Deadly Diseases and the Collective Adoption of International Environmental Agreements

Transboundary pollution problems cause different deadly diseases such as cancers, heart, and lung diseases.[1] Although states are mandated to be cautious of such health implications, it is not emphasised enough whether health influences states to adopt environmental laws in the Global Environmental Politics (GEP) literature.[2] Therefore, to help fill in the gap in the GEP literature, this research examines the correlation between diseases caused by transboundary pollution and the timeliness at which states collectively adopted six transboundary pollution laws.

This research agenda is especially important because, by regulating transboundary pollution, environmental laws improve health protection. Also, moving forward, environmental laws will become even more important for curbing the exacerbation of deadly diseases caused by severe climate changes.[3] Moreover, in the Global Health Politics (GHP) literature, deadly diseases caused by tobacco pollution motivated states to adopt international health laws.[4] Consequently, it is theoretically argued in this research that deadly disease influence states to regulate transboundary pollution and therefore, can affect the timeliness of adopting environment laws. It is hypothesised that *the greater the deadly disease(s) caused by transboundary pollution; states are more likely to collectively adopt environmental law.*

Three case studies are used to test the hypothesis. Each case study is a comparison of a pair of two environmental laws that each regulate different air, marine, and land transboundary pollution problems, some of which, cause more deadly diseases. Studying multiple cases is important if we are to understand whether the influence of deadly disease on law adoption time is generalizable or not. Nonetheless, in sum, the findings for all the case studies provide support for the hypothesis, therefore demonstrating a relationship between diseases caused by transboundary pollution and the adoption time of environmental laws.

However, before proceeding to the case studies, the next section is a concise review of relevant GEP and GHP literatures that build up to the theoretical argument and hypothesis. The remainder of the research expounds on the methodology and data limitations, the findings and case studies, and finally, the conclusion, which includes suggestions and implications for future research and policy.

Factors that Influence Collective Action in Global Environmental Politics

Although transboundary pollution problems have since the 1960s been major sources of diseases, it was not until 2017 that the Environment Assembly (EA) reached a collective resolution on the strong linkage between environment and health, and the need to address both issues jointly.[5] This includes using health as a precautionary approach for addressing transboundary pollution and taking into consideration the health benefits. Others include facilitating regular scientific exchange between the environment and health epistemic communities as well as increasing collaboration between the UNEP and World Health Organization (WHO) to avoid duplication and improve effectiveness alongside relevant UN stakeholders, secretariats, institutions, and organizations like the World Meteorological Organization (WMO), and the Food and Agriculture Organization (FAO) etc.

The EA, which is the highest decision-making body of the United Nations Environment Programme (UNEP), has near universal state membership (i.e., 193 states) and is responsible for 'setting the agenda' on transboundary environmental issues.[6] The UNEP was created by the United Nations (UN) at the 1972 Stockholm Conference on the Human Environment to directly govern and spearhead the creation of international environmental laws, thus situating the UN at the centre of environmental.[7] However, on the EA's environmental agenda, the subject of health compared to other matters such as Sustainable Development remains marginalised.[8] Moreover, states are not obligated by the EA to address

the health consequences of transboundary pollution because the EA's resolution only encourages precaution.

Even in the GEP literature, it is generally unknown whether diseases caused by transboundary pollution influence states to collectively adopt environmental laws. Instead, in the literature, structural, environmental, and institutional factors as well as political and economic differences are among the key factors that influence collective action.[9] It is nonetheless important to mention that there are other factors that affect the timeliness of adopting environmental laws, which include security issue-linkage, global civil society, state political system and membership in regional organizations etc., but they are not reviewed here due to limited space. The GEP literature has a lot to say about how these other factors influence how states respond to international laws under different conditions.[10]

Structurally, the UNEP, for instance, is not a world government and is neither an autonomous independent organization with its own financial, legal, and administrative resources.[11] Even the UNEP's parent organization the UN is also not a world government with overarching authority and jurisdiction above all political entities including states.[12] States are the primary actors involved in making laws, thus making them the supreme decision-making body of each environmental law. This is why the UNEP is rather dependent on the state-led EA and is unable to enforce state participation.[13] Therefore, also, because there is no world government above state actors to control their behaviour and coerce cooperation, states have less incentive to collectively adopt environmental laws.[14]

Another structural disadvantage of the UNEP where it pertains to collective action is the UN's framework convention-protocol process of making laws, which is critiqued for its decentralised state led governance design. The UN framework convention-protocol process is a lengthy law-making process because states anticipate cooperation to continue into the future and therefore, usurp and stall the process by bargaining harder and for longer so that joint

decision-making reflects their closest preference.[15] Hence, the process of environmental law-making within the UN often leads to collective action problems. The process of environmental law-making is for instance often an area of contested irreconcilable preferences, decision-making power struggles, and disputes over the distribution of responsibilities, costs, and benefits of joint arrangements, which overall disrupts the law-making process.[16]

More generally, due to the UN's framework convention-protocol process of making laws, the UNEP like most UN organizations and programmes is said to merely function like an intergovernmental forum for states to negotiate environmental laws.[17] Hence why some scholars have advocated for a more centrally coordinated and hierarchical governance system, which they argue can be achieved by upgrading not just the UN but the entire UNEP to a world environmental organization with enhanced oversight on all environmental laws, and with its own financial, legal, and administrative resources.[18]

Furthermore, environmental problems in comparison to other issue areas pose additional collective action challenges for cooperation. Firstly, most environmental problems, for instance, stem from the fact that the shared environment is a non-excludable public good that is open to be utilized by a large number of rationally self-interested actors that live within and across multiple states.[19] Therefore, in the absence of an overarching world government, it is difficult to restrict self-interested states from benefiting from the provision of a public environmental good via collective action even when they free-ride.

