국외장기일반과정 최종보고서

인권에 기반을 둔 환경정책 수립을 위한 이론 및 모델 연구

2020. 4.

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훈련개요 및 훈련기관 소개

1. 훈련개요

가. 훈련국 : 미국
나. 훈련기관명 : 서던캘리포니아대학(USC)
다. 훈련분야 : 정책, 인권보호
라. 훈련기간 : 2018. 7. 27. ~ 2020. 5. 26.

2. 훈련기관

가. 훈련대학 : University of Southern California
미국, 캘리포니아주, 로스엔젤레스에 위치한 명문사립대학교로 1880 년 로버트위드니(Robert Widney)의 주도 하 설립되었으며, 미국 서부지역에서 가장 오래된 종합사립대학임.

나. 소속학과 : Sol Price School of Public Policy, IPPAM
U.S. News & World Report에 따른 미국 행정, 정책 대학원 서열 2위인 세계적인 명성의 단과대학이며, 국제적인 다양한 이슈를 다룸. 소속학과에서는 정책 분석 이론을 습득, 실제 사례 연구 등을 통한 정책전문인재를 양성하고 있음.

Theory and case studies for environmental policies based on human rights

-Focusing on Fine dust and Food safety Policy-

Contents

1. Executive Summary

In Republic of Korea, it has happened to be violated the health rights from human harmful substances such as carcinogens sanitary napkins, humidifier disinfectants, insecticide eggs and fine dusts. For this reason, the public interest in basic human environment to enjoy healthy life in a clean environment is increasing. However, the government's response to the unexpected situation was slow, and there is little government policy toward the human environment based on human rights.

It is time to strengthen Korea's capacity to protect the human environment and human rights in order to advance international norms and understanding of the environment industry, and actively respond to human rights and human rights remedies in the future environment. Since the environmental rights based on human rights are universal rights to pursue the right to live in the future, it is necessary to conceptualize them as life-friendly human rights through the establishment of academic theories and advanced case studies. Therefore, the purpose of this study is to propose direction to promote environmental human rights through the case study on the establishment of environmental policy in the United States based on human rights based on the basic rights theory.

Among the various environmental problems, the most urgent thing in Republic of Korea is the fine dust problem and food safety. Republic of Korea is the second

poorest air-quality country in OECD countries in 2017[1]. The problems of ultra-fine dust, the high concentration of PM 2.5, which is a particulate matter, is common in Korea, and recent studies have shown that the ratio of PM2.5 fine dust is seriously detrimental to human health[2], so that ultrafine dust directly infringes people's right to health. However, the current policy is not effective and the national satisfaction is very low. Problems of food safety are also the same context. food eating directly is associated with the right to life, and is particularly fatal to children and elderly people with impaired immunity. After the controversy over hamburgers in Republic of Korea in 2017, the prosecutors promoted investigative experts after a few months, and in the early years of the egg pesticide problem, the government did not provide accurate information. This encouraged consumer distrust. There is also criticism that the direction of environmental policy in the framework of human environment and human rights has not been reviewed.

Prior to discussing the solution, first, it was defined the concept of environmental rights, the relationship between human rights and the environment, history and principles of environmental human rights, human rights obligations

[1] OECD, 2017, *OECD Statistics*, Retrieved from http://www.oecd.org/statistics/how-s-life-23089679.htm

[2] Many studies show that fine dust is related in deterioration of health such as lung cancer (Kim Sang-Heon, 2015; Verhoeff, Hoek, Schwartz and Van Wijnen, 1996), Asthma (final day, young-young, 2015; European Commission, 1999), chronic bronchitis, (Cifuentes, Borja-aburto, Gouveia, Thurston and Davis, 2001), infant mortality (Loomis, Casillejos, Gold, McDonnell and Borja-aburto, 1999)

related to the environment, etc. At present, environmental policy is not given priority in Republic of Korea because the theories on environmental human rights are not established sufficiently. Therefore, the theoretical review was carried out and then, procedural rights and substantive rights related to environmental issues was discussed. And then it was discussed the environmental human rights issues related to air pollution and food safety in Republic of Korea.

Next, it was conducted advanced case studies in the United States. The United States approached the realization of environmental rights at the level of justice. In 1982, the Office of Environment Justice was set up in the EPA. In 1993, the National Environmental Justice Advisory Committee was set up to prioritize and coordinate the possession of environmental rights among ministries. The United States is recognized as a leading country in the safety management of all distribution processes, including food production, import and export around the world, and the Food Safety Modernization Act, which transforms the food safety management system into a preventive center, has been enacted and enforced. Therefore, the preventive food safety policy process in the United States and advanced case studies in respect of human rights will be important case studies for policy formulation in Republic of Korea.

