National Journal of Environmental Law
ISSN: 2581-6683
Volume 3, Issue 2
www.stmjournals.com

Artificial Weather Modification: "A need for Precautionary Approach and Regulation"

***Keerty Dabbas*[1,*], *Kritika Jain*[2]**
[1]Research Scholar, Faculty of Law, Delhi University, New Delhi, India.
[2]Delhi Judicial Service, New Delhi, India

Abstract

Inadvertent use of weather modification techniques by many countries including India and intentional intervention in natural weather and climatic cycles have raised many environmental concerns and discussions on liabilities of parties for any environmental damage that is being done, without developing coherent law to regulate the same. In the absence of regulation policies, lack of scientific and environment evaluation studies, research aims to highlight the need to develop a legal regime to regulate the use of these techniques and adopt them with a precautionary approach.

Keywords: *weather, modification, natural weather, climate, policies, regulation, techniques, environment, law*

****Author for Correspondence*** E-mail: keertydabas@gmail.com

INTRODUCTION

As climate change and greenhouse effect have become a reality and more nations have started facing droughts, extreme summers and increased temperatures, glacial melting, etc., geo-engineering synonymous with climate engineering emerged as a concept. It can be described as an intentional and deliberate process of altering the earth's climatic system which is aimed at using geological sciences and various scientific techniques to counter and limit the adverse effects of climate change on earth. It seeks to reduce carbon emissions and removal of greenhouse gases, and also involves solar radiation management. Where geo-engineering is a broad concept, weather modification is a narrower program for enhancing precipitation, rainmaking, inducing snowfall, suppressing hailstorms and controlling smog and fog at the local level using "cloud seeding technique". Cloud seeding technique [1] uses dry ice, chemicals aerosols, silver iodide, potassium iodide, etc. which are infused or sprayed in the atmosphere (by using planes, generators and rocket generating chemical trails). These chemicals help in trapping the moisture already present in the atmosphere, cool down temperatures to form ice crystals and artificial clouds thus making it rain. Towards the end of 2015, USA had thirty-nine active operational weather modification programs. After China and USA, Thailand and India are the biggest investors of these operations. Within 2013-2016; in a span of three years, the number of countries investing in artificial modification techniques increased from forty-two to fifty-nine [2]. India is currently one of the largest investors in weather modification research with a major multi- year program "CAIPEEX" conducted by the Indian Institute of Tropical Meteorology in Pune [3]. Though "hostile" use of environmental modification techniques as a weapon of warfare was banned by UN Convention in 1978, [4] its "friendly" use today is being hailed as the new savior against climate change its catastrophic effects. It has temporary advantages, especially for developing nations; and is a quick solution to battle droughts, water shortages, insufficient rains, and lesser monsoon dependence. But rampant and inadvertent use of such technology by many countries including India and intentional intervention in natural weather and climatic cycles have raised many environmental concerns and discussions on

liabilities of parties for any environmental damage that is being done. Some of these concerns are discussed briefly in this paper.

TRANSLATIONAL NATURE OF ATMOSPHERE AND INTERNATIONAL LAW

Sates have always asserted sovereignty and control over their territorial water, airspace, atmosphere and even clouds over it. Customary international law allows States to exclusively exploit, dispose and manage these natural resources within their territory [5]. However, this is not an absolute principle as international responsibility is imposed if activities of state or its citizens, even if such acts are not intended to be harmful, do in fact cause unwanted damage in another state. This "duty" of one state to " prevent trans boundary harm" have been recognized in several international principles [6] , cases and conventions such as Corfu Channel case, Trail Smelter arbitration, Gabčíkovo-Nagymaros case, UNECE Long-Range Trans boundary Air Pollution Convention, etc. [7]. For the purpose of this paper it is important to understand that just like water, atmosphere and weather are of transnational character as well[8] . Atmospheric activity and disturbance at one place can affect the weather at another place beyond national jurisdictions [9].

Thus, any technology which has the capability to artificially interfere in climatic activity on a large scale, have the potential to cause conflicts and dispute at the transnational level.

LEGAL CONCERNS RELATED TO WEATHER MODIFICATION

The concept of Weather Modification entails economic, ecological, ethical, political social and legal concerns. The possibility of artificially inducing rain has also brought forward a new source of water, whose legal aspects should be explored. The single major legal concern is the "Liability" determination. As already discussed, the atmosphere climate and weather have a transnational character which gives rise to legal issues within the state as well at the transnational level. Here, the experiences of USA which has a developed jurisprudence on this subject are of importance. The general assumption in American legal response is that the landowners, "own" the "clouds" over their property and have some kind of "property rights" over the [10]. This is supplemented by "Natural Rights Doctrine" i.e. "one who owns the property has the right to enjoy the natural precipitation that might fall over it [11]. This perception of viewing atmosphere which is a shared natural resource in terms of property only, has exposed it to similar legal issues as raised in cases of interstate shared water resources, it rather sets to compound the disputes in future and is myopic in its nature.