Moreover, states are more likely to collectively adopt environmental laws when there is scientific certainty that the environmental impact and scope of a transboundary pollution problem is immediate and great.[20] Otherwise, states tend to negotiate harder and for longer, therefore delaying the adoption of environmental laws as they await further scientific

understanding.[21] Moreover, scientific uncertainty makes it more challenging and costly for states to identify and develop solutions to address transboundary pollution problems.[22]

Correspondingly, because of the way states respond to the environmental impacts of transboundary pollution, it is possible to infer that they will respond likewise to the health impacts of transboundary pollution particularly when there is scientific certainty that transboundary pollution causes deadly diseases.[23] Therefore, states, as theoretically argued in the next section, should be more likely to adopt environmental laws when there is scientific certainty that transboundary pollution problems cause deadly diseases.

Nonetheless, still on environmental factors, the likelihood of states adopting environmental laws further decreases when the environmental impact of transboundary pollution is unevenly distributed among multiple diverse states.[24] This is because states that are least affected, compared to those greatly affected, are likely to have differing priorities, cost, and preferences, among other differences, that cause deadlock and freeriding.[25] It is however in such conditions that states more likely adopt flexible environmental laws, as opposed to rigid ones, because they are widely acceptable to diverse states.[26]

Rigid laws, according to the literature, are strict institutional arrangements because they restrict or ban pollution whereas flexible or less rigid laws rarely restrict/ban or do so incrementally.[27] States are therefore less likely to adopt rigid laws since they are demanding of states and/or infringe on their autonomy.[28]

Finally, states have different political and economic characteristics that influence their adoption of environmental laws. Politically, democratic states and especially federated ones compared to other states, for instance, are the most influenced by multiple actors that are part of and/or have access to the government such as the public, non-governmental organisations, businesses, legislature, and political parties etc, to mention a few.[29] Therefore, making it more difficult for such states to adopt environmental laws.

Economically, developing states, for instance, generally lack finances and access to scientific expertise to deal with transboundary pollution.[30] Therefore, compared to developed states, developing states generally lack capabilities to adopt environmental laws. Many environmental laws, nonetheless, often provide financial, scientific, and technological assistance to incentivise especially developing states to adopt laws.[31]

In sum, this succinct review points out that states are structurally disincentivised to adopt environmental laws but are nonetheless more or less likely to adopt environmental laws depending on the type of transboundary pollution and institutional arrangement (i.e., law), and their political and economic characteristics. However, though health as a factor is largely left out in the GEP literature, this review highlighted a particular space for health to fill. This is because transboundary pollution, asides from the environmental impacts, also cause deadly diseases. It is expected that states will more likely adopt laws to regulate transboundary pollution problems that cause deadly diseases.

Given the gap in the GEP literature, the next section turns to the GHP literature. It briefly reviews the influence of health on the collective adoption of health laws and thus, provides support that health can influence the adoption of environmental laws. It also includes information from the environmental public health (EH) literature. All these combined builds the theoretical argument and hypothesis.

Diseases Caused by Transboundary Pollution Affects Collective Action in Global Health Politics

Whereas global environmental politics is governed by the UNEP, global health politics is governed by the World Health Organization (WHO).[32] The World Health Assembly (WHA), like the UNEP's EA, is the highest decision-making body of the WHO responsible for setting the international health agenda. It also has near universal state membership (i.e., 194 states). However, unlike the EA, the WHA is not centred on the

collective adoption of international health laws by states but primarily depends on an Executive Board of health experts to set recommended world health standards and regulations.

Tobacco smoke pollution is however an exceptional case whereby states collectively adopted the first international health laws. This includes the 2003 'WHO Framework Convention for Tobacco Control (FCTC)' and the subsequent 2012 'Protocol to Eliminate Illicit Trade in Tobacco Products.' The WHO FCTC is the first international health law. It was adopted in 2005 after 40 states adopted it and currently has near universal state membership (i.e., 182 states). The subsequent protocol was adopted in 2018 after 40 states adopted it and has less member-states (i.e., 63 states). The protocol, which took longer to be adopted is however an (unusually) very rigid law because it not only mandates states to prohibit all forms of illicit trade in tobacco products but also mandates them to criminalise illegal traffickers of tobacco products (WHO 2013).

Tobacco smoke pollution, initially, was a national health epidemic responsible for causing specific types of deadly noncommunicable diseases such as cancers and other types of cardiovascular and respiratory diseases etc.[33] As the number of diseases and deaths attributed to tobacco pollution increased in the millions, it became not only a shared transboundary health problem but a global one. Also, tobacco smoke pollution became a transboundary problem that necessitated a transnational solution because globalisation of the tobacco industry, which is a multibillion-dollar industry, made it difficult for states to achieve domestic tobacco control.[34]

Transnational tobacco companies (TLCs), due to their expansive markets that cut across multiple states, contribute in undermining the science, public awareness, and domestic policy of states especially in middle and low-income developing states were public attitudes and awareness towards the effects of tobacco are low.[35] All these also contributed in delaying

the WHO framework convention-protocol process of creating the FCTC and the protocol by especially states that are heavily reliant on tobacco leaf production and exportation as part of their gross domestic product (GDP) and states where there is great lobbying influence by the tobacco manufacture industry.[36]

Nonetheless, despite initial opposition from industry and tobacco states, the WHO FCTC and protocol were finalised. This is important because it demonstrates that states are willing to collectively address a pollution problem when it causes deadly diseases that are shared and have a transboundary cause and/or effect. Moreover, it also provides insight as to why states cooperate or fail to cooperate on a health-related issue. This is important given that, and as recognised by the EA, many environmental laws on transboundary pollution problems have implications for health protection because they likely significantly reduce human exposure and health risks to pollutants.[37]

More generally, and in the EH literature, noncommunicable diseases such as kidney, heart, lung, and cancer diseases, because of transboundary pollution problems, have been on the rise.[38] Currently, 7 out of 10 leading causes of deaths globally are noncommunicable diseases, thus accounting for 80 percent of the top ten deadly diseases and 44 percent of all deaths.[39] Also, their high death risk is the reason why state collaboration and surveillance on non-communicable diseases have steadily increased in contemporary times.[40]

