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Volcano Eruption Of Bali's Mount Agung:Aviation Law, Business Law, Environmental Law And Social Science Aspects

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Abstract:*This article purported to study the volcano eruption of Bali's Mount (Mt) Agung such as aviation law, business, environmental laws and social science aspect. It is consisting of four chapters. Chapter one regarding legal ground of aviation; closing of Bali Ngurah Rai International Airport (BNRIA); aviation safety; aircraft accident; chapter two concerning legal ground of tourism; year of disruption; eruption of Mt Agung; economic aspects and tourism business; Chapter four concerning climate change includes global climate, alteration global temperature, global impact; agriculture-plant & animals waste includes a mountain garbage, war on waste and the government's commitment and chapter four concerning culture aspects includes the opening Besakih temple for prayers, Jero Mangku Made Gudug, thousands flee their home, Bali volcano Agung is "more likely than not"; safety in Bali during Mt. Agung eruption includes the answers of Shefali, Kelly Mc Rae, Tabra Tunoa, Gireesh Y, Manveen Maan, Marcel Paul Luitze; disable peoples.*

Keynotes : *Aviation, environmental, business and social science*

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I. Introduction

The violent eruption of Guatemala's Fuego volcano, killing at least 62 people, 13 of who have been identified is the latest in a series of volcanic events that have made headlines around the world. On May 4, 2018, Hawaii's Kilauea volcano erupted forcing thousands to flee their homes. Social media users have widely shared dramatic photos of lava flows engulfing parts of Big Island and the same day as the Guatemala eruption, an earthquake of magnitude 5.5 also shook the island, sending ash plumes from the Kilauea summit that reached up to 8,000 feet. Most recently on 1 June 2018, sending plumes of smoke almost 4 miles into the air. If these events are part of a trend, we should worry about, but according to expert, they are not. According to Karen Fontijn, a volcanologist and postdoctoral researcher at Oxford University, the eruptions are not in any way connected. All these volcanoes are frequently erupting and their behavior is totally normal.[4]

With regard to volcano eruption, Indonesia does not immune to an eruption. On 11 May 2018, the Mount Merapi erupted, as a result, Yogyakarta's International Airport was closed for 28 minutes. After being closed due to the volcanic ash from an eruption, Adisutjipto Airport in Yogyakarta has reopened again after evaluation the conditions due to the volcanic ash had spread across Sleman regency in Yogyakarta, in particular

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[4] Ciara Nugent.,Volcanoes in Guatemala, Hawaii and Indonesia Have Killed 62 and Cost the Economy Millions. Should We Expect More? http://time.com/5300004/guatemala-fuego-volcano-eruption-indonesia-hawaii/

in Tempel, Turi, Pakem, Cangkringan and Ngemplak districts are secure areas. Previously, on 24 June 1982, Mount Galunggung, the active volcano located in 160 kilometers South-East of Jakarta, Indonesia, had erupted violently. Giant plumes of ash and grit had been hurled 13 kilometers into the air.

The explosion had created a vast volcanic storm of thick, hot gases and high electrical activity. No aviation warning was given. North-easterly winds aloft at 25 to 30 knots had blown the plume across the path of BA 009 and it had been engulfed in ash. Mount Agung's eruption, which began in September 2017, forced the island's airport to close for two days and visitor arrivals have dropped by more than 70% and facing US$ 1 billion in lost tourist revenue. On 28 June 2018, Mount Agung erupted again caused Bali Ngurah Rai International Airport (BNRIA) in Denpasar, Indonesia, has been closed all morning. As a result of the closing BNRIA, over 500 flights have already been cancelled. If these events are part of a trend, we should worried about, but according to expert, they are not. According to Karen Fontijn, a volcanologist and postdoctoral researcher at Oxford University, the eruptions are not in any way connected. All these volcanoes are frequently erupting and their behavior is totally normal.[5]

At any point in time there will typically be about 10-20 volcanoes in eruption around the world, we just don't always hear about them. It is likely the impact on infrastructure and communities, as well as the dramatic photos, have brought more attention than usual to the world's volcanic activity. There are theories that volcanic eruptions are on the rise. A 2014 found that changes in the speed of the earth's rotation, caused by factors including the gravitational pull of the sun and the moon, lead to periods of increased volcanic activity. A 2009 study found that the number of eruptions per year has gone up as the earth's temperature has increased since the ice age. Guatemala's Fuego Volcano and Indonesia's Mount Merapi are both on the Ring of Fire, a 25,000-mile horseshoe-shaped area where several tectonic plates rub against each other. Three quarters of the world's volcanoes can be found here. Hawaii's Kilauea is not part of the Ring of Fire.[6] This article purported to study the impact of Bali's Mount Agung eruption especially with regards aviation law, business law, environmental law and social science aspects as follows.

II. Reseach Method

This research is library research uses the normative juridical type with normative legal research methods, including reviewing and analyzing of the legal material and legal issues related aviation, business, environmental, social aspects. In this research, the result will be achieved in the form of prescriptions about what have to be done to resolve the issue. The sources of legal materials used in this research consists of 1st, 2nd and 3rd law material. The 1st law materials which are authoritative legal materials, meaning that such legal materials have the authority, namely legislation, official records. Such legislations used as the 1st legal materials are ICAO Doc.7300/8,[7] Act No.1 Year 2009,[8] Act No.10 Year 2009,[9] the constitutional of the Republic of Indonesia of 1945, whilst the 2nd law materials are over all publications regarding the law and regulations which are not official documents but related to the subject matter. Such publication concerning the law and regulations includes text books, theses, law dissertation. The 3rd law materials used in the research are legal dictionaries, comments on the court decision, also the opinions of legal experts published via journals, magazines or others.

III. Discussion And Results

Chapter One

Mt Agung Eruption and Aviation Laws

This chapter deals with legal ground of aviation; closing of Bali Ngurah Rai International Airport (BNRIA); aviation safety; aircraft accident as follows.