The United States enacted strong regulations that only reflect the viewpoint of the national health protection when drafting the Clean Air Act, the National Ambient Air Quality Standard, and the Regional Haze Rule for the elimination of air pollution. Los Angeles in the United States, was known as the worst city of air

pollution caused by automobile emissions in the 1950s, has the federal environmental protection policy in the United States that gives the authority to establish vehicle emission standards now, became a representative clean city. The California government improve the quality of petroleum products to reduce fine dust and is working to develop alternative energy sources. Of the 1,400 employees in the Office of air resources in the states, 130 are dedicated to vehicle emissions. In addition, “CalEnviroScreen Program” in California is the theoretical foundation for minimizing environmental human rights violations caused by air pollution through the development of an environmental human rights index. California approaches the fine dust problem scientifically, technically and systematically and attaches great importance to cooperation with governments, local cities, corporations and civic groups.

The United States implements stringent standards and strong laws regarding food safety. Various ministries and agencies are responsible for food safety, and is famous for strict quarantine. United States are able to keep track of both imports products and domestic products. Putting the safety of the public, The United States enforces strong preventative laws. In addition, we operate professional education institutions related to food safety and implement preventive control specialist system. Such advanced case studies of the United States can be a good precedent for establishing environmental policies in Republic of Korea.

Finally, it is discussed the direction of environmental policy, including the improvement of laws and institutions. In particular, it stressed the importance of

human rights perspectives in the formulation and implementation of environmental policies. Suggestions are included the participation of citizens, transparency and accuracy of information disclosure, and the need to cooperate with diverse communities.

2. Introduction

2.1. Purpose of the study

The purpose of this study is to propose environmental policies for Republic of Korea based on human rights by studying the case on the US environmental policy based on theory and approach related to human rights. Republic of Korea grew rapidly from the world 's poorest countries in 1950s, poorer than Africa, to the world 's 10th largest economy in 1990s. During this period, the government neglected to protect ecosystems, placing economic growth as a priority. After achieving economic growth, the government has continued to improve the law and institutional system, including the design of greenbelt for the environment, but it is still insufficient. In fact, a study conducted in February of 2017 found South Korea had the worst air quality of all the advanced nations of the Organization for Economic Cooperation and Development. There are also constant issues about food safety. Nonetheless, until now, environmental policies have been pushed out from priority than other policies, which seems to be due to the lack of clear value of policy criteria. It is necessary to recognize the environment as the concept of human rights related to the right to life that violates

the right to health directly to the people, and to change the perspective on environmental policy and make a meaningful policy. Therefore, this study will propose policy direction based on human rights through case study.

2.2. Necessity of the study

In order to advance the understanding of the environmental industry and the international norms which is the Paris Convention, the Nagoya Protocol, etc. and to actively respond to human rights in the future environment, Republic of Korea needs to strengthen its capacity to protect human rights. Therefore, It is necessary to suggest guidelines for establishment of national human rights policy, and constitutional right about environment. it will be based on conflict mediation in development and environment preservation, human environment and human rights to be protected, and the basic theories of human rights protection in advanced societies leading to the establishment of human environment and policy. In addition, since the environmental right based on human rights is a universal basic right to pursue the right to live in the future, it is necessary to conceptualize it as a life-friendly human right through the establishment of academic theories and advanced case studies. Especially, in the case of the atmospheric environment problem, the situation has already become serious. High concentrations in the air of PM 2.5 - fine particulate matter that can get deep in people's lungs - is a relatively common occurrence in Republic of Korea. Fine dust is a potential cause of respiratory diseases and increases the risk of cancer. In the case, it is most

important to guarantee the health of the citizens. Republic of Korea is one of the most densely populated countries in the world with over population density (persons/㎢) over 515. This suggests that the number of people affected by the fine dust per unit area is very high. In addition, food safety is a serious problem. Despite the fact that safe food is associated with the basic right of human life, food safety-related incidents occur annually. Whenever an incident occurs, people are anxious because of government's late response and great damage, so some values are required for policy making that puts people's safety and health first. Therefore, it is time to the government of Republic of Korea recognizes the seriousness of human environmental problems and takes a more active action for improvement.

2.3. Scope and Method of the study

The environment is a common problem all over the world. Therefore, advanced case studies are meaningful. Especially in the city of Los Angeles, atmospheric air quality was the worst in the 1950s called smog city, but it maintains the best air quality at present. The United States conducted an advanced case study of the United States because it determined that it was possible because the approach to the realization of the right to the environment was approached from the level of justice. In 1982, the US Office of Environment (EPA) was established. In 1993, the National Environmental Advisory Committee was set up to co-ordinate the pre-

policy enforcement of environmental violations among ministries. Also, in 1994, President Clinton ordered executive orders (Executive Order No. 12898) that government agencies should consider environmental justice and human rights as a priority when setting up environmental policies. In addition, when designing the Clean Air Act, the National Ambient Air Quality Standard, and the Regional Haze Rule for the elimination of air pollution, it has been enforced strong regulations that reflect the viewpoint of the national health protection. The United States has also implemented human rights in solving environmental problems through the consideration of the human rights of local residents based on human environment and collaboration with environmental organizations (including human rights organizations) In the first place. In addition, the United States has enacted Food safety modernization act (FSMA), and there are many specialized agencies and cooperating institutions related to food safety. It is also known to set strict standards for food safety.