However, transboundary pollution problems vary because some pollutants are more toxic than others and therefore, directly cause death and diseases that are more deadly. The most toxic pollutants more likely cause immediate death including deadly diseases after high exposure to them in the short-term.[41] Whereas less toxic pollutants may lead to death and diseases after longer-term exposure to them. Overall, however, the UNEP environmental governance, also provide advantages that the WHO health governance greatly lacks when it comes to the mobilization of states and utilization of international laws to provide technical

and financial resources for research and the enforcement of uniform environmental standards that also provide substantial benefits for health.[42]

Taken together, the theoretical argument posed in this research is that health influences states to adopt environmental laws. Particularly, states are more likely to collectively adopt environmental laws regulating transboundary pollution problems that directly cause deadly diseases. This is important, not only because health can be used as a factor to explain variation in the timeliness of adopting environmental laws, but also because adoption is a critical aspect of the international environmental law-making process. Without adoption, an environmental law by itself has no legal force and as a result, cannot be implemented. Therefore, the hypothesis posits that *the greater the deadly disease(s) caused by transboundary pollution; states are more likely to collectively adopt environmental law.*

Case Study Methodology

To test the hypothesis, the case study methodology is used because it allows for in-depth analysis of multiple types of data in order to determine and compare the pattern of relationship between deadly disease and adoption time across several cases.[43] The independent variable is deadly disease, and the dependent variable is adoption time. The decision to conduct a bivariate analysis of deadly disease and adoption time is done in order to thoroughly analyse more closely how changes in deadly diseases is associated with or leads to changes in adoption time. The cases are also selected using most similar systems case study design because it not only allows for in-depth comparison within each case study but also helps to hold other factors constant while analysing how changes in deadly diseases is associated with or leads to changes in adoption time.

A total of three case studies are conducted because it enhances the variety of testing. It allows the research to test the hypothesis across diverse environmental problems. This in turn will increase the generalizability of the findings that is the ability to draw inferences to

other types of cases not under study. In sum, each case study compares the diseases and 'environmental law adoption time' for a pair of different types of transboundary air, marine, and land pollution. The pair for air pollution includes ozone depleting substances (ODS) and persistent organic pollutants (POPs). Marine pollution includes oil and metal pollutants, while land pollution includes chemical and non-chemical wastes. These paired cases are based on six environmental laws shown in table 1. Because of the most similar systems case study design, the laws were specifically selected through matching to minimize or control confounding factors that may affect the relationship between the independent and dependent variables. Each pair of law match closely in terms of the scope of transboundary pollution, the number and diversity of states that have adopted them, and their creation time frame as much was possible (the highest difference is approximately about a decade). There is nonetheless some variation across each pair of law especially in terms of institutional differences such as rigidity (i.e., whether they prohibit and/or ban pollution) and collective adoption threshold (i.e., the number of states needed for each law to become fully adopted).

Case study 1 **Transboundary Air Pollution**	**Case study 2** **Transboundary Marine Pollution**	**Case study 3** **Transboundary Land Pollution**
1985 Vienna Convention for the Protection of the Ozone Layer	1969 International Convention Relating to Intervention on the High Seas in Cases of Oil Pollution Casualties	1989 Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal

2001 Stockholm Convention on Persistent Organic Pollutants (POPs)	1972 Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter	1998 Rotterdam Convention on the Prior Informed Consent Procedure for Certain Hazardous Chemicals and Pesticides in International Trade

Table 1. Summary Table of Cases

For the independent variable, deadly disease simply means a disease that can cause death. To measure this, the amount (i.e., level) of exposure (including the frequency and length of exposure) to transboundary pollution is accounted because it indicates the toxicity of a pollutant at different levels and the corresponding disease outcome.[44] For instance, a transboundary pollutant that in the short-term after high or low-medium amounts of exposure to humans causes deadly disease (and even death) is more toxic than a transboundary pollutant that at the same amounts of exposure causes deadly disease but in the longer term. Consequently, the transboundary pollution disease data for the case studies are collected from the Agency for Toxic Substances and Disease Registry (ATSDR). This includes toxicology report data for a total of 10 transboundary pollution per each case study. ATSDR is the registry of the National Centre for Environmental Health for non-infectious diseases under the federal Centres of Disease Control and Prevention division of the U.S. Department of Health and Human Services.

For the dependent variable, adoption time is simply the difference in the number of years (plus months and days) between when an environmental law was created and when it became fully adopted. An environmental law requires a certain threshold or collective number of states to adopt the law before it becomes fully adopted or legal. Therefore, an environmental law with a shorter adoption time indicates that states were more likely to adopt it in comparison to another law with a longer adoption time. The quantitative data for adoption time are collected from the United Nations Treaty Collection (UNTC).[45]

Additionally, all three case studies include key events that led to and affected the law-making process, which provides a more qualitative-detailed context about whether health played a role in influencing states to create environmental law. Data are collected online from the UNEP and UN legal resources including secretariats and the International Maritime Organization. Supplementary data are also collected from newspapers, journal articles, and academic texts.

The most anticipated limitation is regarding the use of ATSDR data as a substitute for the lack of quantitative-standardised disease data dating back to the time when the environmental laws were adopted. However, this was easily resolved since adoption time and the time when disease(s) caused by transboundary pollution were first discovered are fixed. Therefore, only disease(s) discovered before adoption time are analysed. Moreover, ATSDR disease data are regularly reviewed and updated to ensure that data are correct and relevant for policy. ATSDR conducts clinical studies and compiles findings from primary health assessments on diseases and non-disease health effects of different pollutants that affect the general population in the United States and other states/countries, which it uses to produce comprehensive toxicology pollution profile reports.

