

GEOENGINEERING

AND WEATHER MODIFICATION PROGRAMS

ENVIRONMENTAL PROTECTION OR ENVIRONMENTAL WARFARE?

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The aim of this research paper is to outline the scope of geoengineering and weather modification programs in contemporary world, especially in terms of: 1) their role in environmental protection, specifically in mitigating the negative impact of global warming and 2) their potential usage as means of environmental warfare.

The main questions set before this study mind the actual viability of weather modification and geoengineering, the application and development of activity in the two above mentioned areas and the verification of concerns raised over these programs.

The paper starts by clarifying key points concerning the definition of geoengineering and weather modification programs, addresses their background origin traced back to the 1940s and develops further by introducing the debate on the usage of such programs for countering global warming, finally overviewing the potential usage of these programs for warfare purposes.

The interest and importance of the topic is based on the growing worldwide environmental and security-related concerns over further deployment of geoengineering and weather modification technologies, especially considering that they mostly occur beyond wider scientific and public approach. The nature of geoengineering and weather modification practices is largely unknown to the general public, despite many countries already having programs aimed at developing and conducting some more simple forms of manipulating weather patterns.

Within the frame of the paper, its concluding part offers the findings reached and points out other possible emerging questions and considerations for future research.

Definition and concept

Questions regarding geoengineering, also known as climate engineering, start with the definition of the concept itself, which has been re-shaped, particularly recently, as will be seen hereinafter.

The Encyclopaedia Britannica explains geoengineering as “the large-scale manipulation of a specific process central to controlling Earth’s climate for the purpose of obtaining a specific benefit”.¹

Climate stands for the state of the atmosphere during a longer period of time and weather corresponds to the conditions of the atmosphere in a short period of time (temperature, humidity, precipitation, wind, air pressure, etc.), therefore, weather conditions are parts of the climate – its short-term component.

¹ Boyd, Philip “Geoengineering – Earth science” *Encyclopaedia Britannica*, Last updated on 14-12-2014, retrieved on 5 April 2015 from <http://www.britannica.com/EBchecked/topic/1527153/geoengineering>.



Weather modification stands for “the deliberate or the inadvertent alternation of atmospheric conditions by human activity, sufficient to modify the weather on local or regional scales”.²

Latu sensu geoengineering/climate engineering can be understood as a deliberate intervention (engineering) to change weather conditions affecting the natural dynamics of the planet and consequently the climate on a long term. Weather modification programs, on the other hand, stand for a “lighter” type of engineering not aiming to directly affect the climate as a whole but rather specific weather patterns (rain, hail) in a given region/area.

When it comes to goals, it has been argued that the main objective of geoengineering today is to counter the global warming effect by “cooling down the Earth”. Geoengineering also has recently been defined as the means to reduce global warming – by cooling the earth through radiation balance.³ The question whether geoengineering can be or cannot be considered as a means of reducing global warming is quite controversial; I will further explain this issue in this paper.

As regards weather modification programs, these cannot be considered as synonyms of countering global warming, since the latter one only became a hot topic decades after the first scientific weather modification experiments started. Also, the term *global warming* was used in 1975 the first time in a natural sciences article written by Wallace Broecker⁴ (it was priorly named “inadvertent climate modification” which indicates that weather modification programs were not created to reduce global warming but for other purposes which can be related, for example, to agriculture – such as protection of crops).

Still, within the aim of clarifying definitions, global warming refers to the change (increase) in air temperature near the Earth’s surface, which affects the climate,⁵ while climate change means changes induced in the climate due to transformations in the atmosphere,⁶ namely due to the carbon dioxide increase.

² Battan, J.Louis “Weather Modification” *Encyclopaedia Britannica*, Retrieved on 22 April 2015 from <http://www.britannica.com/EBchecked/topic/638346/weather-modification>.

³ Long, Loy, Morgan (2015) Start Research on Climate Engineering *Nature International weekly Journal of Science* Volume 518, Issue 7537, available online at <http://www.nature.com/news/policy-start-research-on-climate-engineering-1.16826>.