[5] .*Ibid.*

[6].*Ibid.*

[7].ICAO Doc.7300/8 *Convention on International Civil Aviation,* signed at Chicago on 7 December 1944; See Dempsey P.S.,(2005) Vol. XXX-Part I, Ann. of Air & Sp.L.at 19-51; Milde M.,(1993) Vol. XVII-Part II, Ann. of Air & Sp.L.at 85-93.

[8].Act *Concerning Civil Aviation*, Act No 1 of 2009 [Civil Aviation Act]. State Gazette of the Republic of Indonesia No.1 year 2009, Supplement State Gazette of the Republic of Indonesia N0.4956

[9] . Act *concerning Tourism*, Act.No.10 Year 2009 [Tourism Act], State Gazette of the Republic of Indonesia No.11 Year 2009, Supplement State Gazette of the Republic of Indonesia No.4966.

1. Legal Ground of Aviation

The aims and objective of the International Civil Aviation Organization (ICAO) is to develop the principles and technique of international air navigation and to foster the planning and development of international air transport so as to insure the safety and orderly growth of international civil aviation through out the world,[10] for that reason, as a member of Chicago Convention of 1944,[11] issued Act No.1 Year 2009,[12] for implementation of such provision. Civil Aviation Act No.1 Year 2009, consist of fourteen chapters such as general provisions, foundation/bases and objectives, scope of law validity, supervision, aircraft design and production, registration and nationality of aircraft, aircraft airworthiness and operation, international interest in aircraft objects, air transportation, flight air navigation, aviation security, search and rescue in aircraft accident, investigation and follow-on investigation in aircraft accident, empowerment of aviation industry and technology development, aviation information system, human resources, public participant, criminal investigation, criminal provisions, transition provisions and closing provision. With regards to aviation safety, it found in chapter XIII from Article 308 to 322.[13] It provides national aviation safety program, aviation safety oversight, aviation safety law enforcement, aviation service provider safety management system and aviation safety culture.

2. **Closing of BNRIA**

Due to the eruption of Bali's Mount Agung o 28 June 2018, Bali Ngurah Rai International Airport (BNRIA) in Denpasar, Indonesia, has been closed all morning. As a result of the closing BNRIA, over 500 flights have already been cancelled. Big delay expected all day and into the weekend and further closures due to volcanic ash are still possible. There is a volcanic ash cloud observed up to flight level 169 in the area, predicted winds will carry the ash southwest toward Java. When Mount Agung erupted in November 2017, airlines faced travel chaos as flights were cancelled due to the lingering ash cloud.

[10]. Article 44 paragraph (a).

[11].Indonesia adhere Chicago Convention of 1944 on 27 April 1950; See Dempsey P.S.,(2005) Vol. XXX-Part I, Ann. of Air & Sp.L.at 52 .

[12] Act *Concerning Civil Aviation*, Act No 1 of 2009 [Civil Aviation Act]. State Gazette of the Republic of Indonesia No.1 year 2009, Supplement State Gazette of the Republic of Indonesia N0.4956.

[13] Amad Sudiro, Martono K. ,*Aviation Criminal Laws Applicable in Indonesia*.www.iosrjournals.org Vol.9(2) 50 (February 2016);Toendjoeng, Gunardi, Martono K., *Legal Aspects of Air Transportation and Environmental Pollution in Indonesia*.www.ijbmi.org Vol.6(4) 47(April 2017);Dwi Handayani, Alexander Sukiman Sugita, Haryono Kuswanto, Martono K., *Analysis of Aviation Legal Aspects in Indonesia: Administrative Sanction, Liability, Criminal Acts and Cases.* www.ijbmi.org Vol.6(7) 18 (July 2017);

Bali Mount Agung Volcanic Ash

Mount Agung's eruption, which began in September 2017, forced the island's airport to close for two days and visitor arrivals have dropped by more than 70% and facing US$ 1 billion in lost tourist revenue. According to Jazeera's Step Vaessen, reporting from Sidemen in Bali, while the volcano continues to erupt, the government has gone out of its way to convince tourists that Bali is safe, outside of the danger zone of 10 kilometers from the crater. The huge loss in tourist revenues has taken authorities by surprise. Some say this is a wakeup call for the holiday island not to fully rely on tourism. The Indonesian government is trying to lure tourists back to the holiday island. On 2 January 2018 , Jokowi, the president of Indonesia has been taking selfies on the beach in Bali, hoping to lure tourists back.[14]

3. Aviation Safety

The eruption of Mount Agung on the island of Bali in Indonesia has emitted a huge plume of volcanic ash over the region, reaching more than 9 kilometers up into the atmosphere. Such eruption has disrupted flights over paradise Island of Bali. With the aviation color code listed as red (the most dangerous), air passengers are once again being stranded, just an many were following the 2010 Eyjallajokull eruption in Iceland, or during the Puyehure-Cordon eruption in Chile the following year. The volcano is still erupting. This means it could become even more explosive and such flying nearby remains a risk. In addition, volcanic ash disruption is strongly influenced by wind direction and speed and the evolving situation still needs to be carefully monitored by the local meteorological offices, and also the Darwin Volcanic Ash Advisory Center (DVAAC) that issues various ash warnings to the aviation sector.[15]

The threat posed by a particular volcano's ash depends on what it is made of, as no two eruptions are exactly alike. Volcanic ash consists of fragments of pulverized rocks, minerals and volcanic glass that varies dependent on the chemical composition of the magma. Once this glass is sucked into jet engines, it is heated up and can accumulate as re-solidified ash on the turbines, resulting in engine failure. The higher the concentration and density of glass, the more problematic the ash will be, although even fine ash has electrostatic charge that can lead to electrical failure.[16]

