FOREST PROTECTION AND AIR POLLUTION CONTROL FROM OPEN BURNING: APPLICATION OF PRESCRIBED BURNING UNDER ENVIRONMENTAL LAW IN MALAYSIA[1]

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ABSTRACT

There is a possible connection between the control of forest fire and open burning with the protection of air quality. In the case of Malaysia, activities relating to open burning have been identified to be among the contributors of air pollution and haze phenomenon that are causing a deteriorating quality of the atmosphere. However, a total prohibition on open burning may not be practicable in the context of Malaysia due to various factors including that concerning land-use practices. In this region, the land-use systems are relying on open burning as one of the methods of land clearing. Some agricultural and farming processes especially among the smallholders and subsistence farmers are still based on the traditional method of using fire. For the policy makers, these are factors that need to be taken into consideration when formulating a law on open burning in order to strike a balance between land-use management and environmental protection. For this reason, this paper seeks to highlight status of forest fires and open burning, and to examine the application of prescribed burning within environmental law in Malaysia which is considered a suitable tool for management practice in forest and other land-use policy. The paper argues that prescribed burning, if strictly performed, can help harmonise different interests and help accomplish the target of forest protection and air pollution control in accordance with acceptable legal parameters.

Keywords: *Forest Protection, Open Burning, Air Quality, Environmental Law, Prescribed Burning*

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1. INTRODUCTION

Malaysia which is a tropical country located in Southeast Asia is well endowed with a diverse range of environmental resources including tropical rainforests. These rainforests are some of the oldest forests in the world with complex ecosystem and contain huge diversity of flora and fauna. Trees and plants within the forest play a major role in trapping carbon which would otherwise be released in the atmosphere, aggravating atmospheric quality and climate change. Thus, when forest is being burnt, it becomes a serious threat not only to the forest environment itself, but also to the quality of the air (Weinhol, 2011). Beginning 1960s, there were rapid changes on natural ecosystems and land use when Malaysia embarked on a policy of rapid economic development. It was this policy that seen parts of lowland forests being converted into commercial rubber and palm oil plantations as well as for other crops. Hanson (1994) who reviewed the effects of replacing natural forests with palm oil identified potential impact such replacement has on biodiversity, climate, hydrology and soil erosion. This is because conversion of land use from forest for plantation, farming and other purposes would require, among other things, the clearing of vast areas of forest land.

Generally, land clearing can be considered as the development of land with the intention of creating a potential use for agricultural purposes. Land clearing would usually require the removal of native cover, including trees, bushes and boulders, from the land surface. While there are various methods utilised for the purpose of clearing of land and forest, fire which is a traditional land management tool in most countries of this region is still a popular option. A study by Mahmud et.al. (2002) has highlighted common method previously applied to establish plantation crops which is through the burning of remnants of trees after felling prior to land preparation. In shifting cultivation for example, farmers would practice field rotation by slashing and burning a new plot of land after the existing plot has lost its fertility (Simorangkir, 2002). Apart from its economic benefits, open burning of plant material is also an efficient method to reduce or dispose of vegetative residues from an agricultural land for reasons such as disease and pest control, as well as crops propagation (Lal, 2008). As environmental issues grow deeper and more complex, policy makers find themselves in the position of sorting out these issues and attempting to manage them within legal and other means. In addition, a solution to the conflicting issues of air pollution control, forest protection and land-use management would also require the consideration of factors such as forest and ecosystem management while developing strong and credible resolution that shows sensitivity to air pollution and public health issues. Thus, in the wake of continuous deteriorating quality of the atmosphere, and ensuing heighten public concern over haze pollution problem, environmental law was subsequently amended to strictly regulate activities relating to open burning.

While open burning restriction is considered necessary as a measure to combat the occurrence of haze and to enhance the quality of air in all parts of Malaysia, a total open burning prohibition may not be practicable due to social, economic and other factors. In this region, the land-use systems are relying on open burning as one of the methods of land clearing. Some agricultural and farming processes especially among the smallholders and subsistence farmers are still based on the traditional method of using fire. In the context of Malaysia, these are factors that need to be taken into consideration when formulating a law on open burning in order to strike the balance between land-use management and environmental protection. For this reason, this paper seeks to highlight status of forest fires

and open burning, and to examine the application of prescribed burning within environmental law in Malaysia which is considered a suitable tool for management practice in forest and other land-use policy. The paper argues that prescribed burning, if strictly performed, can help harmonise different interests and help accomplish the target of forest protection and air pollution control in accordance with acceptable legal parameters.