However, the quantity of disease data collected from ATSDR is limited and do not exactly reflect the multitude of health problems caused by transboundary pollution because

ATSDR sets very high standards for the causal relationship between pollution and diseases that affect the general population. Diseases commonly associated with pollution in academic texts and journal articles including those that affect select members of the general population are omitted from this research.

Nonetheless, strictly using only valid causal disease(s) data is very important because most pollutants cause similar types of symptoms and non-disease health effects such as damages to cells, tissues, and organs, and whole system failure and/or dysfunctions. Disease data helped to avoid information overload that otherwise would have complicated the data collation and analysis of specific health problems caused by multiple transboundary pollution.

In sum, the reliability and validity of ATSDR data sufficiently make up for the limitations. The following section briefly describes the findings while the three case studies are detailed in the subsequent section.

Findings Summary

Case Study 1

Despite limited data about diseases caused by ODS and POPs, data nonetheless shows that direct human exposure to high levels of POPs such as hexachlorobenzene in the short-term causes Porphyria Cutanea Tarda (PCT) disease.[46] Direct exposure to ODS, however, is not known to cause disease. Therefore, POPs are said to cause deadly disease(s) more than ODS. Nonetheless, it is worth noting that ODS indirectly cause deadly skin cancer diseases because they deplete the ozone layer, which exposes the public to more ultraviolet radiation energy (i.e., UVAUVB). Excessive high long-term exposure to UVAUVB cause basal cell, squamous cell, and melanoma skin cancers.[47]

Adoption time results also correspond with the disease findings because it shows a shorter adoption time for the regulation of POPs. The *POP Stockholm* law was created 22

May 2001, and collectively adopted by 50 states after 2 years, 11 months and 25 days on 17 May 2004. Conversely, the *ODS Vienna* law was created 22 March 1985, but it took 3 years and 6 months for 20 states to collectively adopt it on 22 September 1988. Therefore, and despite the higher adoption threshold of 50 states, the *POP Stockholm* law was adopted faster than the *ODS Vienna* law. The *Stockholm* law is also more rigid since it requires the ban of POPs whereas the *Vienna* law does not ban ODS (at least not until the creation of the subsequent law i.e., Montreal Protocol). These combined with the findings provide support for the hypothesis.

Case Study 2

Unlike ODS and POPs, more disease data about the diseases caused by oil pollutants and heavy metals were found.[48] Heavy metals however cause multiple deadly diseases at different exposure levels, hence why they are said to cause more deadly diseases than oil pollutants. This includes central nervous system diseases such as encephalopathy and Minamata disease at short-term high levels of exposure. At lower longer-term levels, heavy metals cause lung diseases (i.e., emphysema), lung cancers (i.e., oat cell carcinoma, adenocarcinoma, and epidermoid carcinoma), skin cancers (i.e., basal cell and squamous cell carcinomas), chronic kidney disease and chronic/ischemic heart disease. On the other hand, oil pollutants at similar lower levels of long-term exposure cause deadly blood diseases such as anaemia and leukaemia cancer.

Likewise, the adoption time results correspondingly show that the *Dumping of Wastes* law regulating heavy metal wastes was adopted faster than the *Oil Pollution* law, therefore both findings support the hypothesis. The *Dumping* law was created 29 December 1972 and 15 states had collectively adopted it after 2 years, 8 months, and 1 day on 30 August 1975. The *Oil Pollution* law was however created 29 November 1969 but was collectively adopted by 15 states after 5 years, 5 months, and 7 days on 6 May 1975. Moreover, although both

laws have the same adoption threshold of 15 states, the *Dumping* law is more rigid because it prohibits the disposal of wastes at sea while the *Oil Pollution* law does not prohibit but only addresses the after event of oil pollution at sea.

Case Study 3

Data for non-chemical land wastes such as asbestos fibrous minerals including some metals show that they cause lung cancer diseases such as adenocarcinoma, epidermoid carcinoma, and pleura mesothelioma at high levels of long-term exposure to them.[49] However, disease data for chemicals such as organophosphorus pesticides are lacking.[50] Therefore, non-chemical wastes are said to cause more deadly disease(s) than chemical pollution.

The results for adoption time, like in the previous case studies, also correspond with the disease findings, and support the hypothesis. Particularly, the *Basel* law that regulates non-chemical wastes was adopted within a shorter time than the *Rotterdam Chemical* law. The *Basel* law was created 22 March 1989 and collectively adopted by 20 states after 3 years, 1 month, and 13 days on 5 May 1992. The *Rotterdam* law, however, was created 10 September 1998 and collectively adopted by 50 states after 5 years, 5 months, and 15 days on 24 February 2004. Though the collective adoption threshold for the *Basel* law was lower than that for the *Rotterdam* law, *Basel* law is a more rigid law because it bans the exportation of prohibited wastes and waste trade between member-states and non-member states. *Rotterdam* law, however, only requires prior informed consent for the exportation of chemicals.

Case Study 1: Transboundary Air Pollution

Scientists, by the mid-late twentieth century¸ identified ODS and POPs as harmful transboundary pollutants.[51] ODS like Chlorofluorocarbons (CFCs) and other halogens used for aerosols and refrigerant fluids etc. were discovered to react with the sun's ultraviolet

(UV) radiation energy. This destroys the ozone layer and increases human exposure to UV energy, damages cell DNA and raises the risks of skin cancer. [52] In contrast, POPs such as Dichlorodiphenyltrichloroethane (DDT) and Polychlorinated Biphenyls (PCBs) were identified as environmentally stable agro-industrial chemicals that damage cells, tissues, organs, and whole systems etc, hence raising the risks of disorders, cancerous diseases, and even death.[53]

These gained public attention, consequently leading to state regulation. For instance, in the 1970s, the *New York Times* reported controversies about CFCs, the ozone effects, and increase in skin cancers as well as the cancerous effects of toxic DDT and other POPs in humans and wildlife.[54] Therefore, despite initial opposition from the chemical industry, several POPs by the 1970s were restricted in Europe and North America and eventually banned.[55] States, however, took longer to prohibit ODS notwithstanding increases in skin cancers around the time by about 4 percent and over two-folds in Europe and North America, respectively.[56]

POP ban in Europe and North America, controversially, did not preclude POP exportation. Therefore, several reports, in the 1970s, also revealed increased poisoning resulting from banned or restricted POP pesticides imported from Europe and North America.[57] The WHO Expert Committee on Insecticides, for instance, reported about half a million number of pesticide poison accidents annually in South America, Africa, and Southeast Asia.[58] This includes respiratory, neurological, and skin reactions caused by the intoxication of POPs such as aldrin, endrin, and parathion in places like Nigeria, Brazil, and India etc.