Even at low concentrations, where the ash is barely visible to the naked eye, it can still pose significant threats and damage to aircraft. Ash also causes significant abrasion to the plane and its windows, while disrupting communications and damaging sensitive equipment. Mount Agung has previously emitted Sulphur-rich gases. Following its most recent major eruption in 1963, its emissions may have led to significant atmospheric cooling of 0.3℃ in average northern hemisphere temperatures. High levels of Sulphur-dioxide and carbon dioxide can also generate discomfort for aircraft passengers, leading to irritations to the eyes, nose, throat and increased airway resistance as well as corroding the aircraft. These gas emissions pose a real risk to passenger comfort, as well as cooling of the tropical troposphere.[17]

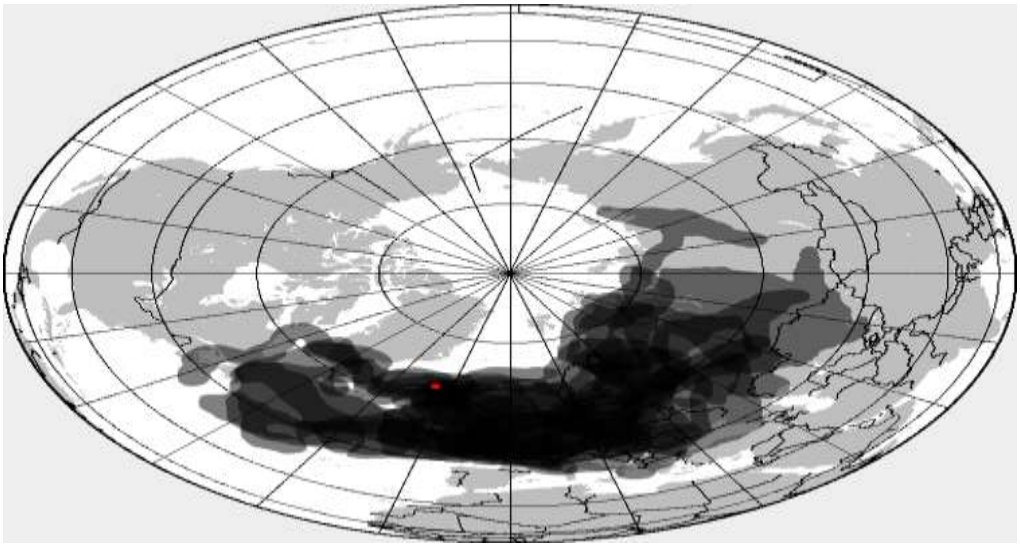
It is no surprise then that a policy of "if ash, no fly" was adopted internationally following two key disasters in Indonesia in 1982 and Alaska in 1989. However, this policy was eventually disregarded during the Eyjafjallajökull ash crisis, after a five-day air-space closure over much of Europe created chaos.

[14]. https://mail.google.com/mail/u/0/h/3j2j19jvxba4/?&th=1644c575ce828133&v=c

[15]. https://theconversation.com/why-mount-agungs-volcanic-ash-is-a-particular-problem-for-aircraft-88353

[16].*Ibid.*

[17].*Ibid.*



Ash from Eyjafjallajökull spread across much of the Northern Hemisphere
Met Office/wiki/ Cogiati, CCBY-SA.

"No fly" was replaced by a safe ash limit of 200-300 micrograms per cubic meter of air, the removal of the flying buffer zone of 60 nautical miles, and then a "time-limited zone" whereby aircraft can fly through higher concentrations of ash for a limited time. This raised fundamental questions about standardized protocols in volcanic ash hazard management. If they can be ignored or revised based on social and economic circumstances, rather than scientific evidence, what's the point of them? Yet the science remains uncertain. It's hard (and expensive) to work out with any precision where atmospheric ash is located in real time and at what concentration. Equally, the risk it poses to aircraft is not fully understood. Figuring out an official safe threshold of ash concentration would require significant testing on the varying aircraft jet engines, which can cost tens of millions of dollars each.[18]

4. Aircraft Accident

Volcanic ash is very dry, abrasive, and fine. When the airplane entered the dust cloud the fine, dry dust electrified with static electricity and appeared to be St. Elmo's Fire. The static makes radio communications impossible. As the dry ash enters the hot engines, it becomes a sludge that collects onto the turbine blades, fouling the airflow and eventually causing them to compressor stall and shut down. After the aircraft is forced to descend the engines cool and the sludge on the turbine blades break off, allowing the engines to be restarted. The powder is so abrasive that the windscreen is sandblasted and very difficult to see through.[19]

On 24 June 1982, Mount Galunggung, the active volcano located in 160 kilometers South-East of Jakarta, had erupted violently. Giant plumes of ash and grit had been hurled 13 kilometers into the air. The explosion had created a vast volcanic storm of thick, hot, sulphurous gases and high electrical activity. No aviation warning was given. North-easterly winds aloft at 25 to 30 knots had blown the plume across the path of BA 009 and it had been engulfed in ash. Flying through the hot grit at speed had the effect of sandblasting X-ray Hotel's leading edges and had stripped paint and caused the opaque surface on the windscreens and landing light covers.[20]

The dust had penetrated aircraft sensors such as pitot tubes which sense dynamic pressure to measure airspeed. The discrepancy in the airspeeds was the result. The engine nacelles, intakes and fans were shot-blasted and stripped clean. Erosion of the compressor blades had occurred and the ash, which was of a silicate material, had fused in contact with the hot metal of the combustion chambers and turbines. Deposits of fused volcanic ash up to half an inch in diameter were later discovered in all the engine tailpipes. The effect was sufficient to disrupt the airflow and was similar to dampening a blaze with sand. As a result, the engines had

[18].*Ibid.*
[19].British Airways 9.,Accident Case Study http://code7700.com/accident_british_airways_9.htm**

[20].Captain Stanley Stewart .,*British Airways 9.,Accident Case Study*
http://code7700.com/accident_british_airways_9.htm

flamed-out and all power had been lost. At 4,115 meters, X-ray Hotel had broken into clean air and the least damaged engine, number four, had roared into life. Subsequent climb to 4,570 meters had taken them back into the ash cloud. It was a close escape which might have ended tragically had not the skill, coolness and persistence of the flight crew won the day. But the passengers and crew of BA 009 were lucky, too, for the aircraft only just emerged from the volcanic storm in the nick of time.[21]

Chapter Two

Mt Agung Eruption and Business Laws

This chapter deals with legal ground of tourism; year of disruption; eruption of Mt Agung; economic aspects and tourism business as follows.

