terms of ownership, about USD684 million of this amount affected the private sector and about USD251 million affected the public sector; that is, more than 73 per cent of the damage and losses was borne by the private sector. There were three main sectors that suffered substantial loss: forestry, agricultural crops and manufacturing. Thus, the private sector will obtain more benefits, or it can reduce losses, by making more effort to conserve and protect the environment.

Table 1. Estimated damage and loss from forest fires in Riau, February to March 2014

Sector	Disaster effects			Ownership	
	Damage	Loss	Total	Public	Private
Forestry	9	292	301	133	168
Agricultural crops	64	196	260	91	169
Mining	0	12	12	0	12
Trade	0	76	76	0	76
Manufacturing	0	219	219	0	219
Tourism	0	20	20	0	20
Transport, communication	0	22	22	6	16
Health	0	11	11	8	4
Environment*	0	0.1	0.1	0.0	0.1
Humanitarian and fire-fighting costs	0	14	14	13	1
Total	73	862	935	251	684

Note: *Environment loss estimates capture direct biodiversity losses only and exclude GHG emissions.

Source: World Bank (2014)

Land and forest fires have been recorded since the early 1980s and their

frequency and scale tended to increase in the years to 1997–98. In 1997–98,

fires destroyed land and forest areas of more than 9.8 million hectares (see Table 2). Most land and forest fires result from human activity and there are four contributing factors; land conversion, shifting agriculture, social jealousy and the transmigration program (National Disaster Mitigation Agency, 2013). The economic loss from haze and fires in 1997 and 1998 was approximately 0.5 per cent and 1.5 per cent of GDP respectively (Ruitenbeek, 1999). However, the haze from land and forest fires not only affected Indonesia but neighbouring

countries too and it caused losses to Singapore and Malaysia. Glover (2001) estimated the damage from fires and haze for the period from 1 August to 31 October 1997 in three countries: Indonesia, Singapore and Malaysia. The total loss for this period was estimated to be nearly USD4.5 billion of which USD1.4 billion was attributed to the effects of haze. After 1997–98, the total area subjected to fires decreased gradually, but haze from land and forest fires is still a major environmental threat locally, regionally and nationally.

Table 2. Total Area Burnt, 1982–2012

Year	Area burnt (’000 ha)
1982–1983	3.6
1987	49.3
1991	118.9
1994	161.8
1997–98	9800
1999	44.1
2000	8.3
2001	14.3
2002	36.7
2003	3.7
2004	14
2005	13.3
2010	3.5
2011	2.6
2012	8.3

Source: National Disaster Mitigation Agency (2013)

Because haze from land and forest fires in Indonesia can adversely affect neighbouring countries, Indonesia has become an instrumental player in maintaining good air quality in the region. Raustiala (2005) (cited in Nguitragool, 2011) said that Indonesia, the haze-exporting country, has the power of veto, that is, Indonesia would be sure of reciprocity from a binding agreement to do with haze prevention or mitigation without running the risk of legal obligations and sanctions if Indonesia were not to comply.

At ASEAN level, efforts to promote effective environmental management and sustainable development were proclaimed in 1990 when the Minister of Environment signed the Kuala Lumpur Accord. ASEAN leaders stressed the importance of 'harmonization of transboundary pollution prevention and abatement practices'.¹ In 1995, the ASEAN Cooperation Plan on Transboundary Pollution was adopted, which allowed member countries to cooperate in preventing and mitigating the effects of land and forest fires and haze. In

December 1997, the ASEAN administration produced a Regional Haze Action Plan, which had three major objectives: (i) to prevent land and forest fires through better management policies and their enforcement; (ii) to establish operational mechanisms to monitor land and forest fires; and (iii) to strengthen regional land and forest fire-fighting capability and other measures to mitigate the effects of haze.² However, the action plan is an *ad hoc* and non-binding accord (Nuitragool, 2011). In June 2002, the ASEAN Agreement on Transboundary Haze Pollution (AATHP) was adopted, and was signed by Ms Liana Bratasida, Deputy Minister of Environment Conservation, Ministry of Environment, Republic of Indonesia. The agreement came into force in November 2003, after it was ratified by six member countries but Indonesia was not one of the six.³

Although the AATHP came into force in 2003, Indonesia's parliament refused to endorse it. However, after more than a decade, in mid-September

1 The Kuala Lumpur Accord on Environment and Development, 1990
<http://cil.nus.edu.sg/rp/pdf/1990%20The%20Kuala%20Lumpur%20Accord%20on%20Environment%20and%20Development-pdf.pdf>, [access on 2 October 2014]

2 Regional Haze Action Plan,
http://haze.asean.org/?page_id=213, [accessed on 2 October 2014].

3 Brunei Darussalam, Malaysia, Myanmar, Singapore, Vietnam and Thailand.

2014, Indonesia became the last ASEAN country to ratify the AATHP. Nguitragool (2011) gives several reasons why Indonesia did not ratify the agreement. First, it can restrict national sovereignty.⁴ Second, it is difficult to comply with the negotiated accord. Third, the Ministry of Environment, a leading institution during the negotiations, had limited authority and influence nationally. Fourth, during the negotiations, Indonesia had a democratic transition to a more decentralised governance; one implication of this is that regional governments became more important in the management of forest and land fires. Fifth, there were competing issues nationally, which distracted the government from focusing on land and forest fires. Sixth, the military was involved in illegal logging, and military reform was protracted because it was still dealing with separatist movement in Aceh and Papua. Seventh, the Ministry of Forestry was the most difficult institution to persuade. This ministry has the right to issue concessions, which, because of bribery

and corruption, have been a source of lucrative benefits for those with the authority to issue licences. In conclusion, Nguitragool (2011) said that the politics of rent seeking and loopholes in institutional regulatory structures had become obstacles to ratifying the agreement.

Nguitragool (2011) also pointed out that differences in understanding of the haze agreement among influential experts in the community was another important factor. Besides the AATHP, there were two other international agreements that had been proposed for ratification: the Cartagena Protocol under the Convention on Biological Diversity, and the Kyoto Protocol under the United Nations Framework Convention on Climate Change. Some Indonesian experts argued that ratifying of the Kyoto Protocol was more important than the ASEAN haze agreement (Nguitragool, 2011).