Consequently, at the *1972 Stockholm Conference on the Human Environment*, the respective state governing councils of the WHO, Food and Agricultural Organization (FAO), and UNEP were assigned to assist developing states address chemical poisoning matters.[59]

This led to the creation of the *International Register of Potentially Toxic Chemicals* (IRPTC) in 1976 to provide information and recommendations regarding the safe use and control of POPs.[60]

Conversely, the first ozone international conference was held the following year in 1977. States at the conference created a Coordinating Committee on the Ozone Layer (CCOL) and a *World Action Plan on the Ozone Layer* to investigate the causes, scope, impacts, and control of ozone depletion.[61] By 1981, an *Ad-Hoc Working Group* was established by the UNEP's council to collaborate with CCOL for the negotiation of a *Global Framework Convention on the Ozon*e.

As negotiations for the ozone law was underway, health concerns continued to play a substantial role in the collaborations between the UNEP, WHO, and FAO councils to address POPs. By 1983, the UNEP and WHO councils established the *UN Consolidated List of Products* as part of the IRPTC to provide information regarding chemicals regulated by states.[62] Also, the UNEP and FAO councils created precautionary measures against the harmful effects of POPs and other pesticides. This includes the *1985 International Code of Conduct for the Distribution and Use of Pesticides* (i.e., *Code of Conduct*) and the *1987 London Guidelines for the Exchange of Information on Chemicals in International Trade* (i.e., *London Guidelines*).[63] However, regarding ozone depletion, the environmental science as opposed to health concerns played a major role in state collaborations.[64] The UNEP council, throughout the ozone law negotiations, mostly collaborated with the World Meteorological Organization (WMO) responsible for monitoring, collecting, and disseminating data on the ozone layer.[65]

Owing to the lack of science, states continued to disagree over the amount and timeline of regulating ODS.[66] It was not until scientific findings from Japanese, British, and other Antarctic scientists between 1984-5 showed a great decline of the ozone layer

surrounding the polar ice caps (infamously known as the ozone hole) that states finalised the *1985 Vienna Convention for the Protection of the Ozone Layer*. States also established another *Ad-Hoc Working Group* for the *Preparation of the Protocol on Chlorofluorocarbons*.[67]

Similar disagreements regarding ODS control nonetheless continued to resurface throughout the protocol negotiations until the *1987 International Ozone Trends Panel* of over 100 scientists, which was organised by the UNEP and WMO.[68] The panel concluded that there was consensus across all scientific models regarding ozone layer change and the classes of ODS to be regulated. States later that same year deliberated on conclusions of the scientific panel, agreed on the list of ODS to be regulated, and finalised the *1987 Montreal Protocol on Substances that Deplete the Ozone Layer* later.[69]

During and even after finalisation of the *Vienna* and *Montreal* ODS laws, health concerns combined with widespread public pressure and criticisms from environmental NGOs (such as Oxfam and Pesticide Action Network) continued to influence state collaboration to control POPs.[70] By 1989, the FAO and UNEP councils adopted the *Prior Informed Consent* (PIC) as a provision to the *1985 International Code of Conduct* and *1987 London Guidelines*. PIC mandates that any regulated chemical that is harmful to the environment and/or human health cannot be exported without the importing state's informed consent.[71]

Shortly after, at the *1992 Rio de Janeiro Conference,* states collectively created an action plan to phase out or ban POP chemicals that are "persistent and bio-accumulative and whose use cannot be adequately controlled."[72] The UNEP and WHO councils subsequently created the *Intergovernmental Forum on Chemical Safety* (IFCS) and the *Inter-Organization Programme for the Sound Management of Chemicals* (IOMC), which commenced an *Ad Hoc Working Group* in 1995 to provide scientific and technical assessments about POPs.[73]

The *Ad Hoc Working Group* findings confirmed that POPs are resistant to degradation and because of their semi-volatile properties travel long distances by air and tend to remain in colder regions but evaporate in hotter regions.[74] Also, POPs because they have lipophilic properties are often found if tested in the fatty tissues of living organisms and thus bioaccumulate, bioconcentrate, and bio-magnify along the food chain. Evidence from a variety of wildlife such as whales, dolphins, seals, polar bears etc. suggest that POPs have the potential to cause harmful effects in humans such as death, reproductive, developmental, and immune problems as well as increased risks of cancers and other diseases etc.[75]

Therefore, upon recommendations of the *Ad Hoc Working Group*, an *International Negotiation Committee* (INC) was tasked in 1997 to prepare negotiations of an international *Convention Framework on POPs*.[76] Throughout the negotiations, states disagreed regarding POP control measures but eventually reached a compromise in 2000 to ban the production, use, and trade of 9 POPs.[77] Other agreements include the broad application of a precautionary and risk-assessment approach in executing PIC and determining the addition of new POPs to be regulated.[78] These were finalised into the *Stockholm Convention on Persistent Organic Pollutants* in the following year 2001.[79]