1. Legal Ground of Tourism

Act No.10 Years 2009, concerning Tourism came into force on 16 January 2009, consist of 17 Chapters such as general provisions; basis, function and objective; tourism administration principles' tourism affair development; strategic area; rights, obligations, and prohibition; government's and regional government's authority; coordination; Indonesian tourism promotion agency; joint Indonesian tourism industry; training on human resources, standardization, certification and manpower; funding; administrative sanctions; penal provisions, transition provisions and closing provisions. With regards to business tourism, it found in Articles 14 to 17. It provides that tourism business shall includes tourist attraction; tourism area; tour transportation services; tour travel services; food and beverage services; accommodation provision; entertainment and recreation activities administration; meeting, incentive travel, conference and exhibition organization; tourism information services; tourism consultant services; guide services; water tourism and spa. Such tourism shall be regulated by Minister.

2. Years of Disruption?

The key question now, is whether Mount Agung will continue to erupt and cause similar types of disruption. The volcano's previous major eruption lasted between February 1963 and January 1964, with a number of explosive eruptions throughout. If this is anything to go by, the current aviation disruption from volcanic ash may continue for some time. Indeed, rather than a short, sharp and large emission of ash, some volcanic eruptions can occur on and off for years. Such on-going unpredictability can be far more disruptive, particularly for an island as dependent on tourism as Bali. This of course does not address the ground-based hazards including flows of lava or volcanic debris that put local people in significant danger. Should Agung continue to erupt, it will be interesting to see whether the ash concentration limits established in 2010 will be implemented. Those affected by the volcanic eruption should have faith in the sophisticated early warning systems set up to monitor the volcanic ash, but if there is one thing we can learn from volcanoes, it is to expect the unexpected.[22]

3. Eruption of Mt Agung

On 29 June 2018, Mount Agung volcano erupted, causing a massive ash cloud which wreaked havoc with air travel. The ash cloud out of Mount Agung was reported to have reached a height of 2000 meters after it began to erupt on the evening of 28 June. Airlines operating to and from Bali Ngurah Rai International Airport (BNRIA) were to delay or cancel flights due to the increased volcanic activity. More than 300 flights were cancelled on the popular tourist island. Volcanic ash poses a hazard to aviation as it can hamper visibility, damage flight controls and cause jet engine failure. Australian airline Qantas had apologized for the inconvenience but said passenger safety was its top priority. A change in wind direction has allowed the BNRIA to reopen. The volcanic ash posing the hazard, have been pushed west away from the airport. The Volcano Observatory Notice for Aviation (VONA) has issued an orange warning, indicating heightened unrest with the increased likelihood of further activity. This signals the potential for further flight delays if conditions change.[23]

More than 300 flights were cancelled on the popular tourist island. According to Sutopo Purwo Nugroho, National Disaster Management Agency spokesman, volcanic ash from Mount Agung is weaker in intensity, up to 300 meters. Flares can be seen from its crater. A danger zone within a four-kilometers radius

[21].*Ibid.*

[22] https://theconversation.com/why-mount-agungs-volcanic-ash-is-a-particular-problem-for-aircraft-88353, *supra* note 11

[23]. Kate Whitfield, Bali Volcano Current Status: Is the Airport Open Again?;See https://www.express.co.uk/travel/articles/981837/bali-volcano-current-status-airport-open-flights-travel-mount-agung-indonesia

around Mount Agung's crater is still being observed. The warning level for the volcano remains at level three, one below the highest advisory. The volcanic activity had only been downgraded to a level three in February this year. The massive ash cloud which wreaked havoc with air travel. After an eruption in November 2017, more than 29,000 people had to flee their homes and the island was on level four alert. After the 2017 eruption, flights were suspended for 24 hours, stranding 59,000 domestic and international passengers.[24]

Indonesia, Bali's island archipelago, is one of the world's most active volcanic regions. It forms part of the Pacific "Ring of Fire" a massive horseshoe-shaped area of seismic and volcanic activity in the Pacific Ocean. Roughly 90% of all earthquakes occur along the "Ring of Fire", and 75% of the world's active volcanoes are dotted along the expansive ring. In 1963 the volcano erupted in what has been recorded as one of the most devastating eruptions in Indonesia's history. Local residents reported explosions, ash clouds, lava rivers and pyroclastic flows. An estimated 1,500 people lost their lives in the eruption of 1963.[25]

Mount Agung's Eruption in Bali Island

4. Economic Aspects

A volcano spewing clouds of ash has plunged one of the world's top tourist destinations into crisis. The Indonesian island paradise of Bali, which welcomed almost 5 million foreign visitors last year (2016), is struggling to deal with the chaos wrought by Mount Agung eruption in recent days. According the official, as many as 100,000 people need to urgently leave the danger zone around the volcano, which started belching ash. The eruptions have prompted the closure of the Bali's main airport, leaving more than 50,000 travelers stranded. The disruption is hurting businesses ranging from international airlines to street vendors. Tourism is the biggest industry in Bali, which was ranked as the world's best tourism destination, this year (2017) by travel site TripAdvisor.[26]

:Local authorities estimate that as many as 15,000 tourists have already canceled their vacations to paradise Island of Bali as a result of the disruption caused by the volcano over the past three days. According to Keith Loveard, senior analyst at Jakarta-based Concord Consulting (JCC), every day BNRIA is closed costs the local economy about US$18 million. He expects the island's economy to take a major hit over the traditionally busy Christmas and New Year period as tourists rethink their travel plans. There is a very strong chance that many would-be tourists will decide to go elsewhere. Tourism in paradise of Bali has suffered in the past. It