Resisting regional and international pressure on Indonesia to ratify the AATHP, the Indonesian government and the parliament demanded guarantees that ASEAN member countries, especially Malaysia, not buy timber illegally exported from Indonesia (Jerger, 2014). The argument is quite strong because international

4 In dealing with forest fires in 1997, Malaysia attempted to help Indonesia by deploying 1200 Bomba troops without consultation. The Indonesian government demanded the Malaysian troops be sent back to Malaysia (Nguitragool, 2011).

trade in illegal timber is closely connected with land and forest fires (Nguitragool, 2011). The second reason is related to an extradition treaty between Indonesia and Singapore (Prasetyawan, 2014). Although the bilateral agreement was signed in 28 April 2007, the agreement combined a Defence Cooperation Agreement (DCA) and an extradition treaty. Indonesia will ratify the agreement if the DCA and the extradition matters are separated.⁵

This paper analyses the local, regional and national consequences and implications after Indonesia ratified the AATHP. This paper has five sections. After the introduction, section two revisits the cause of land and forest fires in Indonesia and suggests a better approach on how the Indonesian government can effectively take measure such fires. Section three discusses how Indonesia can optimise the ASEAN frameworks that relate to mitigation of land and forest fires. Section four analyses the framework of cooperation at local, regional and

national level. Section five is the conclusion.

UNDERSTANDING THE CAUSES OF LAND AND FOREST FIRES

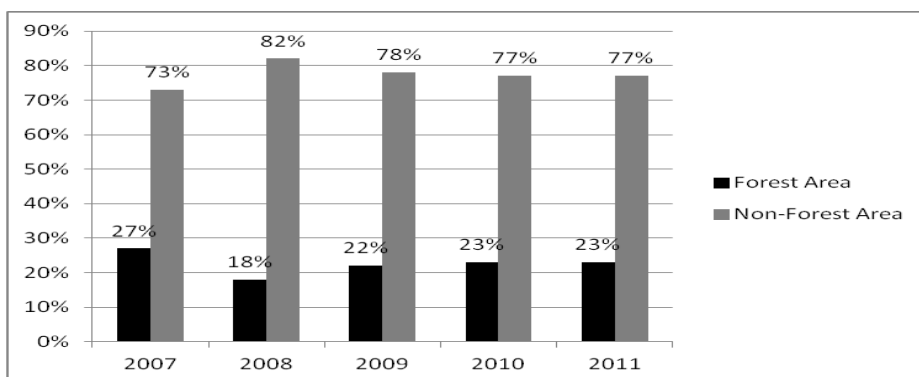
Land and forest fires can be detected by observing the hotspots. According to the National Institute of Aeronautics and Space of Indonesia, the word 'hotspot' refers to particular places on earth where the temperature is relatively higher than at other places elsewhere. The number of hotspots is determined from factors such as climatic, anthropogenic, social and economic indicators. The US National Oceanic and Atmospheric Administration satellite and the moderate resolution image spectroradiometer (Modis) in the Terra and Aqua satellites can detect hotspot positions, but knowing the coordinates of a hotspot is not necessarily an indicator of a fire. Satellite data can help to reduce the risk of land and forest fires but on-ground spot-checking is necessary to ascertain the presence of a fire. The National Environment Agency of Singapore also publishes each day the position of hotspots in Sumatra. Although current satellite technology can give a four to six-hour early warning of places of the

5 Indonesia's House wants extradition treaty with Singapore, <http://news.asiaone.com/news/asia/indonesia-s-house-wants-extradition-treaty-spore>, [accessed 10 November 2014].

highest fire danger, by using weather forecasting data, a warning can be given about two weeks earlier (De Groot et al., 2006). This indicates that the government and the private sector can assess risks and, by taking comprehensive measures to reduce those risks, anticipate fires.

Figure 1 shows that between 2007 and 2011, the distribution of hotspots was concentrated in non-forest areas rather than in forest areas. According to Law 18 of 2013 on mitigation and eradication of forest devastation, the term ‘forest area’ refers to a specific area that is determined by the government to be forest. Thus, it can be argued that because most hotspots are outside a defined forest area, they are beyond the jurisdiction of government. Thus, hotspots are mostly the concern of the private sector.

However, Muttaqin (2010) argued that institutional arrangements and organisation of Indonesia’s forests are complicated and there is no consistency or standardisation on forest management. According to Government Regulation 60 of 2012 on changing allocations and functions of forest, the government is able to redefine a forest area to non-forest area under particular conditions. To do this, there are requirements that need to be met, such as that the total area of forest to be maintained is at least 30 per cent of the total area of a river region, island, or province. Because the government has the authority to change the status of forest areas, it can contribute indirect to forest fire management for areas outside the non-forest area.



Source: Directorate General of Forest Protection and Nature

Figure 1. Distribution of hotspots detected by NOAA satellite receiver operated by the Ministry of Forestry in 2007–2011

The Asian Development Bank (2001) categorised the causes of land and forest fires into four: (i) underlying causes; (ii) direct causes; (iii) contributory factors; and (iv) indirect factors (see Table 3). One of the important direct causes not included is degradation of peatland. Drainage of peatland not only increases the risk of peatland fires but also reduces the peatland's natural capacity to absorb

and store water (ASEAN, 2014). Schweithelm and Glover (1999) argued that human activity over the past thirty years has greatly increased the hazards and risks of fire. Schweithelm and Glover (1999) pointed out that the government needs to focus on (i) timber production; (ii) nature conservation; and (iii) watershed protection.

Table 3. Causes and effects of land and forest fires

Causes				
<i>Underlying causes</i>	<i>Direct causes</i>	<i>Contributing factors</i>		<i>Indirect factors</i>
1. Availability of dry fuel, and a cause of its ignition.	1. Open-burning techniques for land conversion.	1. Political	Economic and physiographic Sociocultural Institutional	Climate and climatic variation (El Niño).
2. A transport mechanism, such as wind, to increase a conflagration.	2. Traditional slash-and-burn agriculture.	2. Economic and		
	3. Speculative burning to stake land claims.	3. Sociocultural		
		4. Institutional		
Effects				
<i>Direct</i>	<i>Indirect short-term</i>	<i>Indirect long-term</i>		<i>Cumulative</i>
Destruction of natural vegetation and agricultural crops and animal mortality rates.	Human health deterioration; disruptions to tourism, transport, and business; reduced enjoyment of life; contributing to the increased production of ozone, acid rain and greenhouse gases; and to a reduction of photosynthesis.	Long-term human health deterioration; changes to forest species and ecological processes.		Extinctions and irreversible changes to forest species and vegetation structure.

Source: For the causes, Asian Development Bank (2001) and for the effects, Schweithelm and Glover (1999).