Case Study 2: Transboundary Marine Pollution

It was not until the 1967 Torrey Canyon disaster that states greatly sought to address marine oil pollution. Torrey Canyon was a large sized oil supertanker ship that enroute in the international seas spilled its entire cargo of over 100,000 tonnes of crude oil after hitting the United Kingdom's rocky Seven Stones Reef.[80] The oil pollution killed thousands of seabirds

including other marine plant life and animals such as planktons, shellfish, fish mammals etc. and affected the businesses of local tourists and fishermen.[81]

Being the biggest oil pollution accident at the time, the Torrey Canyon disaster received international attention and coverage on the frontpages of newspapers such as *The New York Times* (1967) and *The Guardian* (1967).[82] The disaster also exposed the lack of international marine laws to address oil pollution costs and intervention under the UN International Maritime Organisation (IMO) responsible for maritime protection.[83]

Upon the United Kingdom's request, the IMO state Assembly met in London later that year to address maritime oil pollution casualty and an *Ad Hoc Legal Committee* was created to develop an international marine law on *'state intervention and the redress of oil pollution.'* However, throughout the *Ad Hoc Legal* meetings to negotiate the oil pollution law, the health effects of oil pollution did not greatly influence states to cooperate rather states disagreed over intervention scope and liability-compensation costs. Coastal states such as the United States, United Kingdom, and Canada, for instance, sought the scope of state intervention to extend beyond coastlines into territorial zones and the high seas, and preferred that ship owners be responsible for oil pollution damages and costs. However, these propositions were opposed by shipping states like Belgium, Denmark, and other European states including maritime insurance companies that instead favoured fault-based liability.[84]

States were nonetheless able to reach a compromise at the 1969 *Ad Hoc Legal* meeting in Brussels, largely because of liability redress settlements. It was concluded among them that shipping states would be held liable for oil pollution damages, while private ship owners would provide additional liability coverage when damages are exceedingly high.[85] Also, states were given the rights to intervene in the high seas against ships or vessels owned by other states in the event of oil pollution so as to protect economic activities like tourism and fishing but also human health and environmental resources, wildlife, and other living

organisms.[86] Therefore, by the end of the meeting, states passed the *1969 International Convention Relating to Intervention on the High Seas in Cases of Oil Pollution Casualties.*[87]

Serious considerations of the health effects caused by marine pollution started later in 1969 when the IMO Assembly mandated the *UN Joint Group of Experts on the Scientific Aspects of Marine Pollution* (GESAMP) to serve as the advisory body for the creation of the international marine law for the '*Prevention of Marine Pollution by Dumping of Wastes and Other Matter*.[88] The IMO Assembly had created GESAMP at a joint meeting together with the UN Educational, Scientific, and Cultural Organization (UNESCO), WMO, and FAO. Overall, GESAMP was to investigate and provide up-to-date information on different toxic marine pollutants including the disposal at sea of harmful pollutants that are hazardous to human health, marine life, and environment.[89]

By the following year at the GESAMP meeting, GESAMP ranked heavy metals and other inorganic wastes third place (and oil pollutants fifth) in its list of 12 preliminary categories of major marine pollutants most hazardous to human health and other living resources.[90] In its list of 9 top sources of transboundary marine pollution, the deliberate dumping of materials from ships was ranked fourth. As a result of GESAMP findings, an *Intergovernmental Working Group on Marine Pollution* (IWGMP) was established to supervise the formulation of an international marine law for regulating the deliberate dumping and disposal of toxic substances into the marine body.[91]

At the IWGMP negotiation meetings, different IMO Assembly member-states provided comments and proposals for the new dumping law. The United States draft, for instance, suggested a total ban on the transportation of toxic substances from land for dumping at sea but allowed for permit exemptions for when adequate information is supplied to demonstrate that human health, marine life, and resources are not endangered. Although states generally agreed with the United States proposal, several others like Sweden, Canada,

and Russia (then Soviet Union) particularly opposed state discretion in issuing permits for disposal exemptions. They preferred universal exemption criteria under the dumping law to ensure uniformity across states. They also suggested that the IWGMP review and recommend safer alternatives to dumping at sea to prevent disposals through other sources that could be equally harmful such as pipelines, runoff, or outfall discharges in water bodies.[92]

Eventually, it was concluded that additions to the United States proposal were sufficient to finalise the dumping law, which was also submitted to and recommended at the *1972 Stockholm Conference*.[93] Hence, at the subsequent fourth GESAMP (18-23rd September 1972) session, a preliminary report on *marine waste disposal management* and the harmful effects to human health and marine living organisms was also presented.[94] According to the report, exposure of marine organisms such as shellfish and aquatic mammals to highly toxic substances is likely to cause behavioural or physiological damages and bioaccumulate, therefore increasing sea food contamination and posing dangers to marine populations.[95] Also, dumping of toxic substances in the marine environment can be hazardous to human health as a result of "direct skin contact or consumption of sea water in contaminated beaches, consumption of seafood contaminated from sewage and/or the accumulation of toxic substances such as persistent organochlorine compounds POPs or metals."[96]

Furthermore, it was recommended in the report that "since the principal substances causing concern are known (e.g., mercury, cadmium, lead, chlorinated hydrocarbon pesticides, PCBs etc.) specific treatment processes can be developed to reduce their discharge to the marine environment."[97] As a result, in the following month, the GESAMP report recommendations were used at the *Inter-Governmental Conference on the Convention on the Dumping of Wastes at Sea* to conclude and pass the *1972 Dumping of Wastes and Other Matters at Sea Convention*. In the law, "dumping" is defined as "the deliberate disposal at sea of wastes or other matter from vessels, aircraft, platforms or other man-made structures, as

well as the deliberate disposal of these vessels or platforms themselves."[98] The annexes of the law text list the wastes that are prohibited for dumping because of the human and environmental risks that they pose including the criteria for a permit exemption.