⁴Information obtained from: Conway, Eric – What’s in a Name? Global Warming Vs. Climate Change *NASA Website*, published on 12-5-2008, retrieved on 07/04/2015 from http://www.nasa.gov/topics/earth/features/climate_by_any_other_name.html. The article of Wallace Broecker: Broecker, Wallace, S (1975)– Climatic Change: Are we on the brink of a pronounced Global Warming? American Association for the Advancement of Science. Science, New Series, Vol. 189, No. 4201 pp. 460-463. Retrieved online on 22 April 2015 from <http://blogs.ei.columbia.edu/files/2009/10/broeckerglobalwarming75.pdf>.

⁵ Mann, E. Michael “Global Warming” *Encyclopaedia Britannica*, Last updated on 04-02-2015, retrieved 30 March 2015 from <http://www.britannica.com/EBchecked/topic/235402/global-warming>.

⁶ Jackson, T. Stefan – “Climate Change” *Encyclopaedia Britannica*, Last updated on 27-06-2013, retrieved on 6 April 2015 from <http://www.britannica.com/EBchecked/topic/121632/climate-change>.

The origin of scientific weather modification programs

The origin of the idea of manipulating the weather is quite old when it comes to the agricultural point of view, however, the modernity of scientific weather modification programs can be said to have started in the 1940s with scientists Vincent J. Schaefer and Irving Langmuir dropping crushed pellets of dry ice from an airplane originating precipitation.⁷ Scientist Bernard Vonnegut further demonstrated it in the late 1940s that silver iodide could be used for the same purpose.⁸ These experiments marked the beginning of cloud seeding experiments, which, as seen, involve dispersing chemicals – typically silver iodide or dry ice from airplanes into clouds allowing for precipitation enhancement.

Furthermore, several other experiments were attempted namely what became known as the Cirrus Project in 1947, in which the US Army, US Air Force and General Electrics aspired to modify a hurricane which allegedly changed route and ended up in Savannah, Georgia.⁹ Cyclones have been seeded with silver iodide in an attempt to weaken them by North-American scientists in the scope of *Project Stormfury*, which was discontinued in 1983 due to not being fully conclusive or successful.¹⁰

In 2008, weather modification took place at the opening ceremony of the Beijing Olympic Games, for which, according to MIT Technology Review, clouds were sprayed with silver iodide and dry ice before reaching Beijing, so that it rained even before it reached the city.¹¹ Also, China has used cloud seeding to obtain clear skies for particularly important national days such as the National Day Parade in China at Tiananmen Square, where over 400 rockets were fired in 2009 to ensure good weather for the event¹².

Russia has also seeded clouds several times for major celebrations, again, to obtain clear blue skies effect.¹³ Apparently, these activities might also have their own risks: according to Reuters, in 2008, one of the 12 Russian Air Force planes carrying silver

⁷ Battan, J.Louis “Weather Modification” Encyclopaedia Britannica, Retrieved on 22 April 2015 from <http://www.britannica.com/EBchecked/topic/638346/weather-modification>.

⁸ Ahrens, Donald C and Henson, Robert (2013) *Meteorology Today – an Introduction to Weather, Climate and the Environment* p. 117. Brooks/Cole, Cengage Learning, Boston, USA

⁹ Fitzpatrick, Patrick, J (2006) *Hurricanes: A reference handbook*. 2nd edition. Pp.123. ABC CLIO. Santa Barbara, California, USA.

¹⁰ Battan, J.Louis “Weather modification” *Encyclopaedia Britannica*, last updated on 19-02-2014, retrieved 07 April 2015 from <http://www.britannica.com/EBchecked/topic/638346/weather-modification>.

¹¹ Williams, Mark “Weather Engineering in China- How the Chinese plan to modify the weather in Beijing during the Olympics, using supercomputers and artillery”. MIT Technology Review 25-03-2009. Retrieved online on 22 April 2015 from <http://www.technologyreview.com/news/409794/weather-engineering-in-china/>.

¹² Watts, Jonatan “China’s Weather Modification Works Like Magic – Beijing transformed by clear blue skies after massive cloud seeding operation” The Guardian 01/10/2009. The Guardian News and Media Limited. Retrieved online on 5 April 2015 from <http://www.theguardian.com/environment/blog/2009/oct/01/china-cloud-seeding-parade>. and “Largest Cloud seeding effort to prevent rainfall on parade” Window of China 01-10-2009. Xinhua News Agency. Retrieved on 30 March 2015 from http://news.xinhuanet.com/english/2009-10/01/content_12139802.htm.