Econometric model

This section analyses the determinants of hotspots. We collected provincial data for 18 provinces: Aceh, North Sumatra, West Sumatra, Riau, Jambi, South Sulawesi, West Kalimantan, Central Kalimantan, South Kalimantan, East Kalimantan, Gorontalo, North Sulawesi, Central Sulawesi, West Sulawesi, South Sulawesi, Southeast Sulawesi, Maluku and North Maluku for the period 2007 to 2010. Our strategy for estimation is in two forms: (i) pooled OLS; and (ii) a random effect model. We do not run the fixed effect model because there is not enough information to obtain the effect of critical land and, because of data limitations, we made the area of critical land constant. The general form of the pooled OLS model is as follows:

$$y_{it} = \beta_0 + \beta_1 x'_{it} + \varepsilon_{it} \quad (1)$$

where the subscript i stands for a province index ($i = 1, \dots, N$), t is a time index ($t = 1, \dots, T$) and comprises population density, human development index, rainfall, palm oil plantation area, reforested area, log production and area of critical land. According to Didu (2001), the Department of Agriculture and the Department of Forestry use different

definitions for critical land. The Department of Agriculture defines critical land in terms of its ability to produce agricultural products; the Department of Forestry defines critical land in terms of its ability to conserve or regulate water, to yield forest products, and to ameliorate the effects of floods and erosion.

An increase in population density is expected to contribute positively to hotspots. As population density increases, human activity also increases and demands on natural resources (energy, land, food and water) also increase. The human development index (HDI) comprises four components: life expectancy, literacy rate, years of schooling, and expenditure per capita. We assume that when the HDI increases, the capacity and awareness to conserve and to protect the environment will also increase. Thus, we assume there will be an inverse relation between the HDI and hotspots. Rainfall, natural or artificial, can reduce the number of hotspots and the haze. In the previous section we showed that land clearance for oil palm plantations increases the likelihood of land and forest fires and this, in turn, increases the number of

hotspots. Thus, we expect that when the total area of oil palm plantations is increased, the number of hotspots will also increase. Reforestation can reduce the number of hotspots and the government has a program for reforestation, which attempts to reduce the area of critical land and to recover forested areas. The time variable indicates the trend of hotspots over time, it can be an increasing or a declining trend.

Table 4 indicates the data, source and statistical summary of the average value. The average planted area of oil palm was about 379,000 hectares, which was lower than the area of critical land. Similarly, the government also reforested about 5693 hectares, that is about 0.18 per cent of the currently defined critical land. This indicates that land and forest rehabilitation needs to given a high priority by the new government.

Table 4. Data, sources and basic indicators

Data	Unit	Average indicator (2007–2010)	Source
Hotspots	Number	1347	Directorate General of Forest Protection and Nature Conservation. (Expressed in log form)
Population density	Per km ²	76.6	<i>Statistical Year Book of Indonesia</i> , (Statistics Indonesia). (All variables expressed in log form except the Human Development Index.)
Human Development Index	Index	71.5	
Rainfall	mm	2719	
Planted area of oil palm	'000 ha	379	
Reforested area	ha	5693	
Production of logs in forest concession estates	m ³	39,9507	
Extent of critical land	'000 ha	3388	

We used two estimation methods to analyse the consistency of parameters estimate' when we changed the model assumptions. Following the OLS assumptions that $E\{\varepsilon_{it}\} = 0$ and $E\{x_{it}\varepsilon_{it}\} = 0$, the OLS estimate is consistent for β_0 and β under weak

regularity conditions (Verbeek, 2008). With this assumption, we can apply a pooled OLS model and OLS will come with unbiased, consistent or efficient estimators. The, we estimate specifically a random effect model as follows (note that: $\varepsilon_{it} = \nu_i + \mu_{it}$)

$$y_{it} = v_i + \beta_1 x_{it}' + \mu_{it} \quad (2)$$

We may allow $E\{x_{it}v_i\} \neq 0$ or the unobserved heterogeneity in v_i to be correlated with one or more of the

explanatory variables. We apply a random effect (RE) model that allows covariance ($(x_{it}v_i) = 0$), but holds $E(\varepsilon_{it} | x_{it}v_i) = 0$.

Table 5. Econometric results

Independent variables	Pool OLS		Random effect	
	<i>Coeff.</i>	<i>Std Err</i>	<i>Coeff.</i>	<i>Std Err</i>
Population density	0.163	0.227	0.402	0.332
Human Development Index	-0.037	0.062	0.048	0.098
Rainfall	-0.368	0.284	-0.988	0.370*
Oil palm plantation area	0.429	0.154*	0.261	0.214
Reforested area	-0.094	0.071	-0.169	0.076**
Log production	0.074	0.107	0.084	0.136
Area of critical land	1.075	0.198*	1.299	0.296*
Time	-0.197	0.128	-0.229	0.118
Constant	0.834	4.565	-1.653	6.957
Number of observations	38		38	
R2 (robust std error) overall	0.829		0.782	

Note: * significant at 1 per cent; ** significant at 5 per cent

Table 5 shows that for all significant variables, we obtain a similar expected sign under OLS and RE models and it seems that RE has a higher value on parameters estimate' than the OLS model. Rainfall is important to ease the number of hotspots. According to the National Disaster Mitigation Agency (2013), there are three rain pattern zones in Indonesia but most regions follow the monsoonal pattern. The peak rain season is between November and March (precipitation of more than 150 mm a month) and the low-rainfall period between May and September. The monsoonal pattern has a close

correlation with sea temperature, which indicates that climate change will also contribute to the intensity of rainfall. In dealing with the June 2013 forest fires in Riau Province, the government used artificial rain, which was coordinated by the Agency for the Assessment and Application of Technology. The artificial rain was effective in easing the number of hotspots and reducing the haze.

The area of oil palm plantations contributes positively to the number of hotspots. This indicates that expanding the area of oil palm plantations needs to be controlled and monitored strictly

by the government. Thus, a complete ban on burning in the development of an area intended for a plantation must be strictly enforced. Efforts to rehabilitate land and forest need to be improved because such efforts can reduce the number of hotspots. The area of critical land becomes one of contributing factors in generating the hotspots. The government has three categories of critical land; very critical, critical and slightly critical. According to the Ministry of Forestry Regulation P 63/Menhut-II/2011, critical land can be inside or outside a forest area. In 2010, the total critical land was about

Implications

This econometric study confirms that promoting reforestation and minimising the area of critical land are important in reducing the number of hotspots. However, it seems that forest degradation in Indonesia still continues and this will increase risks to the critical land. Margono et al. (2014) indicate that the annual rate of degraded primary forest clearing in lowlands was, respectively, 174,000 hectares per year, 282,000 hectares per year and 343,000 hectares per year for the periods 2000–05, 2005–10 and

82.2 million hectares of which 6.6 per cent was classified as very critical and 30 per cent as critical.