Case Study 3: Transboundary Land Pollution

In the mid-late twentieth century, scientific knowledge and public concern over toxic chemicals did not only result in the regulation of POPs within North America and Europe but also coincided with the regulation of hazardous and toxic wastes in these developed areas.[99] Before then, hazardous, and toxic wastes disposals at landfills, abandoned quarries, waterways, and open dump sites where commonplace and unregulated, thus leading to public health incidents, media publicization, and agitations like the *Not in My Backyard* (NIMBY) movement.[100] Some of these incidents—as reported in the news, reports, and journals included mental, gastrointestinal, and reproductive illnesses including communicable diseases and even death.[101]

However, faced with strict disposal regulations, public opposition, and high disposal costs (of about $100-2000 per metric tons in some cases), the transboundary transport of hazardous and toxic wastes for dumping became a viable alternative for developed states including disposal companies.[102] Particularly, developing states in South-Central America, Southeast Asia, Africa, and Eastern Europe became the favoured disposal destinations in the mid-late 1980s.[103] The majority of shipped wastes were falsely labelled or illegally dumped using fabricated permits or paperwork and not properly disposed, therefore contaminating soil, food crops, and groundwater supplies, and affecting human health.[104] Some of such incidents were reported by international NGOs such as Greenpeace and made international press headlines.[105]

The UNEP state council, in response, convened an *Ad Hoc Meeting* in 1981 for the consideration of a new international wastes law.[106] By 1985, member-states of the *Ad Hoc*

Meeting finalised the *Cairo Guidelines and Principles for the Environmentally Sound Management of Hazardous Wastes* (i.e., *Cairo Guidelines*) and an *Ad Hoc Working Group of Experts* was created to provide recommendations for the development of the wastes law.[107] The *Ad Hoc Working Group* presented its report to the UNEP council two years later stating that the "illegal transport of toxic and dangerous products and wastes take place mainly from the industrialized to the developing world," and posed "serious dangers to the environment and to human health especially in developing states where appropriate treatment and disposal facilities do not exist."[108]

Furthermore, according to the report, heavy metals and pesticides were among the topmost wastes shipped illegally and "there is a clear growth in the number of proposals from industrialized states to construct so-called "waste-to-energy" plants in developing countries or to provide supposedly non-hazardous waste landfill or incineration facilities."[109] Hence, given the recommendations of the *Ad Hoc Working Group*, the UNEP council adopted the *Cairo Guidelines* and authorised another *Working Group of Legal and Technical Experts* to prepare the international law for '*the control of transboundary movements of hazardous wastes*,' which was to commence that same year and be completed within two years.

In-between negotiations of the wastes law, major illegal wastes scandals ensued, thus causing public health problems, and making rounds internationally in the news. For instance, *The New York Times* and *Chicago Tribune* reported the illegal traffic of wastes from Italy to Nigeria that occurred from 1987-8.[110] The incident involved 8,000 drums (about 4,000 metric tons) of toxic wastes containing radioactive chemicals, heavy metals, and poly-chiorobiphenyl (PCB) etc. disguised as fertilizers.[111] The Italian Iruekpen Construction Company contracted the disguised disposal with a local farmer for a token of $100 per month. However, water and food contamination owing to soil use and improper disposal

eventually cost several villagers and government clean-up workers their health including the death of the farmer.[112]

Consequently, throughout the negotiation sessions of the *Ad Hoc Working Group of Legal and Technical Experts*, developing states especially from Africa emphasised total ban of hazardous wastes traffic and the polluter-pays-principle for trafficking states. However, such proposals were opposed by developed states like the United States, Canada, Germany (Federal Republic), and Austria that preferred sound wastes disposal and management based on prior written consent as well as wastes recovery and recycling for economic purposes.[113] However, other key issues deliberated during the negotiations were regarding the categories of wastes to be regulated and the disposal method for wastes intended for recovery and recycling.[114]

Eventually at the last negotiation session in 1989, states were able to reach a compromise and finalise the wastes law taking into consideration the prior recommendations of the *Ad Hoc Working Group* report on the harmful effect of illegal traffic on the environment and human health. They specifically agreed to prohibit the trading of hazardous wastes that have been banned or prohibited for import and/or not consented to by importing states. However, members-states of the wastes law are allowed to trade hazardous wastes for recovery and recycling so long as they exchange written informed consent and ensure environmentally-sound disposal management and protection of human health.[115] Also, the trading of wastes between member-states and non-members are prohibited. In the event of illegal traffic, members-state have a duty to reimport or export back the wastes.[116] Hence, in the following days, states garnered enough votes to pass *the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal*.[117]

Conversely, as negotiations of the wastes law were ongoing, concerns about the regulation of the illegal traffic of toxic chemicals were also occurring because of increased

unregulated exportation of toxic pesticides and industrial chemicals from developed to developing states. Therefore, the transboundary traffic of banned and outdated chemicals including pesticides from developed states to South-Central America, Southeast Asia, Africa, and Eastern Europe continued well until the late 1990s.[118] Similar to illegal wastes traffic, many illegal or prohibited pesticides were disguised as harmless fertilizers without full disclosure of the dangers and risks, therefore affecting human health and sparking international outrage.[119] It also raised concerns about the *circle of poison* resulting from the export of pesticide contaminated agricultural produce grown in developing states into developed states.[120]

Moreover, although the FAO council and WHO assembly had as a result already begun addressing pesticides and their health effects, they did not regulate the transboundary movement of such pesticides.[121] Hence, in 1982 several developing members-states of the UNEP council urged increased efforts to address illegal traffic of toxic chemicals, therefore resulting in the creation of an *Ad Hoc Working Group of Experts for the Exchange of Information on Potentially Harmful Chemicals including pesticides*.[122] It however was not until the 1992 *Rio de Janeiro Conference* that states agreed to develop an international law regulating illegal chemical traffic using *PIC*.[123] Therefore, the UNEP and FAO councils in accordance with the mandate jointly commenced in 1996 the process of preparing the international law.[124] Also, the *Intergovernmental Negotiating Committee* (INC) fully called the *International Negotiation Committee for an International Legally Binding Instrument for the Application of the Prior Informed Consent Procedure for Certain Hazardous Chemicals and Pesticides in International Trade* was established for this purpose.