[24].*Ibid.*

[25].*Ibid.*

[26].Daniel Shane ., Erupting Volcano is Suffocating Bali's Economy; See http://money.cnn.com/2017/11/28/news/economy/bali-volcano-economy/index.html

declined significantly after deadly terrorist attacks in 2002 and 2005, which resulted in "a dramatic drop" in local residents' incomes.[27]

` Volcanic activity in the region has also disrupted air travel to the Bali Island in previous years. According to analysts at Nomura, the current turmoil could hamper the Indonesian government's goal of attracting 20 million tourists annually by 2019. Bali makes up more than 40% of all tourist arrivals into the country. According to Loveard, Indonesia has been trying to cultivate alternative tourist destinations like nearby Labuan Bajo. But these could also be affected by Mount Agung's ash clouds and by a prolonged closure of BNRIA, which is a hub for other parts of the country.[28]

5. Tourism Business

On the weekend, authorities reduced the mountain's alert status and reduced the size of the volcano exclusion zone from six kilometers to four from the crater. It is meant that almost all evacuees have been able to return home. According to I Gusti Ayu Nia Arsiani, who sells clothes near the Besakih temple on the slopes of Mt Agung, when a major eruption was considered likely in November, around 150,000 locals moved in to evacuation center, she felt so glad, she could return home, she was incredibly happy. Compared to life in limbo moving here and there in the evacuation centre. No more running around and the children's school is now back to normal again.[29]

According to Gede Suantika, from Indonesia's Centre for Volcanology and Disaster Mitigation, Mount Agung was returning to normal. This has been a huge relief for us, as the huge eruption we expected has not happened. The danger, if it exists, is only inside or around the crater, but climbing is till prohibited. Hopefully, the Mount Agung was going back to sleep. According to Komang Artawan, rafting coordinator, a 12 kilometre evacuation zone set up around Mt Agung was devastating to local businesses. On the good day he had on average 250 tourists visits, but after Mount Agung he only have 50 visits. Their visitors declined fast, especially when BNRIA shut down for several days. For that reason, he laid off 50% of his employees and lost US$50,000 within three months.[30]

Businesses lost $50,000 in three months during Mt Agung volcano threat. In November, about 150,000 locals were moved to evacuation center. Tourists are slowly heading back to Bali since eruption last year. Cancellations attributed to Mt Agung have cost the island an estimated US$1.5 billion. While arrivals from Australia dropped by 50% at the peak of the crisis in December, arrivals from China fell from 100,000 visitors to 11,500. China's airlines stopped flying to Bali reportedly after a directive from China's aviation authority. But in the past week the tourists have begun returning, just in time for Chinese New Year. During Mount Agung tourists went to Malaysia and Thailand, now they have come back taking into account paradise Bali Island is safe. According to Andreas Aris Utomo, a Mandarin-speaking tour guide at Bali's Benoa Bay, the worst situation was around November to the end of December, it was really, really bad for him. Mount Agung erupted emitting a 1.5 kilometers plume of ash, but the volcano has been mostly quiet since Christmas.[31]

Chapter Three

Mt Agung Eruption and Environmental Law

This chapter deals with climate change includes global climate, alteration global temperature, global impact; agriculture-plant & animals waste includes a mountain garbage, war on waste and government's commitment as follows.

1. Constitutional of Environmental

With regards environmental sustainability, Indonesian constitution Law of 1945 provides that a good and healthy environmental shall be come the fundamental right to every citizen of Indonesia, it is the reason the national economic development shall be organized based on the principles of sustainable and environmentally-friendly development. The environmental quality that is currently declining and has threatened the survival of

[27].*Ibid.*

[28].*Ibid.*

[29]. Adam Harvey.,Mt Agung: Tourists Return to Bali After Eruption of Island's Volcano http://www.abc.net.au/news/2018-02-15/visitors-return-to-bali-after-tourism-blackout/9443924

30.Ibid.

[31].*Ibid.*

human life and other living things and there is a need of protection and environmental management on serious and consistent basis by all the stakeholders. In relation with global is increasing to result a climate change that is exacerbating the environmental degradation, therefore it is necessary to conduct protection and management of environment. In order to ensure the legal certainty and the protection of the right of every person to earn a good and healthy living environment as part of the overall protection of the ecosystem, it shall be necessary to issue an Act to enhance public welfares and achieve happiness of life based on the Pancasila, and implement environmentally sustainability development guided by an integrated and comprehensive national policy which take into consideration the needs of present as well as future generation[32]

2. Climate Change

a. Global Climate

Cancelled flights, missed connections and expiring visas have turned Bali into a nightmare for thousands of tourists scrambling to leave, as a volcano on the Indonesian vacation paradise threatens a major eruption. Hundred of flights have been grounded as the main international airport was shuttered, leaving close to 120,000 stranded visitors in need of shelter. If Mount Agung erupts, the impact on the island would be disastrous, crumbling its economy that is largely dependent on tourism and agriculture. But the eruption could also have ramifications beyond Bali, as it threatens to alter the global climate. According to a Washington Post report, that the eruption could alter the global temperature for months and may be even years to come. In the short term, ash particles would cause regional cooling, as the layer of dust prevents some sunlight from reaching the ground. In the long term, Sulphur-dioxide would mix with water droplets in the atmosphere, spread across the globe and reflect sunlight for up to three years. Average global temperature could decrease significantly. Bali volcano: Mount Agung Eruption to Impact Global Climate, temporarily Cool Entire Planet.[33]