Therefore, this study focused on fine dust and food safety, which are considered to be the most serious human environmental problems in Republic of Korea. The biggest problem with these problems was the value of the policy direction, so this study introduced about the concept of the environment and human rights. It also introduced the US legislation and systems, introduced the California Environmental Justice Program, the US Environmental Health Monitoring System, and so on. The study conducted case studies on advanced cases in the United States about measures of fine dust and food safety. Finally, the case study was largely a

literature study, and it is combined theory and case studies and made suggestions for the Korean environment policy based on human rights.

3. Issue Diagnosis

3.1. Problems of Fine dust

3.1.1. Common Problems

Fine dust is a dust particle having a diameter smaller than 10 microns, which is caused by a vehicle, incineration or construction. Fine dust is a potential cause of respiratory illness and increases cancer incidence. Fine dust has a great negative effect on the respiratory system of humans, so it gives a sense of air pollution. Diseases caused by fine dust can range from respiratory diseases such as coughing to asthma attacks. The effect of fine dust on the respiratory system depends on the particle size of the dust. The smaller the particles are, the better they can penetrate the lungs. Since the lungs cannot filter out particles smaller than 10 microns, fine dusts like PM10 reach the lung to some extent.

Smaller particles can penetrate deeper into the lungs, so ultrafine particles (less than 0.1 μm in diameter) can penetrate the alveoli and break down very slowly or become entrapped (silicosis). According to medical research, an increase in the atmospheric PM10 concentration by 10 μg / m3 would greatly increase the incidence of respiratory illnesses by 0.5-5.7% and the mortality rate from 0.2% to 1.6%. A fine dust cohort study conducted in Germany in 2001-2004 observed a

mortality rate of about 9% per 10 μg / m3 of fine dust. In addition, there is no fine dust concentration harmless to human body due to linear correlation. In the European Union (EU), the fine dust exposure has announced that human life expectancy will be shortened by at least one year.

Recent studies have shown that PM2.5 fine dusts are particularly dangerous to human health as compared to conventional dusts. Therefore, future fine dust measurement and measurement standards are expected to be concentrated on these dust particles. In addition, indoor air pollution, as well as external fine dust, will be more important because real people spend most of their time indoors.

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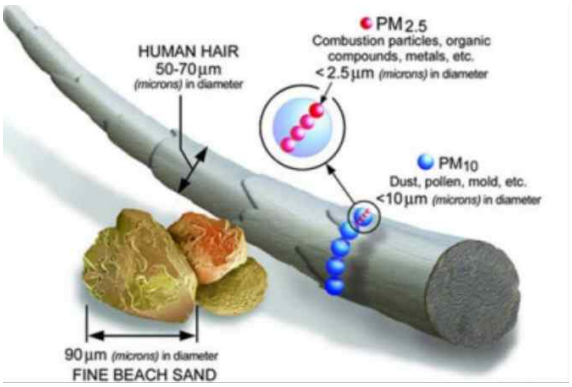
<td> 
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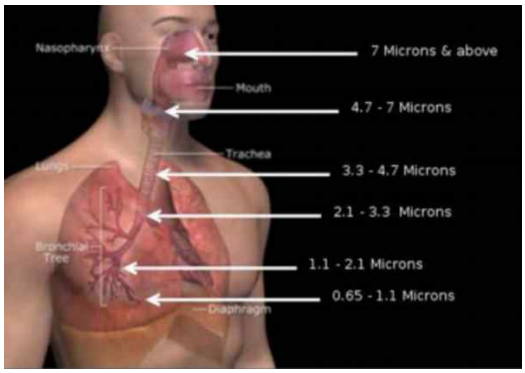
<td> 
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Size of ultrafine dust[3]</td>
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Locations that can penetrate the body by size of fine dust[4]</td>
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[3] Retrieved from http://www.indoorairqualitytestingdallas.com/indoor-air-quality-testing-pm2-5-ultrafine-particles-unsafe-hazardous-dallas-fort-worth/

[4] 한진석, (2015), *노후경유차 운행제한개선대책방안연구*, 한국자동차환경협회

Ultra-fine particles (UFP) are in the nanoscale range of 100 nanometers or less (0.1 microns) just below the PM2.5 FINE particle size range and they can penetrate though the membranes of cells and migrate to distant organs such as the brain. An example is Diesel Particulate Matter (DPM) which are essentially soot (carbon) but with carcinogens such as benzopyrenes adsorbed onto the particle which makes it a potential physio-chemical toxin. Benzopyrenes are considered harmful because they can intercalate (insert themselves) in between the nitrogenous bases of DNA and thereby interfere with self-replication and protein production by transcription errors.[5]

3.1.2. Analysis of vulnerable tier and area

Fine dust containing harmful substances such as heavy metals may have a high concentration and an impact on human health. Recent studies have shown that children are more susceptible to fine dust than adults and that 30,000 deaths occur annually in Korea and Japan due to fine dust from China.