2. STATUS OF OPEN BURNING & HAZE POLLUTION IN MALAYSIA

While open burning has particular benefits in term of cost and time within some agricultural and forest operations, it has nevertheless adverse environmental impacts such as the degradation of air quality by smoke particles and the loss of organic materials necessary for soil enhancement (Lal, 2008). When forest and other vegetation were burnt, heavy smoke and particulate matters can be emitted directly into the open air. In his book, Rothman (2007) explained the consequences of open burning when he states that "burning under unsuitable conditions can also lead to dangerous wildfire incidents whereas uncontrolled burning of land can result in the destruction of already fragile habitats and wildlife, and can place human lives and property directly at risk". In the case of Malaysia, when open burning is carried out during the dry months, it can result in the emission of large quantities of total suspended particles into the air and would prolong the burning and hazy conditions of the atmosphere. The problem of uncontrolled open burning in Malaysia and the Southeast Asia region is compounded by the occurrence of the El Nino phenomena that takes place every few years causing drought, reduction of rain, and increase in temperature which has contributed towards the occurrence of forest fires that cause haze (Department of Meteorological, 2016).

Haze which is currently faced by Malaysia is predominately made of very fine particles with a diameter of less than 10 mm. The smoke generated by open burning can have significant impacts on air quality, with associated health and environmental concerns. The occurrence of haze phenomena has been recorded by the Department of Environment (2017) starting 1991. Subsequent haze that recurred in 1997 happened due to several factors including the El Nino. It was during that year that a Haze Emergency had to be declared in Sarawak when the Air Pollutant Index reached above the 500 level (Department of Environment, 2017). The seriousness of the 1997's haze phenomena has been referred to by Choong (1997) as one of the "Asia's worst man-made environmental catastrophe". In 2015, Malaysia again experienced a deterioration of air quality when the status of 34 areas in the country recorded as unhealthy requiring all schools in certain states to be closed for several days.

Data from the Department of Environment supports the contention that the annual instances of open burning and forest fire are contributing factors towards the haze pollution problem. For example, in 2014, there were over 6000 open burning cases detected all over the country which consisted of burning of garbage in residential areas or roadside, and burning of articles for religious purposes, as well as burning of bushes, forests and agriculture areas (Department of Environment, 2014). Whereas surveillance through satellites have detected the existence of over 4000 hotspots in Malaysia throughout 2014. As a comparison, in 2015, the Department of Environment (2015) identified a total of 2,335 hotspots through via satellites whereas the daily ground surveillance conducted at fire-prone areas managed to detect a total 3,459 open burning cases. Most of the cases recorded were mainly from activities such as burning of garbage in residential area,

garbage burning by roadside and the burning of any article as part of religious rites or worshipping activities (847), bushes (617), forests (606) and agriculture areas (542). During the year 2015, the Department of Environment (2015) received 5,624 environmental pollution complaints. From this figure, 4872 number of complaints relate to air pollution cases. At the same time, statistical analysis from the Fire and Rescue Department, another agency involved in controlling widespread of fire, identified open burning as the type of fire that often contribute to a large number of reports the Department received annually. The term "open fire" is referred to by the Department as open burning which is "a fire in a garden/farm, forest, bush and rubbish fires". In 2014, out of the 54,540 fire calls received, the highest type of fire recorded was open fires (34,671 calls) involving fire garden / farm, forest, bush and rubbish fires.