¹³ Moskvitch, Katya “Russia Appeal of Weather Control” *BBC NEWS* 26-03-2010. Retrieved on 25 March 2015 from <http://news.bbc.co.uk/2/hi/science/nature/8587725.stm>.

iodide, liquid nitrogen and cement powder to seed clouds for the Russian National Day, did not completely release their content (namely cement powder), pulverized in the air, having the non-pulverized cement fallen on a house, causing damage in it.¹⁴

Besides, the official military usage of this technology, there are also some private companies both in the United States and Russia working on weather medication: namely, Weather Modification Inc., in the U.S.A,¹⁵ as well as Russian companies which are allegedly hired for special celebrations such as weddings in order to ensure the desired good weather for the event.¹⁶

Can geoengineering be used to counter global warming? Environmental considerations

As mentioned previously, groups of researchers such as David Keith has nowadays considered geoengineering as a mean to reduce global warming.¹⁷ Unlike him, other scientists oppose the usage of geoengineering to fight global warming, explaining that it can have worse effects on destabilizing the environment than on protecting it and that it is not certain that climate manipulation can actually help counter the problem. To be more accurate, scientist Mike Hulme is against the usage of weather technology for reducing global warming which he explains in detail in his book, entitled “Can Science fix climate change? It is a case against climate engineering, in which he states that technology and science are not the solution in this case and that these should serve more pragmatic goals such as improving air quality or achieving energy technology transition.¹⁸

Nature scientific journal – highly regarded and cited in the field of natural sciences. In its article entitled *Policy*, it calls out to *start research on Climate engineering* as very little is known about the effectiveness of geoengineering and about its consequences, stating that “One country's interventions will affect others and could distract from climate-change mitigation efforts, and there is no international mechanism for regulating such deployments,”¹⁹ which seems like a clear problem to everyone concerned with the environment and the environmental impacts of geoengineering.

¹⁴ “In Russia sometimes it rains cement” REUTERS 17-06-2008. Thomson Reuters. Retrieved on 28 March 2015 from <http://www.reuters.com/article/2008/06/17/us-russia-weather-idUSL1760049120080617?feedType=RSS&feedName=topNews&rpc=22&sp=true>.

¹⁵ “Company Overview of Weather Modification, Inc” Bloomberg Business. Bloomberg LP. Retrieved on April 7 2015 from <http://www.bloomberg.com/research/stocks/private/snapshot.asp?privcapId=6837140>.

¹⁶ Moskvitch, Katya “Russia Appeal of Weather Control” *BBC NEWS* 26-03-2010. Retrieved on 25 March 2015 from <http://news.bbc.co.uk/2/hi/science/nature/8587725.stm>.

¹⁷ Interview by John Grolle. “Cheap but imperfect: Can Geoengineering slow climate change?”. Spiegel Online International 20-11-2013. SPIEGEL. Retrieved on 15 March 2015 from <http://www.spiegel.de/international/world/scientist-david-keith-on-slowing-global-warming-with-geoengineering-a-934359.html>.

¹⁸ Hulme, Mike (2014) – “Can Science fix climate change?: A case against climate engineering”. Polity Press, USA.

¹⁹ Long, Loy, Morgan (2015) Start Research on Climate Engineering *Nature International weekly Journal of Science* Volume 518, Issue 7537, available online at <http://www.nature.com/news/policy-start-research-on-climate-engineering-1.16826>.

On the other hand, considering geoengineering as indispensable, statements from the *Intergovernmental Panel on Climate Change* in 2013 affirm that even if green-house emissions would substantially be reduced, geoengineering would still be needed and required as regards the reduction of carbon-dioxide in the atmosphere – by injecting reflective particles into the stratosphere to control global temperatures and preserve the ecosystems.²⁰

Regarding the topic of countering climate change and global warming, it is worth noting that according to the United Nations and FAO's reports from 2006, the leading cause of climate change and global warming is livestock raising, producing more greenhouse gas than the whole transportation sector worldwide.²¹ It could also be countered in a more simple form, by globally reducing animal product consumption and production, which has, however, been largely ignored.²²

Returning to the main focus of this paper, the previously mentioned article from *Nature* defends that controlled climate engineering/geoengineering research should commence now, (2015) since it might take scientists decades to gain a solid understanding of these subjects. According to the article, proposals on these matters should respect the considerations of value, risk, transparency, vested interest and legal considerations.