Another issue which emerged is the issue of "proof of damage", as there is not enough credible scientific knowledge about consequences of weather modification techniques. Traditional institutes are unable to give rational decisions, because of informational inadequacies, lack of expertise where the courts are attempting to undertake administrative functions in a complex scientific field have led to development of pro technology legal policy [12].

Potential hostile use of this technique has been raised quite frequently in the international community. United States' military operation 'Popeye', [13] exposed the dark side of weather modification capabilities. "Owning the weather" became the agenda of military systems by using the new age technique for purposes of warfare and weapons [14]. To prohibit " *military or any other hostile use of environmental modification techniques having widespread, long-lasting or severe effects as the means of destruction, damage or injury to other State*" , Environmental Modification Convention (ENMOD) was entered into force on 5th October 1978 by the United Nations[15]. As of January 2019, the Convention has seventy-eight state parties [16]. India ratified the same on 15th December 1978. The Convention on Biological Diversity also prohibits few forms of geo engineering and weather modification [17].

Potential ecological effects of weather modification also demand consideration, for instance, the main chemical used in cloud

seeding i.e. silver iodide which is non-soluble, inorganic, hazardous chemical that pollutes water and soil. It has been found to be highly toxic to fish, livestock and humans. World Health Organization listed cloud seeding with silver iodide as one the major anthropogenic sources responsible for elevated silver concentrations in the environment which is a hazardous compound for aquatic and marine life [18].

Thus, hasty adoption of new technologies can lead to disastrous unintended environmental damage, especially when there has not been a single scientific study completed and reported in the literature to identify possible adverse effects of weather modification on environment [19].

FRAGMENTED INTERNATIONAL LAW ON ATMOSPHERE

Traditionally, international air law was perceived as a synonym of aviation law. Even though the issues and concerns related to the atmosphere have been highlighted and regulated under various conventions, but International law on atmosphere remains patchy and fragmented [20]. Debate on the environment remains focused upon greenhouse emissions, CFC's, carbon emission, climate change etc. barring a single UN Convention limited to restrict their hostile use and there is no UN Convention or any other form collective response towards regulating geo engineering and weather modification practices. Even the traditional Fault Theory i.e., using the "cause-effect" doctrine to locate the fault in order to determine State liability; is more or less ineffective in these cases as there is scarce scientific research on the subject and a definite scientific theory on "causation" or "effect" of weather modification is absent.

WEATHER MODIFICATION IN INDIA AND NEED TO ADOPT THE PRECAUTIONARY PRINCIPLE

As an agrarian and monsoon dependent State, India stands to benefit from adopting and developing weather modification techniques. Although the experimental projects are still at infancy stage, world metrological organization report shows the huge amount of investment being done by India in for rapid development of weather modification technology [21]. States like Maharashtra, Karnataka, Uttar Pradesh and Delhi are making huge investments in cloud seeding operations to tackle droughts and air pollution [22]. This raises a concern of inadvertent utilization of this technology in the near future, more so, because the law related to the use of this technology has not been developed yet. Especially in terms of the legal and ecological concerns which are evident now, it cannot be denied that India will experience similar concerns and disputes in the future as USA, if it does not regulate the use of weather modification techniques.

India has always been committed towards environment protection, sustainable development and climate change. Mirroring the international developments in environmental law, India has enacted The Air (Prevention and Control of Pollution) Act, 1978, The Water (Prevention and Control of Pollution) Act, 1974, The Environment Protection Act, 1986 and several other legislation [cite]. The Central Government is empowered under Environment Protection Act,1986 to notify Rules [23], formulate regulations, set standards and adopt adequate measures for maintaining environment safety and quality but no guidelines regulating the use of weather modification techniques has been issued yet. Therefore a comprehensive weather modification policy is required to address legal concerns such as licenses, permits, compensation scheme, the establishment of appropriate authorities, etc.

Furthermore "Precautionary Principle" as stated in Rio Declaration and acknowledged by the Supreme Court of India in Vellore Citizens Welfare Forum V Union of India [24], necessitates that "*where there are threats of serious and irreversible damage, lack of scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation. The State Government and the statutory authorities must anticipate, prevent and attack the causes of environmental degradation*" [25].

One cannot deny that there is a lack of scientific evidence as to the adverse effects of weather alteration and the harmful effects of chemicals being used on ecology. There is no credible or safe approach to use this technology, global regulation and legal framework for climate-related geo engineering is inadequate, there is no understanding of its economic, social or cultural impact, impact on local communities or biodiversity, moreover the governments themselves are major investors in weather modification projects.

Accordingly, it is suggested that India adopts the Precautionary Principle in its essence to prevent any unintended environmental damage. India should not indulge in commercial utilization of this technique. There is no harm in developing the law related to technology as we develop the technology itself.

CONCLUSION

Oppenheimer, observed that, "*the job of a lawyer working with scientists and engineer in an emerging field such as weather modification is to help to identify and accommodate the complex and interrelated scientific and public interest which means that we must try to create and evolve an environment of law suitable for the development of science and technology and for the protection of the varied and conflict interest*" [26].