The amount of logging has a positive effect to increase the quantity of haze, but the results are not significant. However, the results might not include the effects of illegal timber trading, which also contributes to fires. Interestingly, we do not obtain strong evidence that better quality human resources can lead to a better environment. Further, although the trend of hotspot incidents is in decline, it is not statistically significant.

2010–12.⁶ Further, according to Margono et al. (2014), of the 15.79 megahectares of forest cover loss for Indonesia for the period 2000–2012, 38 per cent or 6.02 megahectares was in primary intact or degraded forests. Even in 2012, the primary forest loss was about 0.84 megahectares, more than the reported forest loss in Brazil (which was about 0.46 megahectares). Thus, as forest degradation increases,

6 Primary forest is defined as mature natural forests of five or more hectares that retain their natural composition and structure, and have not been completely cleared and re-planted in recent history, including intact and degraded types (Margono et al., 2014, p. 1).

more critical land will be created and more hotspots caused.

Margono et al. (2014) mentioned that large wetland clearances are probably not caused by smallholders but by agro-industry land developers.

The development of peatland is often preceded by draining the wetlands (Margono et al., 2014). Although, in May 2011, the government declared a deforestation moratorium, Margono et al. (2014) argued that the moratorium has not had its intended effect. Even in 2012, Indonesia had the highest rates of loss of lowland and wetland primary forest cover (Margono et al., 2014, p. 5). This indicates that deforestation moratoriums are not an effective way to conserve forest.

Simplifying the organisation and promoting effective coordination are the biggest challenges to reduce deforestation. Didu (2001) indicates that there are 28 institutions and 14 related policies that affect the formation of critical land. There are four institutions that have the most influence on that formation: (i) the Ministry of Finance; (ii) the Ministry of National Planning Agencies; (iii) the Ministry of Forestry; and (iv) traditional institutions (*lembaga adat*).

Development policies that affect the formation of critical land are (i) environmental policies; (ii) policies affecting the welfare of people in the forested areas and nearby; (iii) policies affecting the ownership and management of forests; and (iii) security policies.

Further, the econometric analysis also indicates the importance of ensuring the availability of a water supply nearby to areas where land and forest fires are prevalent. Letchumanan (2014) also pointed out the importance of managing water, especially during the dry season. However, many canals have been dug to drain the peatland areas. In fact, for maximum productivity of crops and for maintaining the ecological integrity of peatlands, the water table should be between 40 and 60 centimetres below ground level (Letchumanan, 2014). Government Regulation 71 of 2014, Article 26, (on the protection and management of peatland ecosystems) prohibits the construction of canals that can drain peatland. Thus, the government needs to apply this regulation to any parties that have built canals and to block any existing canals.

However, most important is how to change the development paradigm from

exploitation of natural resources to their enrichment for sustainable development. A study from Oxford Policy Management that was completed by March 2013, showed that the current rate of growth is no longer sustainable.⁷ This is because the adjusted net saving have been around minus 5 per cent of GNI per year since 2004. This is mainly because of a fall in traditional capital, lower national savings and more depreciation of physical capital, and a rise in natural capital depletion, including deforestation and energy depletion.⁸

PROMOTING REGIONAL COOPERATION

Between 2003 and 2012, before Indonesia ratified the AATHP, the Indonesian government made constructive efforts to mitigate the effects of haze by issuing regulations and preparing technical support. For instance, the government issued Law 41 of 1999 on forestry, Law 18 of 2004 on plantations, Law 31 of 2009 on meteorology, climatology and geophysics, and Law 32 of 2009 on

protecting and managing the environment. Then, following the Copenhagen COP15 Conference, on 19 January 2010, the National Council on Climate Change sent a letter to the executive secretary of the United Nations Framework on Climate Change, stating that Indonesia intends to reduce its GHG emissions by 26 per cent to 41 per cent of CO₂. This means a reduction of around 6 to 24 per cent below the 2005 emissions level under a business-as-usual scenario (Ministry of Finance, 2009). The emissions reduction target covers seven major areas; peatland, forestry, agriculture, energy, industry, transport and waste. The second letter, delivered on 30 January 2010, stated that Indonesia's Voluntary Mitigation Action will reach 26 per cent by 2020. International cooperation has helped to reduce greenhouse gas emissions (Onn, 2013). Indonesia and Norway signed a USD1 billion partnership. Further, Indonesia is also involved in the Reduction of Emissions from Deforestation and Forest Degradation (REDD) schemes.

Mr Balthasar Kambuaya, a former Minister of Environment, claimed that he promulgated three regulations to protect the environment and ecosystems: (i) Government Regulation

⁷ Growth in Indonesia: is it sustainable?, <http://www.opml.co.uk/sites/opml/files/Growth%20in%20Indonesia_An%20Overview.pdf>, [accessed 27 July 2014].

⁸ Ibid.

71 of 2014 on the protection and management of peatland ecosystems; (ii) Presidential Regulation 61 of 2011 on the national action plan for greenhouse gas emission reduction; and Presidential Regulation 71 of 2011 on the implementation of a greenhouse gas inventory; (iii) and 16 ministerial regulations that relate to managing environmental degradation and climate change.⁹

The government also claimed that four technical measures have been taken.¹⁰ First, publicising the AATHP has been promoted to government and non-government agencies. Second, there has been international cooperation and coordination under the Indonesia Comprehensive Plan of Action on Transboundary Haze Pollution. Third, law enforcement has been done and coordination across all related government agencies. Fourth, the government has strengthened organisations and institutions to enable zero burning policies to be effective. Further, Singapore and Jambi Province signed a Letter of Intent in 2007 to

support anti-haze projects. Singapore committed to allocating SGD1 million to help build fire-danger rating systems, to train Jambi officers in interpreting satellite data, and to upgrade the province's fire-fighting capability (Onn, 2013).

However, in June 2013, Singapore suffered the worst haze for the past sixteen years and the pollutant standards index (PSI) reached 321 (Onn, 2013).¹¹ This caused tensions in Indonesia–Singapore and Indonesia–Malaysia relations because the Indonesian government argued that the haze was caused by plantation companies owned by Singaporean and Malaysian interests (Onn, 2013). As a result, Singapore and Malaysia asserted that Indonesia needed to make more serious efforts in law enforcement (Onn, 2013).