On the other hand, in 2010, The World Meteorological Organization (WMO) stated in Documents on Weather Modification that “since the 1980's there has been a decline in support for weather modification research, and a tendency to move directly into operational projects”.²³ The same organization claimed in 2010 that there were “dozens of nations operating hundreds of weather modification projects, particularly in arid and semi-arid regions all over the world”.²⁴ These projects, however, do not directly seem to be, at least in the majority of the cases, oriented towards climate modification on a long term, having rather short term goals as precipitation enhancement or suppression, hail suppression, fog dispersal or others.

²⁰ Long, Loy, Morgan (2015) Start Research on Climate Engineering *Nature International weekly Journal of Science* Volume 518, Issue 7537, available online at <http://www.nature.com/news/policy-start-research-on-climate-engineering-1.16826>.

²¹ “Rearing cattle produces more greenhouse then driving cars, UN report warns” *UN News Centre*. United Nations News Centre 26-11-2006. Retrieved on the 22 March 2015 from <http://www.un.org/apps/news/story.asp?newsID=20772#.VSjjYckXLw0> ; Castel, Gerbe ,Haan, Rosales, Steinfeld and Wassenaar – Livestock's Long Shadow: Environmental Issues and Options Rome, Italy: FAO 2004

²² See – *Conspiracy: The Sustainability Secret* – Dir. Kip Anderson and Keegan Kuhn. 2014. Documentary

²³ *Documents on Weather Modification*. World Meteorological Organization, 2010,pp. 3. Retrieved on 3 March 2015 from http://www.wmo.int/pages/prog/arep/wwrp/new/documents/WMR_documents.final_27_April_1.FINAL.pdf.

²⁴ Documents on Weather Modification. World Meteorological Organization, 2010,pp. 4. Retrieved on 3 March 2015 from http://www.wmo.int/pages/prog/arep/wwrp/new/documents/WMR_documents.final_27_April_1.FINAL.pdf.

In 2013, a catalogue of countries being active in weather modification activities was presented by the WMO, showing the source and the type of engagement of each of these countries – the list of 42 countries and activities can be seen in a footnote.²⁵

According to the same report of the WMO the countries which, in 2013, invested the most in weather modification programs (both operational and research programs) were China, followed by USA, Thailand and India.²⁶

As previously presented, these weather modification projects mentioned by the WMO are not aimed at resolving the global warming issue (as the climate research mentioned in Nature) and are not perceived as “large scale” interventions. However, it is also urgent to research on their environmental impact, since they are carried out to obtain more favourable weather conditions in a certain country/region by selectively changing weather patterns.

Weather modification programs as a potential means of environmental warfare

Besides the environmental considerations, it is also important to analyse the threat to international security deriving from the possible usage of geoengineering or weather manipulation programs as tactic means.

Since the early stages of the development of weather modification programs in the 1960s, some scientists highlighted their potential dangers and their possible usage as weapons. To be exact, geophysicist and member of President Johnson’s Science Advisory Committee, Dr. Gordon J.F. MacDonald predicted *the development of technologies that will use the planet as a weapon* and that these would fully be developed in the XXI century.²⁷

Between 1967 and 1972, the *Operation Popeye* took place in Vietnam, Laos and Cambodia. In this operation the US military caused torrential downpours and droughts by cloud-seeding that constrained troop movements in their favour by blocking enemy routes. This information was later verified by the disclosure of *The Pentagon Papers* and by investigative journalist, Jack Anderson.²⁸ The weather was in fact manipulated for military purposes in South East Asia already back in the 1970s.