In fact, the number of respirations for one minute is 20 times for children, while adult's breathing is 12 times. The volume of respirations per kilogram of body weight is 200 liters for adults, while 450 liters for 4 years old and 600 liters for under 1 year old. In other words, the physical conditions of children are inevitably vulnerable to fine dust. In addition, children can still develop diseases such as

[5] Retrieved from http://www.indoorairqualitytestingdallas.com/indoor-air-quality-testing-pm2-5-ultrafine-particles-unsafe-hazardous-dallas-fort-worth/

growth and developmental delays, further attention deficit hyperactivity disorder, childhood obesity, and gynecomastia when exposed to fine dust because the brain is still in the developmental stage. The World Health Organization says more than 600,000 children under 15 years of age worldwide are dying from airborne toxic substances every year, emphasizing that polluted air is particularly threatening to children's health. One in ten children under age 5 die from respiratory illness due to polluted air. Children are breathing faster than children and inhale more pollutants. Children are smaller than adults, so it is also vulnerable to pollutants from near the surface. Sulfates and black carbon that penetrate deeply into the lungs and cardiovascular system are typical ultrafine dusts. These substances cause asthma and childhood cancer in children. Exposure to contaminated air also increases the risk of premature birth and premature birth.[6]

In addition, elderly people are also as vulnerable as children because of their relatively high impact on death and illness when exposed to fine dust. When the PM10 concentration increased by 10mg/m^3, the risk of death in the younger group was 0.34%, which was much higher at 0.64% in the elderly group. When the PM10 concentration increased by 10mg/m^3, respiratory disease patients aged 65 years and older increase by 8.84%. The correlation between the ultrafine dust concentration and risk of disease in the city of Seoul has been proved.[7] These

[6] World Health Organization Report, (2018)

[7] Korea Environmental Policy Research Institute data

problems create regional differences. For example, the distribution of nursing homes in Seoul and elderly care facilities, it can be seen that the nursing homes in Seoul are mainly concentrated in Gangseo-gu and Nowon-gu. Although elderly care facilities were relatively uniformly distributed, there were many nursing homes in Eunpyeong-gu, Nowon-gu and Songpa-gu. As a result of analyzing the distribution of people over 60 who are vulnerable to fine dust, the population of elderly people in their 60s or older in Seoul was mainly distributed in Gangbuk area such as Seodaemun-gu, Jongno-gu and Seongbuk-gu.

3.1.3. Implication

First of all, it should be recognized that the fine dust problem is a problem of the right to life and health of the people and should be placed in the priority of policy. Indeed, many studies have demonstrated the hazards of fine dust and, if serious, it leads to death. In particular, when designing policies, it is important not to be limited to formal indicators but to consider how they are actually affected. The influence of elderly and children in the same concentration of fine particles will usually be different from the influence of adults, and this phenomenon also happen other areas such as regions. Therefore, the government should be able to analyze the problems from a substantive standpoint. In addition, the government should strengthen procedural transparency, including disclosure of relevant information, and this should take precedence over other policies. it is also necessary to examine environmental feasibility even in areas that seem to be

unrelated to the environment, such as commercial and export areas, and always consider whether the fundamental human rights of life are not violated. This requires a well-structured database of vulnerable layers and regions.

3.2. Problems of Food safety

3.2.1. Common Problems

Food safety is threatened by numerous contaminants, which can originate from environmental pollution, such as toxic metals and organic halogenated compounds; chemicals used in the production of food, such as pesticides and veterinary drugs; contaminants formed during food production and cooking; contaminants arising from food packaging, or natural toxins in food. Consumers' perceptions of food-related risks have recently been investigated in the 2010 Eurobarometer. The highest concern was reported for pesticides in fruit, vegetables and cereals, with 72% of the respondents being very or fairly worried. Somewhat fewer people were worried about residues like antibiotics and hormones in meat (70%), pollutants like mercury and dioxins (69%), food poisoning from bacteria (62%) or putting on weight (47%).[8]

Adverse effects of environmental contaminants may be displayed as developmental toxicity and endocrine disruption, with fetuses and children being vulnerable target groups. One contaminant, which has attracted much attention, is