In conclusion; no matter how effective are Indonesia's national measures to tackle directly and indirectly the root causes of haze, there is no guarantee that there will no more haze problems. Haze has become a transboundary problem, national action

9 Serah terima jabatan menteri lingkungan hidup dan kehutanan [Handover in Ministry of Environment and Forestry], <<http://www.menlh.go.id/serah-terima-jabatan-menteri-lingkungan-dan-kehutanan/>>, [accessed 10 November 2014].

10 Ibid. p. 5.

11 PSI includes sulphur dioxide (SO₂), particulate matter (pm10), nitrogen dioxide (NO₂), carbon monoxide (CO) and ozone (O₃), and the Singapore government has determined that PL 2.5 will be incorporated in the PSI (*Yearbook of Statistics, Singapore*, 2014).

and regional resources need to be optimised to mitigate the effects of haze permanently. As a result, Jerger (2014) proposed that Indonesia ratify the AATHP because it develops an effective framework for mitigating transboundary haze pollution. Jerger (2014) argued that after ratifying the AATHP, Indonesia would benefit in three ways: (i) more systematic and sustained international and regional coordination, (ii) access to funds, and (iii) the ability to share the responsibilities entailed in the agreement.¹² Jerger (2014) also argued that the AATHP has adopted a managerial model rather than a coercive system. The managerial model has two major benefits (Jerger, 2014), (1) it brings together parties that are sceptical of a binding agreement; and (2) it will improve cooperation between parties in mitigating transboundary pollution. The structure of the AATHP has three main elements: the ASEAN body for Coordinating Pollution Control, the Secretariat, and a transboundary haze pollution control fund. The three elements are consistent with the managerial model of multilateral environmental agreements.

¹² The AATHP allows any party to propose amendments to the agreement.

After the Indonesian parliament ratified the AATHP, the government claimed four benefits from it.¹³ First, Indonesia will be a key player in decision making and can direct the decisions in controlling land and forest fires. Second, Indonesia will have a greater capacity to protect the economic, social and ecological interests of its people. Third, Indonesia can protect its natural resources (land and forests). Finally, Indonesia can positively contribute to the mitigation of land and forest fires by improving regulations and policies, optimising resources within ASEAN and outside, and by strengthening managerial and technical skills. For these reasons, it will benefit Indonesia if the regional office of AATHP were to be in Indonesia.

On 5 August 2014, Singapore's parliament passed a transboundary haze pollution bill. The bill acknowledged that the haze comes from two major

¹³ Pendapat Akhir Presiden Republik Indonesia Terhadap RUU Tentang Pengesahan ASEAN Agreement on Transboundary Haze Pollution [Final Remarks from the President of Republic Indonesia on Ratification of ASEAN Agreement on Transboundary Haze Pollution], <http://www.menlh.go.id/pendapat-akhir-presiden-republik-indonesia-terhadap-rancangan-undang-undang-tentang-pengesahan-asean-agreement-on-transboundary-haze-pollution-persetujuan-asean-tentang-pencemaran-asap-lintas-batas/>, [accessed on 30 September 2014].

sources; farming and forestry operations. The bill mandated huge fines, with a maximum of SGD2 million, to any entity that refers to proprietorship, partnership, corporation or other body or person, corporate or incorporate, that causes haze pollution for Singapore. The bill covers not only entities in Singapore but also external to Singapore. Thus, the Singaporean government can use several measures to bring the entity to court if the entity comes to Singapore or if it has any business in Singapore. Further, the environment and water resources minister of Singapore, Mr Vivian Balakrishnan, said that the role of consumer power in Singapore is to put pressure on products or services from any entity that causes transboundary haze.

Singapore's haze pollution bill is important because it can help Indonesia and Singapore in pursuing more balanced diplomatic responses in dealing with haze, especially in strengthening the sovereign state position of both countries. Singapore can impose legal sanctions on any firm that contribute to haze pollution in Singapore; on the other hand, Indonesia cannot blame Singapore for not monitoring Singapore plantation

companies' activities in Indonesia. Further, the bill can also push the Indonesian government to make more serious efforts to enforce laws with regard to companies that cause land and forest fires. The Indonesia Forum for the Environment has said that Indonesia can be haze-free by 2015 if the government strengthens law enforcement.¹⁴ The challenge is how to ensure that the punishment or fines for any misconduct are equal, or relatively comparable, between the two countries because this allows business certainty and protects those good businesses that remain in the market.¹⁵

Following the land and forest fires in Riau in June 2013, the Ministry of Environment investigated eight companies involved in land and forest fires: PT Multi Gambut Industri, PT Udaya Loh Dinawi, PT Adei Plantation, PT Jatim Jaya Perkasa, PT Mustika Agro Lestari, PT Rakksa Sejati, PT Tunggal Mitra Plantation and PT Langgam Inti Hiberida. Two

14 Jokowi urged to see forest fires for himself, <http://www.thejakartapost.com/news/2014/11/17/jokowi-urged-see-forest-fires-himself.html?utm_source=Daily+News+on+the+Southeast+Asian+Region+17+November+2014&utm_campaign=Info+Alert+20141117&utm_medium=email> [accessed 10 November 2014].

15 Good companies will invest more funds and effort and they will not be disadvantaged by bad companies. All parties will be able to monitor their behaviour more closely.

companies, PT Lagam Inti Hibrida (in Pelalawan District) and PT Bumi Reksa Sejati (in Indragiri Hilir), have a case to answer and nine people arrested. Some companies have direct or indirect business relations with Malaysia and Singapore companies.¹⁶ Thus, Indonesia having ratified the AATHP, and with the new transboundary haze pollution bill in Singapore, law enforcement can be improved significantly.

However, Indonesia also needs to improve environmental protection by developing effective environmental legislation. Reviewing some of the environmental litigation cases between 1982 and 2002, of ten cases, seven went to general courts and three to administrative courts (Nicholson, 2010). Nicholson (2010) reported that seven cases were lost at district courts and three (in part) won at district level but none won at appellate level. Nicholson (2010) argued that environmental organisations have been unsuccessful in achieving substantive protection for environmental interests through public interest suits. There are

several reasons why litigation in Indonesia is relatively unsuccessful with few cases being won in the courts (Nicholson, 2010): procedural access, lack of financial resources, evidential obstacles, judicial independence and social context.