In 1972, the US renounced the use of climate modification techniques for hostile purposes and in 1973, the Senate passed a resolution calling for an international agreement a base to start negotiations with the Soviet Union on this topic. In 1974, both parties agreed to hold bilateral discussions, coming up with draft texts in 1975 at the Conference for the Committee on Disarmament, which would set the foundations

²⁵Bruintjes, Roelof (Chairman) and Expert Team, Report from Expert Team on Weather Modification Research for 2012/2013 pp. 2-6. Geneva, Switzerland, WMO (2013) CAS/WWRP/JSC6/Doc 3.6

²⁶ Page 5 of *Report from expert team on weather modification research for 2012/2013*, Retrieved on 3 March 2015 from http://www.wmo.int/pages/prog/arep/wwrp/new/documents/Doc_3_6_weather_mod_2013_Final_tn.pdf

²⁷ Gordon J. F. MacDonald (1968) *How to Wreck the Environment* – Ed. Calder, Nigel (1968) *Unless Peace Comes, a Scientific Forecast of New Weapons*. New York, USA, Viking Press.

²⁸ *The Encyclopedia of the Vietnam War – a Political, Social and military history*, “ pp. 921. Oxford. Oxford University Press, 2nd Edition 2011.

for the text of the *Convention on the Prohibition of Military or Any Other Hostile Use of Environmental Modification Techniques* (also called ENMOD Convention) adopted by the UNGA in its resolution 31/72 of 10 December 1976 and opened for signature and ratification from 1977.²⁹

The Convention entered into force in 1978 and specifies that it shall have an unlimited duration.³⁰ From the five permanent members of the United Nations Security Council – the main organ responsible for ensuring international peace and security³¹ – the USA, the Soviet Union (today Russia,) the Peoples Republic of China and the United Kingdom ratified the treaty, while France did not sign or ratify it. A further view on the ratifying States can be found above.³²

Following the Vietnam War, the two Cold War superpowers (the US and the Soviet Union) were said to have turned to a different type of cold war – competing in being able to manipulate ionosphere and magnetosphere through electro pulses.³³ Particular breakthrough was made by both sides in conducting experiments with Very Low Frequency (VLF) and Extremely Low Frequency (ELF) radio waves. ELF transmitters were used to manipulate ionosphere –action performed in a certain place leading to altering the weather below. Once emitted, the VLF or ELF waves leave an incision in the ionosphere upon impact. These signals cause streams of particles to fall down far away from the transmitter in the outermost regions of the atmosphere with only a minor loss of signal, thus affecting the motion of free electrons and leading to electronic rain that alters weather patterns.³⁴ Although the USSR was initially far more advanced in the field of ELF transmitters, with the collapse of the state many projects were abandoned and the USA remained in the lead as regards this research.³⁵

In 1995, the HAARP (High Frequency Active Auroral Research Program) project was introduced as a scientific and academic program aimed at researching properties of

²⁹ Convention on the Prohibition of Military or Any Other Hostile Use of Environmental Modification Techniques (ENMOD). United Nations Office at Geneva. UNOG. Retrieved on 22 April 2015 from <http://www.unog.ch/enmod>.

³⁰ See Article VI of the ENMOD Convention – Convention on the prohibition of military and other hostile use of environmental modification techniques. New York 10, December 1976. United Nations, Treaty Series, vol. 1108, p. 151 and depositary notification C.N.263.1978. Retrieved online on 2 April 2015 from https://treaties.un.org/Pages/ViewDetails.aspx?src=IND&mtdsg_no=XXVI-1&chapter=26&lang=en

³¹ See Article 23 of the Charter of the United Nations.

³² *Convention on the prohibition of military and other hostile use of environmental modification techniques*. New York 10, December 1976. United Nations, Treaty Series, vol. 1108, p. 151 and depositary notification C.N.263.1978. Retrieved online on 2 April 2015 from https://treaties.un.org/Pages/ViewDetails.aspx?src=IND&mtdsg_no=XXVI-1&chapter=26&lang=en.

³³ Belford Group Citizens in Action (2010) "Case Orange – Contrail Science, Its impact on Climate and Weather Manipulation Conducted by the United States and its allies" Compiled by the Belford Group, Evergem Belgium, page 50.

³⁴ Belford Group Citizens in Action (2010) "Case Orange – Contrail Science, Its impact on Climate and Weather Manipulation Conducted by the United States and its allies" Compiled by the Belford Group, Evergem Belgium, page 52.