[8] NCBI, Retrieved from https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3305716/

bisphenol A (BPA) and there is a scientific controversy about the low-dose health risks of BPA. BPA is used in the production of polycarbonate plastics and epoxy resins. Human exposure is mainly from packaged food and beverages. BPA binds to estrogen receptors and also acts through other mechanisms on endocrine function. We have investigated effects of BPA on steroidogenic pathways in the human adrenocortical cell line H295R. Secretion of steroidogenic hormones and intermediates were affected at non-toxic levels of BPA. The effects were mediated by inhibition of CYP17 and CYP21 and expressions of steroidogenic genes were downregulated. This may be an additional mechanism behind the endocrine disruptive effects of BPA.

One of the greatest challenges in toxicology today is in predicting the risks associated with chemical mixtures. The exposure to contaminants via the diet occurs as a mixture rather than as individual compounds. Thus, food safety is to a high extent dependent on possibilities to predict risks from mixtures.

3.2.2. Food Safety Status in Republic of Korea

In April 2008, the Korean government announced the outcome of the United States-Republic of Korea beef negotiation, which included imports of dangerous parts of mad cow disease, which became the biggest issue related to food. The public anxiety about the risk of mad cow disease has been amplified, and candlelight rallies with more than 1 million citizens have lasted for three months. Therefore, the distrust of national policies such as the beef quarantine standards of

the government, food safety management began to increase, and the government hardly considered the step of establishing confidence in the public in the policy promotion process. The government was also criticized for failing to provide accurate information.

Thereafter, in 2017 there was an issue related to insecticide egg. In Europe, fipronil-contaminated eggs and egg products were circulated, and in August 2017 eggs produced from Korea were found to be contaminated with fipronil. As the cause became known as pesticide use, the distrust of the standard policy on pesticides spread. Not only this, there has been various food-related incidents such as hamburgers causing disable, the occurrence of insects in snacks, etc. This situation has caused consumers to feel anxiety about food safety, and the public interest in basic human environment Is increasing.

Therefore, the Government of Republic of Korea has enacted the Food Sanitation Act and introduced various certification mark systems for safe food. In addition, the government has established a food safety policy committee and strives to promote effective food safety policy. The Ministry of Food and Drug Safety manages the safety of agricultural, marine products and processed foods, livestock products, foods including alcohol, health functional foods, drugs, drugs, cosmetics, quasi-drugs and medical devices. In the case of Republic of Korea, there is a high concentration of work related to food safety in a single ministry, a lack of civic cooperation, and above all, consumers are anxious due to the lack of transparency of late response and information disclosure.

3.2.3. Implication

Since food acts directly on people, it is closely related to the right to life and the right to health. Prevention is of the utmost importance in these matters. Currently, Republic of Korea lacks preventive policies. Also, when a specific incident occurs, response is delayed, information disclosure is unclear, and communication with the citizen is inadequate. In designing policies, it is necessary to have a human rights perspective that places people's health and safety at the forefront, and strengthened policies for the management of imported goods are needed. Republic of Korea seems to have little problem about the absolute amount of food. However, there is still insufficient safety concerns on food that can lead to death, so advanced case studies and policy directions are required.

4. Concepts of Environment Rights

4.1. Relationship between Human rights and Environment

The concept of human rights is changing according to historical, political, and social conditions according to the trend of the times and the desire of the public for the times. In 1776 the American Declaration of Independence and the French Revolution of 1789 brought up the modern concept of human rights, and the notion that all human beings were born equal and inalienable to God were begun to be used. Since then, the Universal Declaration of Human Rights, proclaimed at the UN General Assembly in 1948, has begun to reveal full human rights. The

Universal Declaration of Human Rights provides common human rights standards to be pursued by all human beings and nations, despite differences in politics, economy, culture and religion.

French legal scholar Karel Vasak suggests that human rights have developed in three major forms. The first generation of human rights is to protect individuals' political freedom from the infringement of the state, and the second generation of human rights means social fundamental rights that require the active involvement of the state. Third-generation human rights are rights related to basic social life of man, apart from non-political rights. The contents of the third-generation human rights include economic development rights, the right to enjoy a healthy environment, and the right to peace.

It is the Stockholm Declaration adopted by the United Nations Conference on the Human Environment (1972) that the international debate on environmental issues and human rights began in earnest. The declaration states that environmental change can threaten human rights. It was first discussed globally. Emphasizing that the environment is very important for enjoying basic life including the right to survive, emphasizing the need for environmental protection linked to each other for the full realization of human rights. Since then, the close relationship between the environment and human rights has been emphasized in the sustainable development presented in 1987 by the World Commission on Environment and Development, or the Rio Declaration of the United Nations Conference on Environment and Development in 1992.