b. Alteration Global Temperature

Volcanic eruptions can violently shake up the immediate proximity of the eruption site but scientists believe that the millions of tons of gases and particles spewed out into the atmosphere can alter the global temperature. Variation in the temperature depends on what is being erupted and the location of the eruption. According to a UCAR study on how volcanoes influence climate. Most of the particles spewed from volcanoes cool the planet by shading incoming solar radiation. The cooling effect can last for months to years depending on the characteristics of the eruption. Volcanoes have also caused global warming over millions of years during times in Earth's history when extreme amounts of volcanism occurred, releasing greenhouse gases into the atmosphere. According to the Vox report, while the carbon dioxide emitted during an eruption traps heat, the ash particles and gases like sulfur dioxide, which form compounds that reflect sunlight, are also released that form a temporary shield, thereby cooling the planet. Bali volcano: Mount Agung Eruption to Impact Global Climate, temporarily Cool Entire Planet.[34]

c. Global Impact

According to Alan Robock, an environmental scientist at Rutgers University, the ash does not matter. What matters , the chemistry of the stuff that is being ejected and how it is ejected. Once high in the sky, sulfur dioxide reacts with water to produce droplets that can linger for a year or more. And when sunlight hits these droplets, energy is reflected back into space, depriving Earth of substantial amounts of sunlight. The UCAR study further states that despite the location of the eruption, the impact can be global. Even though volcanoes are in specific places on Earth, their effects can be more widely distributed as gases, dust, and ash get into the atmosphere. Because of atmospheric circulation patterns, eruptions in the tropics can have an effect on the climate in both hemispheres while eruptions at mid or high latitudes only have an impact the hemisphere they are within. Bali volcano: Mount Agung Eruption to Impact Global Climate, temporarily Cool Entire Planet.[35]

3. Agriculture - Plants & Animals

[32] Toendjoeng, Gunardi dan Martono., *Legal Aspects of Air Transportations and Environmental Pollution in Indonesia.* www.ijbmi.org Vol.6(4) 44(April 2017).

[33].https://www.firstpost.com/world/bali-volcano-mount-agung-eruption-to-impact-global-climate-could-temporarily-cool-entire-planet-4233119.html

[34].*Ibid.*

[35].*Ibid.*

Ash fall can have serious detrimental effects on agricultural crops and livestock depending mainly on ash thickness, the type and growing condition of a crop, the presence of soluble fluoride on the ash, timing and intensity of subsequent rainfall, condition of pasture and animals prior to ash fall, and availability of uncontaminated feed and water. Fluorine poisoning and death can occur in livestock that graze on ash-covered grass if fluoride is present in high concentrations; it may be advisable to sample and analyze ash or ash-coated vegetation to determine whether this potential hazard exists for livestock in areas covered with ash, even as thin as 1 mm. Livestock eating pasture that is contaminated with ash can suffer and die from gastrointestinal blockages. Shortages of uncontaminated feed and water after an ash fall can also lead to starvation.[36]

Survival of agricultural crops and pasture is often severely limited when ash thickness is greater than 100-150 mm (4-6 in). Predicting the potential crop losses from ash fall, however, is difficult and usually exaggerated because of the great variety of environmental and plant conditions that exist in tropical and temperate areas during and after ash falls of varying thicknesses. The abrasiveness of ash can damage farm machinery and equipment, but increased maintenance and a few precautionary actions can significantly reduce the cost of keeping the machinery in working condition. Ash fall can adversely affect crops and livestock in a variety of ways, but it is very difficult to predict exact consequences and associated costs of potential ash damage or mitigation measures. This is especially true for large explosive eruptions that result in ash fall over large areas and for a series of small eruptions that occur repeatedly over months to years.[37]

The information in this section identifies a range of known effects of ashfall on agricultural crops and livestock that can serve as a rough guideline for what can be expected. The information below is incomplete, however, and is not applicable to all situations because of the wide range of ash thickness and type and status of crops that can exist in different parts of the world at the time of an explosive eruption. Furthermore, there is a lack of detailed accounts of the effects of ashfall on individual farms in different regions, including the ways that farmers and governments have attempted to reduce the damaging consequences to their crops and livestock. Additional information and case studies are needed to improve the usefulness of this section. If you have information and knowledge of case studies that can help the Ash Web Team prepare new material on the effects of ash on agriculture and livestock, please contact the Ash Web Team . Through your support and contributions, this Web site can be significantly improved to help farmers and others deal with future volcanic ash falls[38]
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4. Waste

a. A Mountain of Garbage

Bali's palm-fringed Kuta beach has long been a favorite with tourists seeking sun and surf, but nowadays its golden shoreline is disappearing under a mountain of garbage. Plastic straws and food packaging are strewn between sunbathers, while surfers bobbing behind the waves dodge waste flushed out from rivers or brought in by swirling currents. According to Vanessa, an Australian traveler, when anyone wants to swim, it is not really nice. She sees a lot of mountain garbage here every day and every time. It is always coming from the ocean and it is really horrible.[39]

The archipelago of more than 17,000 islands is the world's second biggest contributor to marine debris after China, and a colossal 1.29 million metric tons is estimated to be produced annually by Indonesia. The waves of plastic flooding into rivers and oceans have been causing problems for years.The problem has grown so bad that officials in Bali last month declared a "garbage emergency" across a six-kilometer stretch of coast that included popular beaches Jimbaran, Kuta and Seminyak. Officials deployed 700 cleaners and 35 trucks to remove roughly 100 tons of debris each day to a nearby landfill.[40]

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[36]. GS-G-HI_Ash@usgs.gov | Accessibility | FOIA | Privacy | Policies and Notices | U.S. Department of the Interior | U.S. Geological Survey | USAGov

[37].*Ibid.*

[38] GS-G-HI_Ash@usgs.gov | Accessibility | FOIA | Privacy | Policies and Notices | U.S. Department of the Interior | U.S. Geological Survey | USAGov

[39].Bali Declares *'Garbage Emergency'* Amid Sea of Waste; The Indonesian holiday island has become an embarrassing poster child for the country's trash problem. — AFP)

[40].*Ibid.*

b. War on Waste

According to I Gede Hendrawan, an environmental oceanography researcher from Bali's Udayana University, some 72 kilometers from Kuta, Mount Agung has been threatening to erupt for two months, prompting tourists to cancel visits and displacing tens of thousands of villagers living within a 10 kilometers-radius of the volcano's crater, but the island's waste problem is no less of a threat due to garbage is aesthetically disturbing to tourist, but plastic waste issue is way more serious. Microplastics can contaminate fish which, if eaten by humans, could cause health problems including cancer.[41]

c. The government's Commitment.