³⁵ Belford Group Citizens in Action (2010) "Case Orange – Contrail Science, Its impact on Climate and Weather Manipulation Conducted by the United States and its allies" Compiled by the Belford Group, Evergem Belgium, page 51

Aurora Borealis (Northern Light) and manipulating it to enhance communication and surveillance systems both for civilian and defence purposes. However, some scientists considered it controversial such as Rosalie Bertell who, for example, expressed concerns several times in the 1990s and 2000s regarding that scientists were continuing to work on weather modification systems as potential weapons. In 1996 she stated that “It would be rash to assume that HAARP is an isolated experiment which would not be expanded. It is related to fifty years of intensive and increasingly destructive programs to understand and control the upper atmosphere. It would be rash not to associate HAARP with the space laboratory construction which is separately being planned by the United States. HAARP is an integral part of a long history of space research and development of a deliberate military nature”.³⁶

The HAARP website seems to have been shut down and access to it is currently not available for further information.

According to Professor Michel Chossudovsky, at the moment, the US has such advanced capacities that it can selectively alter weather patterns. This technology has been worked on by HAARP – *High Frequency Active Auroral Research Program*, which can operate from the outer atmosphere and destabilize agriculture and ecosystems around the world, being therefore considered by Michel Chossudovsky as a weapon of mass destruction.³⁷

Besides HAARP’s main facilities in Alaska (which are said to be currently closed), it has been claimed that its activities are spread in different parts of the world within several other smaller weather modification facilities, not only within the US but also in several other countries.³⁸

In 2002, members of the Russian general assembly, the so-called *Duma* expressed concerns about HAARP as new type of weapon and demanded a ban on these experiments. This appeal was said to have been sent to Vladimir Putin, to the UN, as well as to parliaments and leaders of UN countries.³⁹

Regarding other forms of using weather modification as a weapon, it is essential to mention a report of the *Air University*, which is the intellectual and leadership centre of the North-American air force and provides an accredited military educational system. One of the chapters of this report conducted in 1995-96 for the Air Force Chief of Staff – “*Weather of a Force Multiplier: owning the weather in 2015*” – gives evidence of intentions of manipulation of weather against “enemies” and to “enhance friendly forces”. It goes on stating that “In the United States, weather-modification will likely

³⁶ Betrell, Rosalie. *Background of the HAARP project*. EarthPulse.com. 2005-2015 Earth Pulse Press. Retrieved on April 11 2015 from <http://www.earthpulse.com/src/subcategory.asp?catid=1&subcatid=1>.

³⁷ Chossudovsky, Michael. *The Ultimate Weapon of Mass Destruction: Owning the Weather for Military Use. Global Research*. GlobalResearch.ca. 27 September 2004. Retrieved on 3 April 2015 from <http://www.globalresearch.ca/the-ultimate-weapon-of-mass-destruction-owning-the-weather-for-military-use-2/5306386>.

³⁸ *HAARP Coordinates and Explanation*. Geoengineering Watch. 2015 Geoengineering Watch. 3 December 2012. Retrieved on 17 March 2015 from <http://www.geoengineeringwatch.org/haarp-coordinates-and-explanation/#more-7388>.

³⁹ *Russian Parliament concerned about US plans to develop new Weapon*. Moscow Interfax 2002. Document Number: FBIS-SOV-2002-0808. Retrieved on 10 April 2015 from <http://fas.org/irp/program/collect/haarp-duma.htm>. and Smith, Jerry E (2006) *Weather Warfare: The Military’s Plan to Draft Mother Nature*. Pp.188. Adventures Unlimited Press. Illinois, U.S.A.

become a part of national security policy with both domestic and international applications. Our government will pursue such a policy, depending on its interests, at various levels. These levels could include unilateral actions, participation in a security framework such as NATO, membership in an international organization such as the UN, or participation in a coalition. Assuming that in 2025 our national security strategy includes weather-modification, its use in our national military strategy will naturally follow. Besides the significant benefits an operational capability would provide, another motivation to pursue weather-modification is to deter and counter potential adversaries.”⁴⁰

The disclaimer prior to the report sustains that the statements contained in it are of responsibility of its authors. However, the fact that this report is elaborated for the above-mentioned purpose, as well as its contents already show evidence of the type of policies, ideals and existence of weather manipulation structures for military purposes in the US.