Environmental rights are human rights. Environmental rights mean access to the unspoiled natural resources that enable survival, including land, shelter, food, water and air. They also include more purely ecological rights, including the right for an individual to enjoy an unspoiled landscape. Environmental rights include political rights like rights for indigenous peoples and other collectivities, the right to information and participation in decision-making, freedom of opinion and expression, and the right to resist unwanted developments.[9]

More than 2 million annual deaths and billions of cases of diseases are attributed to pollution. All over the world, people experience the negative effects of environmental degradation ecosystems decline, including water shortage, fisheries depletion, natural disasters due to deforestation and unsafe management and disposal of toxic and dangerous wastes and products. Indigenous peoples suffer directly from the degradation of the ecosystems that they rely upon for their livelihoods. Climate change is exacerbating many of these negative effects of environmental degradation on human health and wellbeing and is also causing new ones, including an increase in extreme weather events and an increase in spread of malaria and other vector born diseases. These facts clearly show the close linkages between the environment and the enjoyment of human rights, and justify an integrated approach to environment and human rights.[10]

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[9] Retrieved from https://www.foei.org/what-we-do/environmental-rights-human-rights

[10] UN Environment, Retrieved from http://web.unep.org/divisions/delc/human-rights-and-environment

4.2. History and Principles of Environmental human rights

The draft of the Principles on Human Rights and the Environment of the UN Commission on Human Rights submitted in 1994 was not adopted as a formal convention but referred to environmental human rights. The ecologically sound environment, sustainable development, and peace have an inseparable relationship with human rights, and Article 2 states that "everyone has the right to a safe, healthy and ecologically sound environment" have. In addition, the following rights are mentioned; Freedom from discrimination in relation to actions affecting the environment and decision-making (Article 3), the right to an environment appropriate to fairly satisfy the needs of the present generation, The right not to impair the same rights of generations (Article 4), the right to be free from pollution, environmental deterioration and adverse environmental effects and threats to life, health, life, welfare or sustainable development The right to protect and preserve the area (Article 6), the right to have the highest possible level of health (without regard to environment), The right to safe and healthy food and water (Article 8), the right to a safe and hygienic working environment (Article 9), the safe, healthy and ecologically sound (Article 10), the right to the equitable benefits of conservation and sustainable use of nature and natural resources (Article 13), the management of land, territory, natural resources and the traditional life And the rights of indigenous peoples who maintain the system (Article 14). Procedural rights include the right to access information about the environment (Article 15),

the dissemination of information and ideas related to the environment, the right to express opinions (Article 16), the right to environment and human rights education (Article 17), The right to association for environmental protection (Article 19), and the right to compensation and compensation through administrative and judicial procedures (Article 20)[11].

In Europe, a report on the "Additional Protocol to the European Convention on the Rights of the Environment" was adopted at the General Assembly of the European Council in 2009. It should be noted that not only basic rights but also obligations of citizens who live in a healthy environment should be considered here. In the Americas, the 1988 Additional Protocol to the Americas Convention on Human Rights in the Field of Economic, Social and Cultural Rights (Sanbarbador) states that "Everyone has the right to live in a healthy environment, And the right to use it. In relation to the right to health, it is defined as "everyone enjoys the highest level of physical, mental and social welfare."[12] In Korea, environmental rights were introduced into the 1980 Constitution.

The Stockholm Declaration, and to a lesser extent the Rio Declaration, show how the link between human rights and dignity and the environment was very prominent in the early stages of United Nations efforts to address environmental

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[11] 남상민, (2007), *인간 중심적 관점을 넘어서야 할 환경권*, 월간 세상을 두드리는 사람

[12] 송정은, (2013), *기후변화와 인권; 환경 인권 법리의 적용가능성과 향후 과제*, 강원대학교 대학원 법학과 석사학위논문

problems. That focus has to some extent faded away in the ensuing efforts by the international community to tackle specific environmental problems, with more focus being placed on developing policy and legal instruments, both at the international and national levels, targeted at the environmental problems that were emerging, through a series of some mechanisms. Although the foundation of developing such mechanisms laid on the considerations made at the time of the Stockholm Conference, the human rights dimension is not made explicit in most of these instruments.

However, there have been several calls from different UN bodies to address the issues of human rights and environment in conjunction. The Commission on Human Rights (now transformed into the Human Rights Council) by Resolution 2005/60 requested the High Commissioner and invited UNEP, UNDP and other relevant bodies and organizations, within their respective mandates and approved work programs and budgets. And the Board of Directors mentioned the following. ″It is for to continue to coordinate their efforts in activities relating to human rights and the environment in poverty eradication, post-conflict environmental assessment and rehabilitation, disaster prevention, post-disaster assessment and rehabilitation." The UN reform process also calls for the integration of human rights in all of the organization’s work.