States, during the INC negotiation meetings debated the regulation of illegal chemical traffic. Developing states and some European Union (EU) states proposed the sound management, full toxic information disclosure, and regulation of traded chemicals. However,

other developed states such as the United States objected to such regulatory measures and opted for instituting only the PIC principle, which mandates the exchange of a formal written notice between exporting and importing states guaranteeing consent and full chemical information disclosure.[125] Also, states differed on the list of chemicals and methods for identifying chemicals to be included and exempted from PIC.

However, indicating that health was perhaps not as much as a priority for states and to avoid further delay, states by the 1998 deadline INC meeting agreed to abandon the regulation, information disclosure, and sound management of illegally traded chemicals for a PIC information exchange system.[126] Particularly, each state was to be held responsible for submitting all PICs and designating national authorities to facilitate PICs. Hence, shortly after, states passed the *Rotterdam Convention on the Prior Informed Consent Procedure for Certain Hazardous Chemicals and Pesticides in International Trade* (i.e., *Rotterdam Convention*).

Conclusion

This research deviates from mainstream GEP and makes an original interdisciplinary contribution to the literature by demonstrating that there is a relationship between deadly disease(s) caused by transboundary pollution and the timeliness of adopting environment laws. The findings particularly show that POPs, metals, and other non-chemical wastes when compared with ODS, oil, and chemical pollution cause more deadly diseases such as PCT, cancers, heart, lung, and other diseases.[127] Correspondingly, the *Stockholm, Dumping,* and *Basel* laws regulating POPs, metals, and non-chemical wastes laws were adopted within a shorter time compared to the *ODS Vienna, Oil Pollution,* and *Rotterdam* chemical laws.

Additionally, the *Stockholm, Dumping,* and *Basel* laws compared to the *Vienna, Oil Pollution,* and *Rotterdam* laws are rigid institutions because they prohibit and/or ban pollution. This goes against the notion that states are less likely to adopt rigid laws. It also

provides further support for the findings by demonstrating that states are more likely to adopt rigid laws when they control transboundary pollution that cause deadly diseases.

However, it is worth noting that this research does not take into account the non-disease health effects caused by transboundary pollution. Different types of transboundary pollution are known to cause several other types of health problems other than diseases such as damages to vital cells, tissues, and organs, and organ system failure and/or dysfunctions. These types of health problems are important and can influence states to adopt international environmental laws. Nonetheless, focusing only on diseases helped to avoid information overload that would have otherwise complicated the process of differentiating and comparing the specific health effects caused by multiple transboundary pollution.

Also, because this research focused on diseases, the amount of data found varied. Data for the specific disease(s) caused by pollutants was found to be abundant for some pollutants but also lacking for several types of pollutants for scientific reasons. For instance, data on the specific diseases caused by POPs are generally lacking and therefore, impacted the total amount of disease information that was collected from the ATSDR. This is in contrast to amount of disease information for heavy metals, hence perhaps why the findings also show that heavy metals caused the greatest number of deadly diseases. Overall, data limitations affected the total amount of disease information that could have been expounded upon in the case studies but this limitation was compensated for thanks to the reliability and validity of ATSDR toxicology profile reports used.

Nonetheless, what the findings imply for the direction of future research is that there are specific types of transboundary pollutants that are more toxic to human health and therefore, across the board should likely cause great health effects compared to other types of pollutants and so states are more likely to address them within a relatively shorter time. Consequently, future research should particularly look into conducting more in-depth case

studies and quantitative analysis that demonstrate how specific types of transboundary pollutants such as heavy metals are more toxic to human health and therefore, cause states to address them within a relatively shorter time. The goal is to study variation in the timeliness of adopting different environmental laws and to further determine how diseases caused by transboundary pollutants account for the variation. However, it goes without saying that such research endeavours would require increasing intra-IR research between GEP and GHP and interdisciplinary research involving environmental health.

Likewise, pertaining to policy, global environmental politics as governed by the UNEP should move beyond making health implications a precaution for transboundary pollution regulation and towards making health an enforceable aspect of environmental protection and vice versa. The primary policy end goal is to get states to adopt especially rigid environmental laws because they enhance pollution regulation and consequently, health protection. Also, as the diseases caused by transboundary pollution worsen and are increasingly known, environmental laws will be instrumental role for regulating them. This, particularly, will likely be the case for future climate change law(s) as the diseases caused by climate change become apparent over time. Moreover, the simple fact remains that humans are part of the natural environment not external from it, pollution not only harms the environment but also our health—although we are the primary cause.

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[121] See transboundary air pollution case study.

[122] This eventually led to partnership among the different UN bodies (i.e., FAO, UNEP, WHO) and consequently (as detailed in transboundary air pollution case study), the creation of the 1985 *International Code of Conduct for the Distribution and Use of Pesticides* and the 1987 *London Guidelines for the Exchange of Information on Chemicals in International Trade* (FAO 1985; Kees and Milou 2014, 4; IISD 2005). And by 1989, the FAO and UNEP councils both adopted the *Prior Informed Consent* (PIC) as a provision in the *1985 International Code of Conduct* and *1987 London Guidelines* (Kees and Milou 2014, 5; Krueger and Selin 2002).

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United Nations Sustainable Development (UNSD), "United Nations Conference on Environment & Development Rio de Janerio, Brazil, 3 to 14 June 1992," (New York, United States: United Nations, 1992), 231.

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[127] Nonetheless, what POPs, heavy metals, and other non-chemical wastes have in common is that they hardly breakdown in the environment, they bio-magnify along the food chain, and bioaccumulate in cells, tissues, and vital body organs. This means that they build up in the environment, living organisms, and the human body, and take longer to leave or breakdown, which leads to death and deadly diseases.