The above legal concerns have highlighted the need to develop international and national legal jurisprudence about weather modification. Other disciplines have to be considered and linked for wider context since the subject involves social, economic, ecological, ethical as well as political concerns. The idea is to manage the international relations and rights, duties and liabilities of the states with respect to the use of this technology and consequences thereof.

REFERENCES

1. Origins can be traced back to 1946 when Vincent Schaefer by series of experiments and using ideas generated between him and Nobel laureate Irving Langmuir caused it to snow by using dry ice, and Noted atmospheric scientist Bernard Vonnegut discovered the potential of silver iodide for use in cloud seeding but the research gathered pace only during World War II.
2. World Meteorological Organization, WMO, Expert Committee on Weather Modification Research report 2013-2016
3. WMO Expert Committee on Weather Modification Research, 2016
4. Convention on the Prohibition of Military or Any Other Hostile Use of Environmental Modification Techniques, 1977
5. United Nations General Assembly Resolution on the "Permanent Sovereignty over Natural Resources." 1962
6. sic utere tuo ut alienum non laedas principle (use your own property in such a way that you do not injure other people's)
7. Corfu Channel, United Kingdom v Albania, Judgment, Compensation, (1949) ICJ Rep 244; Trail Smelter case, (United States v. Canada) (1938 and 1941) 3 R.I.A.A. 1905; The Gabčíkovo-Nagymaros Project case, Hungary v. Slovakia, ICJ Rep. (1997); UNECE Convention on Long-range Transboundary Air Pollution (CLRTAP)1979 ; Convention on the Protection and Use of Transboundary Watercourses and International Lakes (UNECE Water Convention).
8. Bhatt, "Some Reflections on International Law and Relations involving weather Modification Activities, Including Some Special Features Relating to India, Journal of the Indian Law Institute, Vol. 15, No. 2 (APRIL-JUNE 1973), pp. 253-272.
9. Reason is the interconnection or interdependence between earth's system i.e. oceanic, geological, biological (includes human activities) and atmospheric. All affect the climate system and exert influence on each other.
10. Pennsylvania Natural Weather Assoc. v Blue Ridge Weather Modification Assoc. (C. P. Fulton city. 1968). The court said, "Every landowner has a property right in the clouds and the water in them." (at 759-760)
11. The only case found where plaintiffs succeeded against "rain makers" was a,

Southwest Weather Research, Inc. v Jones (Sup. Ct. Tex. 1959) in which certain ranchers obtained a preliminary injunction against a hail suppression project over neighboring lands by asserting that the rainfall on their own lands would also be suppressed
12. Harris, "Law and Technological Change: The Case of Weather Modification," Yale Review of Law and Social Action: Vol. 3: Issue. 1, Article 3. 1973, Pg. 13
13. In Vietnam War 1967-1972, USA used cloud seeding to enhance and expand monsoon season in Vietnam to delay the truck traffic carrying military supplies and gain an advantage in warfare; see "Rainmaking used as a Weapon in SE Asia". Daytona Beach Morning Journal. Daytona Beach, Florida. New York Times News Service. May 19, 1974
14. "Weather as a Force Multiplier: Owning the Weather in 2025" US Air Force document AF 2025 Final Report (1996), it "offers the war fighter a wide range of possible options to defeat or coerce an adversary", capabilities extend to the triggering of floods, hurricanes, droughts, and earthquakes."
15. Convention on the Prohibition of Military or any other Hostile Use of Environmental Modification' (ENMOD) (Geneva: 18 May 1977, Entered into force: 5 October 1978)
16. The United Nations Treaty Collection, available at: https://treaties.un.org/pages/ViewDetails.aspx?src=TREATY&mtdsg_no=XXVI-1&chapter=26&lang=en (visited on 30th March 2019)
17. The Convention on Biological Diversity, 29th December 1993; The tenth meeting of the Conference of the Parties to the Convention on Biological Diversity (CBD) adopted decision X/33 which includes a section on climate-related geo engineering and its impacts on the achievement of the objectives of the convention. It allows small scale scientific research studies but prohibits the climate-related geo engineering activities that may affect biodiversity.
18. World Health Organization, Concise International Chemical Assessment Document on Silver and Silver Compounds: Environmental Aspects, Geneva, 2002.
19. Cooper and Jolly, "Ecological Effects of Weather Modification: A Problem Analysis", Univ. of Michigan, School of Natural Resources,1969, p. 8.
20. Weiner "Towards a New International Law of the Atmosphere? "Gottingen Journal of international law 7 (2016) 2, pg.195-223
21. Supra note 3
22. see Koshy, "Clouds over Maharashtra will have a silver iodide lining" The Hindu, February 16, 2017; Government Uttar Pradesh too with IIT Kanpur, have undertaken artificial rain experiment, to tackle pollution in the state.
23. Environment (Protection) Act, 1986 ss. 3, 6, 25
24. (1996) 5 SCC 647
25. ibid
26. Oppenheimer, "Legal Aspects of Weather Modification," 1958 Ins. L. J.1958, p 314,

Cite this Article
Keerty Dabbas, Kritika Jain. Artificial Weather Modification: "A need for Precautionary Approach and Regulation". *National Journal of Environmental Law*. 2020; 3(2): 1–5p.