In a series of resolutions, the former United Nations Commission on Human Rights and the United Nations Human Rights Council have drawn attention to the

relationship between a safe and healthy environment and the enjoyment of human rights. next, the Human Rights Council in its resolution 7/23 of March 2008 and resolution 10/4 of March 2009 focused specifically on human rights and climate change, noting that climate change-related effects have a range of direct and indirect implications for the effective enjoyment of human rights. These resolutions have raised awareness of how fundamental the environment is as a prerequisite to the enjoyment of human rights.[13]

The Human Rights Council recognized the need to clarify some aspects of its human rights obligations related to the environment and the Board requested the Special Rapporteur to work with governments, human rights institutions, civil society organizations and others to continue to study those obligations. In this regard, the special rapporteur (John H. Knox) presented a report on the Fundamental Principles on Human Rights and the Environment to the 37th Board of Directors. The 16 principles reported are as follows.[14]; Framework principle 1 - States should ensure a safe, clean, healthy and sustainable environment in order to respect, protect and fulfil human rights. Framework principle 2 - States should respect, protect and fulfil human rights in order to ensure a safe, clean, healthy and sustainable environment. Framework principle 3 - States should prohibit

[13] UN Environment, Retrieved from http://web.unep.org/divisions/delc/human-rights-and-environment

[14] Retrieved from https://www.ohchr.org/EN/Issues/Environment/STEnvironment

discrimination and ensure equal and effective protection against discrimination in relation to the enjoyment of a safe, clean, healthy and sustainable environment. Framework principle 4 - States should provide a safe and enabling environment in which individuals, groups and organs of society that work on human rights or environmental issues can operate free from threats, harassment, intimidation and violence. Framework principle 5 - States should respect and protect the rights to freedom of expression, association and peaceful assembly in relation to environmental matters. Framework principle 6 - States should provide for education and public awareness on environmental matters. Framework principle 7 - States should provide public access to environmental information by collecting and disseminating information and by providing affordable, effective and timely access to information to any person upon request. Framework principle 8 - To avoid undertaking or authorizing actions with environmental impacts that interfere with the full enjoyment of human rights, States should require the prior assessment of the possible environmental impacts of proposed projects and policies, including their potential effects on the enjoyment of human rights. Framework principle 9 - States should provide for and facilitate public participation in decision-making related to the environment, and take the views of the public into account in the decision-making process. Framework principle 10 - States should provide for access to effective remedies for violations of human rights and domestic laws relating to the environment. Framework principle 11 - States should establish and maintain substantive environmental standards that are non-discriminatory, non-

retrogressive and otherwise respect, protect and fulfil human rights. Framework principle 12 - States should ensure the effective enforcement of their environmental standards against public and private actors. Framework principle 13 - States should cooperate with each other to establish, maintain and enforce effective international legal frameworks in order to prevent, reduce and remedy transboundary and global environmental harm that interferes with the full enjoyment of human rights. Framework principle 14 - States should take additional measures to protect the rights of those who are most vulnerable to, or at particular risk from, environmental harm, taking into account their needs, risks and capacities. Framework principle 15 - States should ensure that they comply with their obligations to indigenous peoples and members of traditional communities, including by: (a) Recognizing and protecting their rights to the lands, territories and resources that they have traditionally owned, occupied or used; (b) Consulting with them and obtaining their free, prior and informed consent before relocating them or taking or approving any other measures that may affect their lands, territories or resources; (c) Respecting and protecting their traditional knowledge and practices in relation to the conservation and sustainable use of their lands, territories and resources; (d) Ensuring that they fairly and equitably share the benefits from activities relating to their lands, territories or resources. Framework principle 16 - States should respect, protect and fulfil human rights in the actions they take to address environmental challenges and pursue sustainable

development.[15] The special rapporteur issued a press release on 5 March 2018 and called for global recognition of the right to safe and healthy environment.

4.3. Substantive rights and Procedural rights on Environmental rights

Environmental rights mean any proclamation of a human right to environmental conditions of a specified quality. Human rights and the environment are intertwined. Fundamental rights cannot be enjoyed without a safe, clean and healthy environment whilst sustainable environmental governance cannot exist without the establishment of and respect for human rights. This relationship is increasingly recognized yet paradoxically environmental rights are increasingly violated.

Environmental rights are composed of substantive rights (fundamental rights) and procedural rights (tools used to achieve substantial rights).

Substantive rights include those in which the environment has a direct effect on the existence or the enjoyment of the right itself. Substantive rights comprise of: civil and political rights, such as the rights to life and liberty, freedom of expression, freedom of religion; cultural and social rights such as rights to health, water, food, and culture; and collective rights affected by environmental degradation, such as

[15] John H. Knox, (2018), *Framework Principles on Human Rights and the Environment (A/HRC/37/59) In its resolution 28/11*, United Nations Human rights Office of the High Commissioner.

the rights of indigenous peoples which is recognized in human rights and environment law.