In 1997, US Secretary of Defence William S. Cohen stated that some states “are engaging... in an eco-type of terrorism whereby they can alter the climate, set off earthquakes, volcanoes remotely through the use of electromagnetic waves”,⁴¹ alerting for the possibility that certain other states might use weather manipulation programs for their private purposes, in a conference on terrorism, weapons of mass destruction and U.S. Strategy.

In 2010, the Russian Navy (Russian Northern Fleet) released a report claiming that a test carried out by the US Navy created the earthquake in Haiti. The same report mentions that there is a plan to destroy Iran through successive earthquakes. These systems being tested by the HAARP could also allegedly create floods, droughts and hurricanes.⁴² Other claims come namely from Mahmoud Ahmadinejad, President of Iran, who has publicly stated that *Western countries have designed plans to cause drought in certain areas of the world, including Iran*”.⁴³ However, as no clear proofs are officially presented, these statements remain public accusations between states.

In an interview by Spiegel in 2013, the renowned scientist David Keith, who favours geoengineering research to counter global warming, explains its benefits and dangers mentioning his strong opposition to the usage of geoengineering technology for

⁴⁰ Celentano, House, Husband, Mercer, Pug, Shields. Weather as a force multiplier: Owning the Weather in 2025. A Research Paper Presented to Air Force 2015. August 1996. Retrieved online on the 3 March 2015 from <http://csat.au.af.mil/2025/volume3/vol3ch15.pdf>.

⁴¹ News Transcript, Press Operations. DoD News Briefing: Secretary of Defense William S. Cohen. 28 of April 1997. US Department of Defense. Retrieved on 3 April 2015 from <http://www.defense.gov/transcripts/transcript.aspx?transcriptid=674>

⁴² “Haiti: The U.S created the earthquake in Haiti? Pravda.ru 24-01-2011. PRAVDA.RU. Retrieved on 29 March 2015 from Haiti – ‘The US created earthquake in Haiti?’ (2010) Pravda Newspaper online, available at: http://english.pravda.ru/science/tech/24-01-2010/111809-russia_says_us_created_earthqua-0/.

⁴³ Henderson, Barney. Mahmoud Ahmadinejad says Europe 'stealing Iran's rain'. The Telegraph 21-05-2011. Telegraph Media Group Limited. Retrieved online on 23 March 2015 from <http://www.telegraph.co.uk/news/worldnews/middleeast/iran/8527455/Mahmoud-Ahmadinejad-says-Europe-stealing-Irans-rain.html>

military purposes but recognizing that the more “tailored” the technology gets, the stronger and more serious chances will be of its usage for military purposes.⁴⁴

Conclusion

As regards geoengineering as a tool of environmental protection in the fight against global warming, it seems possible to scientifically debate whether these programs can actually help mitigating its effects, although it should be taken into account that there are other ways of trying to reduce global warming and climate change, moreover, further research is needed to fully understand its potential in these terms.

As for environmental warfare, however, it is difficult to accurately real-time track the use of weather modification weapons, given the fact that its dimensions and proofs are relatively scarce and evidence is difficult to obtain, environmental warfare does not seem unconceivable. If it is certain and proven that weather modification was already used for warfare purposes back in the 1970s and that since then technology has been in continuous development, weather modification programs for warfare purposes should be at least a subject to attentively consider and to carry out further research on.

Weather modification processes are essential to address and to take into account since they can be a threat to both international peace and security and to the environment.

Moreover, incentivising the UN member states which did not sign the Convention of 1976 on the *Prohibition of the Military or any other Hostile Use of Environmental Modification Techniques* to do so is important, as well as taking action in a preventive way, to avoid the future misuse of environmental techniques in contemporary and modern conflicts.

Just as with nuclear proliferation, weather modification experiments and geoengineering shall be internationally debated and regulated before experiments reach an uncontrollable level and cause irreversible negative consequences to humans and to the environment.

Research and operational projects shall be closely observed, framed and regulated within international global governance forums, rather than only on a national level without international accountability.

⁴⁴ Interview by John Grolle. “Cheap but imperfect: Can Geoengineering slow climate change?”. Spiegel Online International 20-11-2013. SPIEGEL. Retrieved on 15 March 2015 from <http://www.spiegel.de/international/world/scientist-david-keith-on-slowing-global-warming-with-geoengineering-a-934359.html>.