It seems that ratifying the AATHP is the last option to monitor and to prevent haze pollution effectively. Further, the political landscape changed when Joko Widodo won the presidential election. The Indonesian Democratic Party of Struggle (PDI-P) opposed the bill, but when Joko Widodo from the PDI-P was elected president, the party needed to support government policies.¹⁷ According to the Joko Widodo–Jusuf Kalla platform, there are fourteen items on the agenda for the forestry sector: (1) to improve effectiveness in monitoring and enforcing the law on illegal logging; (2) to develop agreements on forestry systems; (3) to develop environment-friendly industries for forest products and non-wood product; (4) to evaluate and regulate sustainability of forest

16 Sime Darby, KLK units among firms blamed for fires, <http://www.straitstimes.com/the-big-story/the-haze-singapore/story/sime-darby-klk-units-among-firms-blamed-fires-20130626>, [accessed 13 November 2014].

17 Ratifikasi Setengah Hati Undang-Undang Penanganan Bencana Asap Lintas Negara [Lack of clarity to ratify law on transboundary haze], <http://www.mongabay.co.id/2014/09/17/ratifikasi-setengah-hati-undang-undang-penanganan-bencana-asap-lintas-negara/>, [accessed 10 November 2014].

resources; (5) to maintain ecological processes and supporting systems; (6) to preserve natural resources and ecosystems; (7) to ensure the availability and accuracy of data on forests; (8) to resolve land ownership disputes, and problems of overlapping permits; (9) to ensure a fairer distribution of the income generated from forest products and to mitigate the effects of forest fires and illegal logging; (10) to improve forest and land rehabilitation; (11) to protect 26.63 million hectares of forest cover, and flora and fauna; (12) to rehabilitate 100.7 million hectares of unforested areas, unproductive forest, and critical land; (13) to manage 1.99 million hectares of unexploited forest; and (14) To make plans to ensure that annual domestic demand for timber be met (approximately 46.3 cubic metres). However, because the AATHP ratification was before Joko Widodo was inaugurated as president, this achievement can be claimed as one of Susilo Bambang Yudhoyono's legacies.

REGIONAL, NATIONAL AND LOCAL FRAMEWORKS

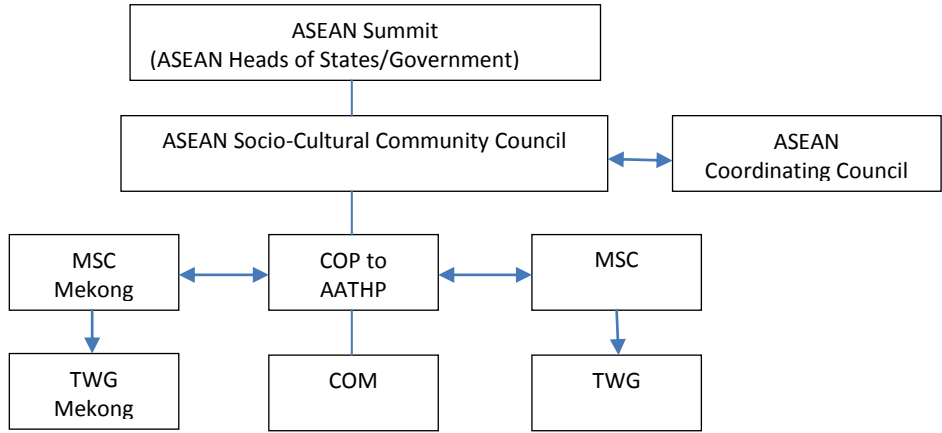
The analysis from the previous section indicates that to reduce the number of

hotspots, there are four areas that need to be focused on by the government. First, it is necessary to increase awareness of the danger of land and forest fires. The importance of environmental awareness also needs to be increased even in regions where the human development index is relatively high. Second, the econometric results strongly suggest that reforestation needs to be done on a very large scale. This is important to recover critical land. Similarly, developing critical land needs to be pursued with 'zero burning' policies. It is a good starting point that under the Widodo–Kalla administration, the Ministry of Environment and the Ministry of Forestry have merged to become the Ministry of Environment and Forestry. Third, the government needs to optimise climate information in setting priorities and formulating strategies to reduce the haze. Fourth, it is imperative to protect the peatland areas. This section elaborates the consequences of the AATHP and what must be done by local and national governments.

ASEAN has three pertinent ministerial bodies: (i) ASEAN Political-Security Community (APSC); (ii) ASEAN Economic Community (EEC); and (iii) ASEAN Socio-

Cultural Community (ASCC). The ASCC has 17 bodies and one of them is the Conference of the Parties of the ASEAN Agreement on Transboundary Haze Pollution (COP). COP is organised by the committee under the ASEAN Agreement on Transboundary Haze Pollution. According to the

AATHP, cooperation and coordination is facilitated by the ASEAN Coordinating Centre for Transboundary Haze Pollution Control (the ASEAN Centre). The ASEAN Centre must carry out the functions as directed by COP.



Note: MSC = Sub-Regional Ministerial Steering Committee on Transboundary Haze Pollution;
COP = Conference of Parties; TWG = Technical Working Group; COM = Committee under COP to AATHP

Source: ASEAN (2014)

Figure 2. The ASEAN institutional framework for cooperation on transboundary haze pollution

Now that Indonesia has ratified the agreement, the Indonesian government needs to prepare for the National Authority. The authority from each member country comprises the committee, which oversees the ASEAN Centre. The National Authority is supported by three bodies: Competent

Authority, Focal Point, and National Monitoring Centre. The Competent Authority can comprise several agencies and the authority is responsible for implementing the agreement. On the other hand, the Focal Point is responsible for receiving and transmitting communications and

data pursuant to the provisions of the AATHP. The National Monitoring Centre provides monitoring results to the focal point. The monitoring covers (i) all fire-prone areas; (ii) all land or forest fires; (iii) the environmental conditions conducive to such land or forest fires; and (iv) haze pollution arising from such land or forest fires.

The coordination of the national authority and the ASEAN Centre is conducted by the Focal Point or the National Monitoring Centre. Thus, the Focal Point nationally is mostly responsible for coordinating and organising assignments. The ASEAN Centre is supported by an ASEAN secretariat that is responsible for preparing for COP meetings and administering the ASEAN Transboundary Haze Pollution Control Fund.

As mentioned in a previous section, during the negotiations for the haze agreement, most of the Indonesian negotiators were from the Ministry of Environment. This indicates that the Ministry of Environment has become a focal point. However, as shown in Table 6, the Minister of Environment is responsible for management and coordination, and law enforcement. Further, the Coordinating Minister for

People's Welfare is responsible for coordinating the management and coordination of fourteen agencies, and the Ministry of Forestry is responsible for coordinating fire suppression. However, according to Presidential Decree 16 of 2011, the Ministry of Forestry is only responsible for fire suppression in forests under its control or conservation forests. Thus, according to the decree, the National Disaster Mitigation Agency has become a coordinating agency on forest fires nationally.