3. LAW AND POLICY ON OPEN BURNING

Combating forest fires requires appropriate laws and regulations for effective implementation. In the context of Malaysia, such protection necessitates the involvement of laws that deal with different aspects of environmental protection, particularly that of forestry and air. Under the National Forestry Act 1984, which is the most important law relating to forest conservation, the scope on the regulation of forest burning is rather limited and confined to permanent reserved forest only. Section 82 of the Act states that no person shall kindle, keep or carry any fire, or leave any fire burning, within a permanent reserved forest in such a manner as to endanger such reserved forest. Penalty imposed on any person who contravenes this section is a fine not exceeding RM50000 or to imprisonment for a term not exceeding five years or to both. When the occurrences of haze continue to cause serious air pollution problem in Malaysia, it was the law on air pollution control that was amended to provide for a comprehensive control of open burning activities, including that relating to forest. This was done through the introduction of section 29A within the EQA which was also meant to ensure the implementation of zero burning policy. This amendment to the EQA also abolished the Department of Environment's powers to issue contravention licences for burning under the repealed Environmental Quality (Clean Air) Regulations 1978.

Under section 29A, any person is strictly prohibited from causing open burning on any premises, and land. The term "open burning" is defined by this section to mean "any fire, combustion or smouldering that occurs in the open air and which is not directed there through a chimney or stack". It has been argued by Mahmud et.al. (2002) that one of the major impacts of section 29A is the total prohibition of open burning and forest fire on large plantations. According to M. Noor (2003), such prohibition right away put a serious pressure up the plantation industry such as palm oil to find alternative and more sustainable way of land clearing. One method advocated for this purpose is the practice of zero burning which aims at attaining zero usage open fire the clear the land.

At the regional level, the policy of zero burning has been promoted by the ASEAN in response to the 1997's land and forest fires that affected the ASEAN region including Malaysia in 1997 (ASEAN, 2003). Malaysia which adopts the ASEAN's Regional Haze Action Plan subsequently embraced the recommendation to formulate policies for prohibiting open burning, enforcing strict control of slash-and-burn practices during the dry period, and adopting the policy on zero burning among the plantation companies (ASEAN, 2003). However, even before the introduction of zero burning policy by

ASEAN, the practice of land clearing in oil palm by the clean burn method has already been replaced by the no-burn method. According to Mohd. Hashim et.al. (1993), the idea of zero burning was initiated as early as 1989 when large plantation companies began to develop zero burning technology due to environmental concerns.

Table 1: Impacts of Open Burning and Zero Burning

Impact	**Burning: Advantage**	**Burning: Disadvantage**	**Zero-burning: Advantage**	**Zero-burning: Disadvantage**
On the environment		Air pollution, smoke & haze		
On land clearing	Simple and easy method, easy supervision and applicable to all types of terrain	Requires fire control system, weather dependent		Needs heavy equipment, difficult in hills or swamps, piles of vegetation hamper supervision and movement
On pests and diseases	Destroys many pests and diseases			Higher risk of pests and diseases
On costs and benefits	Less expensive to implement in short term, no need for heavy equipment	Reduces soil fertility in the long term	Reduce the use of fertilisers and increase yields	Requires heavy machinery and special skills

Source: IUCN 2002

Previous studies such by Jamaludin et.al. (1999), and Thandapani (2002) have shown that zero burning of land clearing is an environmentally friendly technique which helps safeguard the environment from air pollution. The technique allows recycling of plant nutrients through the decomposition of wood residues. Large quantities of organic matter are returned to the soil thus restoring and improving soil fertility as illustrated in Table 1 above. The zero burning that complies with EQA includes the disposal of old palms by shredding and decomposition in the fields, thereby avoiding air pollution and helping return the plant nutrients to the soil (Verlag, 2012).

4. EXCEPTIONS TO OPEN BURNING PROHIBITION

While section 29A is meant to be a sever law that imposes a total prohibition of open burning, the EQA was later amended to allow for some exceptions, taking into account social, economic and other needs. In this regard Tiraieyari, et al (2014) was of the view that that a total ban on fire usage would not be practicable for Malaysia considering that some activities that are normally practiced by the locals require open burning such as for land clearing or farming wastes disposal. Burning is also considered to be the cheapest and fastest way to clear land in preparation for planting. In the context of land-use planning and forest management, the use of fire if done in a controlled manner may be considered a potential management technique to attain objectives such as control of insects and diseases

and biodiversity conservation (Montiel & Kraus 2010). Under such circumstances, certain exceptions to the ban are therefore warranted.