Indonesia is one of nearly 40 countries that are part of UN Environment's Clean Seas campaign, which aims to halt the tide of plastic trash polluting the oceans. As part of its commitment, the government has pledged to reduce marine plastic waste by 70% by 2025.It plans to boost recycling services, curb the use of plastic bags, launch cleanup campaigns and raise public awareness. Still, the scale of the problem facing Indonesia is huge, due to its population of more than 250 million and poor waste processing infrastructure. According to Hendrawan, both locals and tourists are responsible for the Island's rubbish problem and urged authorities to invest more resources to tackle the problem. The Bali government should spare more budget to raise people's awareness to take care of local rivers, not to dump waste, while the central government should boost the campaign to reduce use of plastic packaging and ban free plastic bags at convenient stores.[42]

Chapter Four

Mt Agung Eruption and Social Science

This article deals with culture aspects includes the opening Besakih temple for prayers, Jro Mangku Made Gudug, thousands flee their home, Bali volcano Agung is "more likely than not"; safety in Bali during Mt. Agung eruption includes the answers of Shefali, Kelly Mc Rae, Tabra Tunoa, Gireesh Y, Manveen Maan, Marcel Paul Luitze; disable peoples as follows.

1. Culture Aspects

a. Opening Besakih Temple for Prayers

In September 2017, for weeks since tremors were first detected, millions of Balinese have been tirelessly coming together in prayer in the hope of calming the "mother mountain". According to I Made Mangku Pastika, Bali's governor, praying among dozens of Hindu worshippers at the Besakih temple, just a few kilometers from the crater of Mount Agung and within the officially declared no-go zone. The temple was briefly reopened by local officials, who deemed it necessary for prayers to be held there. Priests have also been photographed holding prayers and taking offerings to the holy mountain top, standing before a white plume emitting from the crater, prompting both criticism and support. Mount Agung is the centre of everything for the Balinese people, the place where the gods live. Jro Mangku Made Gudug, a Hindu priest, when asked why the mountain is considered the holiest in Bali Island. According to Balinese legend, without Mount Agung, there would be no Bali. According to Jro Mangku Made Gudug, that what we know as "the Island of Bali" now used to be untethered, floating about the ocean and very unstable. Life was difficult for the people. The gods then came, and Mount Agung was given to us. It is an anchor, a stake that keeps everything together. He is one of a number of Hindu priests who have been holding regular prayers for the safekeeping of those whose homes are closest to the volcano, Almost 150,000 residents have been evacuated.[43]

b. Jro Mangku Made Gudug

The old priest hopes that such devastation will not occur again. "The communications system, the alerts from the government. Anyone can now only pray for the best and ask for forgiveness. Do it at their own homes, do it according to their beliefs."Asked if the latest tremors at the holy mountain could mean the gods are angry, He declines to give a straight answer. He is an old man, he is almost 80 years old, he is nearly blind, he almost cannot hear. According Jro Mangku Made Gudug, he can only pray for the good of the people, but he wishes people could come to understand how important and how holy this mountain is for the Balinese people. As with any religious place in Bali, he wishes for it to be kept sacred and not commercialized. If people want to visit

[41].*Ibid.*

[42].*Ibid.*

[43]. Mount Agung's Eruption is in the Lap of the Gods for Bali's Hindu population http://www.scmp.com/lifestyle/travel-leisure/article/2114721/mount-agungs-eruption-lap-gods-balis-hindu-population

Mount Agung in future, he hopes they can come with an understanding of what this mountain is and what it means spiritually for the locals. Wayan Susun also remembers the 1963 eruption. The villager from Selat Karangasem, 10 kilometers from the crater, looks incredibly calm. He smiles and jokes as he reminds his grandson not to stray too far from a corner of the shelter that has been home to his family of eight for more than two weeks. The family is staying at GOR Swecapura, a sports arena in the Balinese regency of Klungkung that is one of 471 evacuation center set up for people living near Mount Agung. About 3,000 people are being housed at GOR Swecapura.[44]

c. Thousands Flee Their Home

Every village, every temple, big and small have been holding prayers since the first official warning was issued. The prayers is called Guru Piduka. It wishes for safety, and aims to calm the wrath of the Gods and beg for forgiveness, so that what is unwanted will not happen. According the priest, before Mount Agung last erupted, in 1963, there was a disagreement between high priests near the mountain over dates to perform one of the most important Balinese Hindu ceremonies, the centennial Eka Dasa Rudra at Besakih temple. According the priest, they managed to complete the ceremony, but there were also misdeeds done in front of the Gods, so to ask for forgiveness, Guru Piduka was also performed. However, forgiveness was not forthcoming. The 1963 eruption of Mount Agung claimed more than 1,700 lives in Bali, and destroyed tens of thousands of homes. It was said that what we know as 'the island of Bali' now used to be untethered ... The gods then came, and Mount Agung was given to us. It is an anchor.[45]

5. Bali Volcano Agung is "more Likely Than Not"

According to Susun, he had to stay in the shelter for at least six months. He did not remember too many details. He did not remember how many people were missing, or how many people did not want to move out of the villages. He did remember the shattering earthquakes. For now, he prays every day. He will ask the gods for protection ... he really want to go home. Balinese authorities have imposed a 12km exclusion zone around the mountain, and everyone living within that radius has been told to pack their belongings and leave. The local authorities have been keeping a close watch on activity at Mount Agung, and Indonesia's volcano monitoring body, Magma, posts minute-by-minute updates on seismic activity around Bali's highest mountain. Yet, according to Indonesia's National Disaster Mitigation Agency, while the chance of an eruption is high, its timeline cannot be predicted. This may mean that for thousands of evacuees at GOR Swecapura and other temporary shelters, there's no telling how long they will be away from home. That, Bali's residents believe, remains in the hands of the God.[46]

2. Safety in Bali During Mt. Agung Eruption

Taking into account that Mount Agung is going to erupt, there is question, is it safe to go paradise Island of Bali Island during the eruption in 2017. In this regard, there are several answers to the question, such as follows.

a. Shefali.