However, the division of tasks and responsibilities needs to be adjusted to accord with the new cabinet structure. Jokowi's working cabinet for 2014–2019 comprises four coordinating sets of ministries: (i) political, legal, and security affairs; (ii) economic affairs; (iii) maritime affairs; and (iv) human development and culture. Table 6 shows the division of tasks and responsibilities during the presidency of Susilo Bambang Yudhoyono. The Coordinating Minister for People's Welfare becomes a coordinating agent for land and forest fires.¹⁸ The

18 The Coordinating Ministry for People's Welfare, has six main functions: (i) to synchronise planning, drafting, and policy implementation on people's welfare; (ii) to coordinate planning, drafting, and policy

Coordinating Ministry is responsible for managing eight ministries and other agencies; ministries such as health, education and culture, social welfare, religion, environment, women's empowerment and child protection, public housing, youth and sport. Because, under the new government, the Coordinating Minister for People's Welfare has been removed, the government needs to decide which ministry is to coordinate activities. It seems that the Minister of Economic Affairs will be responsible for management and coordination. This is mainly because the primary ministry, that of the Minister of Environment and Forestry, is under the coordination of the Minister of Economic Affairs.

Reflecting the previous division of tasks and responsibilities, and the current formation of the new cabinet, we suggest a national structure as shown in Table 7. As can be seen in Table 7, a huge degree of coordination is required, especially among the relevant authorities. Because some ministers coordinate using different standards, it is better to pool the work

of all the relevant authorities under the coordination of National Development Planning Minister-National Development Planning Board (Bappenas). Further, Bappenas is also responsible for coordinating strategic activities and handling urgent and large-scale problems.¹⁹

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implementation; (iii) to control implementation of points (i) and (ii); (iv) to manage assets that are owned by its ministry; (v) to monitor policy implementation; and (vi) to help the president in dealing with specific tasks.

19 Koordinasi [coordination], <http://www.bappenas.go.id/profil-bappenas/tupoksi/?&kid=1416435833>, [accessed 10 November 2014].

20 Koordinasi [coordination], <http://www.bappenas.go.id/profil-bappenas/tupoksi/?&kid=1416435833>, [accessed 10 November 2014].

Table 6. Division of tasks and responsibilities for land and forest fires

	Agency	Management and coordination	Functions Fire suppression	Law enforcement	Security
1	Coordinating Minister for People's Welfare	C			
2	Minister of Home Affairs	S	S	S	
3	Minister of Foreign Affairs	S			
4	Minister of Agriculture	S		S	
5	Minister of Forestry	S	C+P	S	
6	Minister of Environment	S		S	
7	Attorney General			S	
8	Indonesian Military	S	S		S
9	National Police	S	S	P	P
10	National Disaster Mitigation Agency	P			
11	Agency for the Assessment and Application of Technology		S		
12	Meteorology, Climatology and Geophysics Agency	S			
13	National Search and Rescue Agency		S		
14	Local Government	S	S		
15	Responsible Business Unit, Private Sector	S	S	S	S

Note: C = Coordinator Agency; P = Primary Sector; S = Supporting

Source: National Disaster Mitigation Agency (2013)

Table 7. Proposal for a new structure on the division of tasks and responsibilities for land and forest fires

Coordinating Agency: Bappenas			
National Focal Point	National Monitoring Centre	Competent authorities	
Minister of Environment and Forestry	<ol style="list-style-type: none"> 1. Meteorology, Climatology and Geophysics Agency 2. Agency for the Assessment and Application of Technology 3. National Disaster Mitigation Agency 4. National Institute of Aeronautics and Space of Indonesia 5. National Coordinating Agency for Surveys and Mapping 	<ol style="list-style-type: none"> 1. Minister of Home Affairs 2. Minister of Foreign Affairs 3. Minister of Agriculture 4. Minister of Agrarian and Spatial Planning 5. Minister of Health 6. Minister of Culture and Elementary and Secondary Education 7. Minister of Communications and Information Minister 8. Minister of Research and Technology and Higher Education 9. Minister of Villages, Disadvantaged Regions and Transmigration 10. Attorney General 11. Indonesian Military 12. National Police 13. National Search and Rescue Agency 14. Local government (provincial, district or city) 	

Although improving coordination nationally is important, developing local government capacity is necessary. It is also important to improve the planning of land-use and to strengthen local management. At provincial level, the supreme command is held by the governor. There are many agencies involved, such as the local disaster mitigation agency, and other agencies for forestry, plantations, agriculture, fire brigades, the environment, plantation companies, and associations for the management of forest production (*kesatuan pengelola hutan produksi*), associations for the management of forest conservation (*kesatuan pengelola hutan lindung*), societies concerned with fire prevention (*masyarakat peduli API/MPI*), public works, and public health. Further, in 2002, the Ministry of Forestry formed forest fire brigades in 30 regions (*Daerah Operasi/Daops*) and in provinces that are likely to have land and forest fires, such as North Sumatra, Riau, Riau Archipelago, Jambi, South Sumatra, West Kalimantan, Central Kalimantan, South Kalimantan, East Kalimantan and South Sulawesi. The forest fire

brigades (*Manggala Agni*) personnel now number about 5000.²¹

According to the Minister of Forestry Regulation P.12/Menhut-II of 2009, on controlling forest fires, forest fire brigades are to be of service to national, provincial, district or city, and other units of forest management. However, most forest guards work on a voluntary or honorary basis. As a result, it is very difficult to expect high performance in their duties considering the high risks they must take. The National Disaster Mitigation Agency (2013), pointed out several limitations or challenges in the controlling necessary for suppressing land and forest fires. There are two main challenges: (i) resources, and (ii) organisation and institutions. Resources relate to funding, personnel and equipment. Organisation and institutions relate to coordination and policy synchronisation across agencies and law enforcement.

21 Seluruh Manggala Agni Berstatus Honorer [All the forest guards are honorary personnel], <http://nasional.kompas.com/read/2012/08/27/12440745/Seluruh.Manggala.Agni.Berstatus.Honorer>, [accessed 11 November 2014].

CONCLUSION

Land and forest fires and haze remain the biggest environmental challenges in the ASEAN region. By mid-September 2014, Indonesia's parliament agreed to ratify the AATHP after a delay of more than a decade. This paper analyses the consequences and implications for local, regional and national authorities after Indonesia ratified the AATHP. Identifying the spread of hotspots can provide important information to help anticipate the haze. By evaluating the number of hotspots over 18 provinces in Indonesia for the period 2007 to 2010, we argue that land and forest rehabilitation needs to be promoted by the new government. Rainfall can ease the number of hotspots and this implies that drainage in the peatland will increase the risk of peatland fires especially during the dry season. Complete fire bans need to be strictly enforced.