In 2003 section 29AA was subsequently inserted within the EQA which provides for some exceptions to certain open burning activities in the form of "Declared Activities" as listed in the Environmental Quality (Declared Activities) (Open Burning) Order. There are 15 instances in which open burning is allowed by the Order, including the burning of any diseased and noxious plants, agricultural equipment, residues from land cleared for cultivating food crops, paddy stalks, and sugar cane leaves prior to harvesting. However, according to the Order, exceptions to open burning of those 15 activities can be executed only if they are carried out in accordance with the conditions specified by the Order. In other word, the permission of open burning under the EQA is strictly in the form of prescribed burning. In practice, there are some major differences between prescribed burning and uncontrolled burning including the extent of their size, the speed at which they can spread out from the original source, their potential to change direction unexpectedly, and their ability put lives and property at risk (Ahrens, 2013). Research by Montiel & Kraus (2010) has shown that prescribed or controlled burning has already been used by farmers for a long time to achieve desired outcomes such as to allow for the removal of unwanted vegetation from land and creating favourable conditions for new growth.

While there is no specific definition of prescribed burning, Tolhurst et.al. (1999) described prescribed burning as "the controlled application of fire under specified environmental conditions to a predetermined area at the time, intensity of heat and rate of spread required to attain planned objectives". Adams & Attiwill (2011) on the other hand referred to the term as "the controlled application of fire to a predetermined area, at a specified time of day and season, and under specified weather and fuel conditions, so as to ensure that the intensity, rate of spread and extent of spread of the fire meet planned land management objectives, and comply with legal, environmental and social constraints". The ASEAN Agreement on Transboundary Haze Pollution to which Malaysia is a party uses the term "controlled burning" which is defined as "any fire, combustion or smouldering that occurs in the open air, which is controlled by national laws, rules, regulations or guidelines and does not cause fire outbreaks and transboundary haze pollution". From these definitions, it can be construed that controlled or prescribed burning is the use of fire in a knowledgeable manner on a specific land area under selected weather conditions to accomplish predetermined, well-defined management objectives.

Under the EQA, farmers and other burn operators are not required to obtain a written permission from the Department of Environment to execute an open burn (Maizatun, 2016). In most instances, the prerequisite is to notify the Director General in writing before the burning is carried out. However, it is a strict requirement that any imposed conditions must be adhered to including that pertaining to content of the material to be burned; the circumstances of combustible material generation; the weather condition; and type of soil on which the open burning is to be carried out. In forest burning, the conditions are imposed on three activities involving specific categories of farmers or farming practices as provided in Table 2 below:

Table 2: Prescribed Activities Relevant to Forest Protecting

Activities	Conditions
The burning of plant from a land clearing for the cultivation of food crops or cash crops for the purposes of shifting cultivation	(i) which shall be felled and is dry prior to burning; (ii) during dry weather between the hours of 8.00 a.m. and 6.00 p.m.; (iii) which is closely monitored and controlled until completely burned; (iv) of which the Penghulu or Village Headman of the village in which the burning is to be carried out has been informed prior to the burning; and (v) which is not carried out at any peat soil area.
The burning of agricultural plant for land clearing for the purpose of planting or replanting of plant crops by subsistence farmers in rural areas.	Not carried out at any peat soil area.
The burning of plants for land clearing for the purpose of planting or replanting of any plant crops by smallholders in an area that does not exceed 2 hectares per day.	i) which shall be felled and is dry prior to burning; (ii) during dry weather between the hours of 8.00 a.m. and 6.00 p.m.; (iii) that does not use material that emit black smoke as tinder material to ignite the fire; (iv) which is carried out away from the roads and other major routes; (v) that does not cause a nuisance to nearby residents nor interfere with normal visibility; (vi) which is closely monitored and controlled and which shall be stopped after the felled plant and the biomass are completely burned; and (vii) which is not carried out at any peat soil area.

Source: Environmental Quality Act 1974

Specifically, the three types of farmers and farming activities exempted from the open burning prohibition relevant to forest protection are shifting cultivators, subsistence farmers, and smallholders as indicated in the above Table. In Malaysia, shifting cultivation is mainly practiced in Sarawak which is considered to be a traditional and primary form of agriculture for local farmers. Historically, the Iban natives practiced shifting cultivation with upland rice and pepper as the main crop for subsistence. However, unlike elsewhere where the crops are planted on a relatively large scale, Kendawang et.al. (2005) and Sota (2014) emphasised that shifting cultivation in Malaysia is done mainly on a small scale basis by local farmers as their main cash crops.