Shefali, works at Pickyourtrail (2016 -present) answers such question, that not anymore, it seems. Although only a 15 kilometers radius from Mount Agung is under threat and most tourist spots are safe, the ash dispersed has resulted in zero visibility. Thus causing all flights from and to BNRIA being cancelled and the airport being shut-down for two days. There is no definite answer to when the sky will clear up and permit travel so best to monitor the situation. Pickyourtrail is a 3 year-old travel platform that aims to change the way people travel. Our travel platform is a unique experience for those wanting the independence of making your own vacation plus the insights that we have to offer.[47]

b. Kelly McRae

Kelly Mc Rae, daughter of Quora, single Mama of 5, Traveler, HODL.er, answers such question, yes please do. November's Month is a lovely time to see Bali. My mother lives in Ubud, and I have zero concern for

[44].*Ibid.*

[45].*Ibid.*

[46].*Ibid.*

[47].https://www.quora.com/Is-it-safe-to-go-to-Bali-in-November-2017-considering-the-Mt-Agung-volcano-is-going-to-erupt

her safety re: Mount Agung and because of the imminent eruption, tourism crowds are down, and the Balinese are anxious to continue work. This would be the BEST time to visit. Anyone will be safe. But if she erupts while there were there? Imagine the stories to tell back home.[48]

c. Tabra Tunoa.

Tabra Tunoa,owns Tabra Jewelry shop on Jalan Hanuman in Ubud, answer such question that Mount Agung volcano could erupt at any-time. From everything I am hearing here in Indonesian paradise of Bali Island, outside of the 7 to 8 miles radius around the volcano, everyone will be safe. Tabra Tunoa lives in a village within walking distance of Ubud and she is told that Ubud will definitely not be affected. It has been very bad for business, but good for those who do not like huge crowds of tourists. I would say that it is probably the best time to come that there will be for years. I hear airplanes overhead every day, so planes are still coming and going.[49]

d. Gireessh Y

Gireessh Y, enthusiactic Traveler-India, answers the question that she was in Bali l (one) month age when Mount Agung volcano erupt news came out. It is safe, as Mt. Agung is around 35 to 40 kilometers from Bali/ Kuta/ Seminyak places. Indonesia Government will keep alerting the locals and tourist in case of any emergency.[50]

e. Manveen Maan.

With regards to the question, Manveen Maan, works at Rome2 Rio, answers such question that BNRIA and Lombok airports are currently closed so she is not sure if anyone will even get to land there. This is a really useful article for those needing more information about what's going on in Bali right now - heaps of practical advice. Good luck.[51]

f. **Marcel Paul Luitze.**

Regarding such question, Marcel Paul Luitze, live in Bali, Indonesia, answers that no problem to visit Bali. Just stay away / out of the designated danger zone of 12 km's around the volcano. That danger zone covers just 2% of Bali's landmass, the other 98% of Bali is safe, even when the volcano erupts (if at all).[52]

Based on the 6th answered above-mentioned regarding the safe in Bali during Mount Agung's eruption, the authors conclude that living in Bali is safe considering that the hazard zone limited to 15 km radius from Mount Agung, the Balinese are anxious to continue work, outside of the 7 to 8 miles radius around the volcano, everyone will be safe, Indonesia Govt will keep alerting the locals and tourist in case of any emergency and the danger zone covers just 2% of Bali's landmass, the other 98% of Bali is safe even when the volcano erupts.

3. Disable Peoples

In a back room of the village chief's office in the small community of Abang, close to Mount Agung, two young children lie on the floor, cradled and stroked by their mother and aunt. The children are both severely disabled. They are among hundreds of disabled children among the 145,000 evacuated from around Bali's Mount Agung eruption. Ni Ketut Nonik is 12 and I Gede Jati Suardana is 14, although both are the size of children half their age. Ni Ketut Nonik's thin arms are bent at an awkward angle in front of her, and her tongue pushes uncontrollably out of her mouth. They are both lying n mats on the floor. These young evacuees are helpless. They can barely move, let alone walk, and in an emergency they need to be picked up.[53]

According to I Luh Teni, their mother that running away from a volcanic eruption would be impossibly slow. After an evacuation order was issued for 12 kilometers around Mt Agung the family hurried to get out. Teni is afraid, she has four other children. According to Ketut Darmo, workers from a local charity Puspadi came to help, he took Ni Ketut Nonik and I Gede Jati Suardana with pick-up truck. They were given

[48].*Ibid.*

[49].*Ibid.*

[50].*Ibid.*

[51].*Ibid.*

[52].*Ibid.*

[53]. By Indonesia correspondent Adam Harvey from Australian Broadcasting Corporation

this place at the back due to they need a special place. These children can't cope in a crowded evacuation centre, with the chaos and noise of hundreds of people sharing tiny spaces. They have got no idea what is happening and they are easily distressed. They are unsettled when we come into the room, and calm after a few minutes of quiet talk. Puspadi staff and volunteers have been doing this work all week, collecting hundreds of children from inside the evacuation zone and taking them out of danger. According to Ketut Darmo, this work is very important. He also had to pay attention to his family too, due to his wife is disabled, she is lost her right leg.[54]

IV. . Conclusion And RECOMMENDATION

The impact of Mount Agung eruption in Bali are, among others, aviation safety, closing of airport, business tourism, economics, environmental aspects such as climate change, alteration global temperature, mountain garbage, waste, damage agriculture-plant & animal, thousands flee their home etc. The authors recommend that the government should prevent and recovery damage to as a result of Mount Agung eruption.

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