Government has issued many laws to protect forest, land, and the environment. Commitment to reduce CO₂ emissions has been proclaimed, and bilateral cooperation promoted, for instance, with Norway and Singapore. However, forest degradation still continues at an

increasing rate and this can create more critical land. The haze, and land and forest fires, still cannot be controlled effectively, and have become a yearly nightmare. Thus, there is a challenge for Indonesia to transform from 'symbolic' ratification of the AATHP to more practical action.

We argue that the transboundary haze pollution bill that was passed by Singapore's parliament, can help both countries (Indonesia and Singapore) in promoting more robust law enforcement. However, the challenge is how to ensure that the punishment or fine for any misconduct by parties can also bring more incentives for good companies to remain in the market. Further, President Joko Widodo's commitment to the protection of forests also needs to be supported by other related ministries and his effort to merge two ministries (forestry and environment) can bring new hope because the two ministries tend to have different attitudes in dealing with environmental degradation.

Finally, after ratifying the AATHP, Indonesia needs to prepare a competent authority, a focal point, and a national monitoring centre. Further, the current division of tasks and responsibilities also needs to be adjusted following the new cabinet structure. There are two strategies that can be promoted by national and local government. First, it is necessary to provide more resources for promoting financial capacity, personnel, and equipment. Second, it is imperative to develop coordination and policy synchronisation across agencies and in strengthening law enforcement.

REFERENCES

- ASEAN. (2014). *ASEAN peatland management strategy 2006–2020: Updated September 2013*. Jakarta: ASEAN.
- Asian Development Bank. (2001). *Fire, smoke, and haze: the ASEAN response strategy*. Manila: Asian Development Bank.
- De Groot, W, JG Goldammer, T Keenan, MA Brady, TJ Lynham, CO Justice, IA Csiszar, O'Loughlin. (2006). 'Developing a global early warning system for wildland fire'. <
<http://www.fire.uni-freiburg.de/gwfews/pubs/V%20ICFFR%20Global%20EWS-Fire.pdf>>, (accessed 10 December 2014).
- Didu, MS. (2001). 'Analisis posisi dan peran lembaga serta kebijakan dalam proses pembentukan lahan kritis' [The analysis of position and function of institution and policy in the process of creating critical land]. *Jurnal teknologi lingkungan*, 2(1): 93–105.
- Glover, D. (2001). 'The Indonesian fires and haze of 1997: the economic toll'. In *Forest fires and regional haze in Southeast Asia*. Peter Eaton and Miroslav Radojevic (eds). New York: Nova Science Publisher.
- Jerger, DB. (2014). 'Indonesia's role in realizing the goals of ASEAN's Agreement on Transboundary Haze Pollution'. *Sustainable development law & policy*, 14(1): 35–45, 70–74.
- Letchumanan, R. (2014). 'Haze pollution and peatlands: can ASEAN finally breathe easy? – Analysis'. *RSIS Commentary*, 243(9). <
http://www.rsis.edu.sg/wp-content/uploads/2014/12/CO14243.pdf?utm_source=getresponse&utm_medium=email&utm_campaign=rsis_publications&utm_content=RSIS+Commentary+2

- 43%2F2014+Haze+Pollution+and+Peatlands%3A+Can+ASEAN+Finally+Breathe+Easy%3F+by+Raman+Letchumanan +>, (accessed 10 December 2014).
- Margono, BA, PV Potapov, S Turubanova, F Stolle and MC Hansen. (2014). 'Primary forest loss in Indonesia over 2000–2012'. *Nature climate change*. DOI:10.1038/NCLMATE227.
- Ministry of Finance. (2009). *Ministry of Finance Green Paper: economic and fiscal policy strategies for climate change mitigation in Indonesia*. Jakarta: Ministry of Finance and Australia Indonesia Partnership.
- Muttaqin, MZ. (2010). 'Restrukturisasi arsitektur kelembagaan kawasan hutan di Indonesia' [Restructuring the institutional architecture of forest areas in Indonesia]. *Policy brief*, 4(5). Jakarta: Kementerian Kehutanan, Badan Penelitian dan Pengembangan Kehutanan, Pusat Penelitian Sosial Ekonomi dan Kebijakan Hutan.
- National Disaster Mitigation Agency. (2013). *Rencana kontijensi nasional menghadapi ancaman bencana asap akibat kebakaran hutan dan lahan* [National Contingency Planning to Measure Haze Disaster due to Land and Forest Fires]. Jakarta: National Disaster Mitigation.
- Nguitragool, P. (2011). *Environmental cooperation in Southeast Asia: ASEAN's regime for transboundary haze pollution*. New York: Routledge.
- Nicholson, D. (2009). *Environmental dispute resolution in Indonesia*. Leiden: KITLV.
- Onn, Lee Poh. (2013). 'No end in sight to haze dilemma'. *ISEAS perspective*, 24 June 2013.
- Prasetyawan, T. 'Implikasi ratifikasi AATHP terhadap pengendalian kebakaran hutan dan lahan di Indonesia' [Implications of AATHP ratification on forest and land fire management in Indonesia]. *Info singkat kesejahteraan sosial* [Brief info on social welfare], VI(19): 9–12.
- Raustiala, K. (2005). 'Form and substance in international agreement'. *American journal of international law*, 99(3): 581–614.
- Ruitenbeek, J. (1999). 'Indonesia'. In *Indonesia's fires and haze: the cost of catastrophe*. David Glover and Timothy Jessup (eds). Singapore: ISEAS.
- Schweithelm, J and J Glover. (1999). 'Causes and impacts of the fires'. In *Indonesia's fires and haze: the cost of catastrophe*. David Glover and Timothy Jessup (eds). Singapore: ISEAS.
- Verbeek, M. (2008). *A guide to modern econometrics* (3rd edn). Chichester: John Wiley and Sons.
- World Bank. (2014). 'Development Policy Review: Indonesia avoiding the trap'. <<http://www.worldbank.org/en/news/feature/2014/06/23/indonesia-2014-development-policy-review>>, (accessed 20 July 2014).

World Bank. (2005). *Natural disaster hotspots, a global risk analysis*. Disaster Risk Management Series. Washington DC: World Bank.

World Bank. (2006). *Sustaining economic growth, rural livelihoods, and*

environmental benefits: strategic options for forest assistance in Indonesia. Washington, DC: World Bank and Jakarta: World Bank Office.