On the other hand, smallholders are another category of farmers and they can generally be divided into two types. First is subsistence farmer who practices farming on a self-sufficient basis and grow food only for themselves and their families and sell the produce in the marketplace or to the middleman. These farmers normally practice mixed cropping

systems where vegetables and fruit trees are the main crops being cultivated. The second type of smallholders is those that practice monocropping type of subsistence farming. Normally, these farmers cultivate their land with commodity crops such as rubber, cocoa, or palm oil similar to those planted by the plantations. Under the EQA, the term "smallholder" for the purpose of open burning is defined as "the owner or occupier or representative of the owner or occupier of any land of an area of less than 40 hectares". In Malaysia, smallholder planters are typically family-based enterprises producing palm oil from less than 50 ha of land (RSPO, 2006) and makes up 40 per cent of oil palm planted areas in Malaysia. There is currently over 300,000 small farmers throughout Malaysia cultivating palm oil and contributing to more than 18 million tonnes of palm oil exported to the world every year (RSPO, 2006).

Despite the EQA's exemptions of open burning ban upon smallholders who exist in a relatively large number in Malaysia, under prescribed conditions, these farmers can use fire only for the purpose of efficient disposal of unwanted agricultural residues as indicated in Table 2. No person is also allowed under the law to carry any type of open burning on peat soil as it can burn easily and tend to produce a lot of smoke while difficult to extinguish. Conditions attached to prescribed burning by the EQA seems to represent the order of importance, whereby protection of human life and environmental wellbeing will take precedence (Department of Environment, 1998). Thus, while the EQA allows for open burning practices on specific activities, this permission is however not absolute. The Department of Environment, which has a duty to monitor the quality of the air throughout Malaysia, may notify the Director General of the status of air pollution in the country. In the event that the Air Pollution Index reading has reached an unhealthy level, or where such activity would be hazardous to the environment, the exemption will be withdrawn. Thus, during that situation, any such fire, combustion or smouldering would not be allowed to be occurred (Department of Environment, 2017). The penalty imposed by those who defy this prohibition is a fine of up to RM500 000, and a jail term for five years, or both.

5. CONCLUSION

In the Southeast Asia region including Malaysia, fire is still considered to be an effective and economic tool for the burning of agro-forestry wastes and constitutes an important land management plan. However, the increasing severe smoke emission which can contribute to the problem of haze requires the application of law that aimed not only at air pollution control but allows for more sustainable approaches in land use practices. The serious haze episodes as experienced since 1997 and the latest one in 2015 have raised concerns of unsustainable land use practices in the region including Malaysia. However, haze pollution is a complex issue and its regulation involves, among other things, two different areas of environmental control: forestry resource management and air quality, and might entail management targets that are inconsistent with one another. In the case of Malaysia, since open burning produces air pollution, it is therefore subject to regulation by air pollution control under the EQA and not under the National Forestry Act 1984. For Malaysia, it is pertinent that the link between air pollution control strategy, land use policy and forest practices is clearly established so that the target of environmental protection through law and other means can be achieved. However, in the midst of struggle against haze pollution, Malaysia concedes that while a total prohibition of forest burning should be enforced on large plantation companies, similar prohibition could not however be imposed

on smallholders, farmers and shifting cultivators. For this reason, the practice of prescribed burning was therefore incorporated under the law to provide for exceptions to certain circumstances. It is acknowledged that prescribed burning is not the only solution to forest management practices as it can be overused and misused, and can be a significant source of air pollution in its own right. Nevertheless, because it can help reduce larger quantities of air pollution generated by unplanned wildfires and restores natural flora and habitats, prescribed burning has been included as a legal strategy for air pollution control. At this juncture, the function of environmental law is to strike the balance among competing objectives while taking into account of the role and impact of fire in environmental protection, and the protection of the health and welfare of the public as a whole. It is contented that if prescribed burning conditions are followed and provisions are not violated, the chance of a catastrophe on a burning operation will be slight. In the mean time, unless and until Malaysia's land-use and smoke management techniques become more advanced, usage of fire will continue to become a priority, and will be recognised by as an air pollution control strategy under environmental law.

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