Procedural rights are a key point of intersection between environmental and human rights law; they prescribe formal steps to be taken in enforcing legal rights. Procedural rights include rights to free, prior and informed consent, access to information, participation in decision-making, and access to justice. These rights are found in both environmental and human rights instruments and have been interpreted under both regimes to provide broad protections for environmental interests.[16]

When the environment is combined with the concept of human rights, we must discuss substantive rights beyond procedural rights. For instance, this type of environmental rights violation is a case in which the damage to air pollution in a low-income class residential area is more severe or the countermeasures against it are relatively insufficient. In addition, even if the vulnerable groups such as elderly, women, pregnant women, children, etc. are exposed to the same concentration of air pollution, they may be harmful to the general group. It cannot be guaranteed.

Procedural rights are also important. As an example of air pollution, the main factors that define procedural rights and air pollution are information accessibility,

[16] United Nations Environment, Retrieved from https://www.unenvironment.org/explore-topics/environmental-rights-and-governance/what-we-do/advancing-environmental-rights/what

and the real decision-making power.[17] If an individual or a group directly or indirectly affected by air pollution damage is excluded from the decision-making process related to the occurrence of air pollution, or if participation is limited or information is not sufficiently disclosed, sufficient discussion opportunities will be provided for air pollution and damage control measures. If not, procedural rights can be seen as violating the human rights of the environment.

In terms of legal issues, there are three main aspects of the relationship between human rights and environmental protection. The environment as a pre-requisite for the enjoyment of human rights; implying that human rights obligations of States should include the duty to ensure the level of environmental protection necessary to allow the full exercise of protected rights, Certain human rights, especially access to information, participation in decision-making, and access to justice in environmental matters, as essential to good environmental decision-making; implying that human rights must be implemented in order to ensure environmental protection, and The right to a safe, healthy and ecologically-balanced environment as a human right in itself.[18]

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[17] 유정민, (2017), *밀양 송전탑·영덕 신규 핵발전소 부지 선정 과정을 통해 본 절차적 환경정의 문제와 제도개선 방안*, 환경정의 법·제도 개선방안 포럼 자료집

[18] UN Environment, Retrieved from https://www.unenvironment.org/explore-topics/environmental-rights-and-governance/what-we-do/advancing-environmental-rights/what

4.4. Human rights obligations related to the environment[19]

Human rights to a healthy environment have already become a widely used concept worldwide. Therefore, it is important to accept relevant rights and observe human rights obligations. By following the human rights norms, not only promoting the realization of all human rights, including human dignity, but also helping to strengthen policy decisions. It can also ensure that people get information and that people express their opinions freely. This will greatly help to ensure that human life is improved. In this regard, it will be added a detailed explanation based on the report submitted by the Special Rapporteur of United Nations Human Rights in 2018.

An unusual aspect of the development of human rights norms relating to the environment is that they have not relied primarily on the explicit recognition of a human right to a safe, clean, healthy and sustainable environment — or, more simply, a human right to a healthy environment. Although this right has been recognized, in various forms, in regional agreements and in most national constitutions, it has not been adopted in a human rights agreement of global application, and only one regional agreement, the African Charter on Human and Peoples' Rights, provides for its interpretation in decisions by a review body. Treaty bodies, regional tribunals, special rapporteurs and other international

[19] John Knox, (2018), *Report of the Special Rapporteur on human rights obligations on the enjoyment of a safe, clean, healthy and sustainable environment*, United Nations Human rights

human rights bodies have instead applied human rights law to environmental issues by "greening" existing human rights, including the rights to life and health.

Environmental harm interferes with the full enjoyment of a wide spectrum of human rights, and the obligations of States to respect human rights, to protect human rights from interference and to fulfil human rights apply in the environmental context no less than in any other. Explicit recognition of the human right to a healthy environment thus turned out to be unnecessary for the application of human rights norms to environmental issues. At the same time, it is significant that the great majority of the countries in the world have recognized the right at the national or regional level, or both.

The Special Rapporteur recommended that the Human Rights Council consider supporting the recognition of the right in a global instrument. A model could be the rights to water and sanitation, which, like the right to a healthy environment, are not explicitly recognized in United Nations human rights treaties but are clearly necessary to the full enjoyment of human rights. In 2010, in its resolution 64/292, the General Assembly recognized "the right to safe and clean drinking water and sanitation as a human right that is essential for the full enjoyment of life and all human rights". General Assembly could adopt a similar resolution that recognizes the right to a safe, clean, healthy and sustainable environment, another right that is essential for the full enjoyment of life and all human rights. States may be understandably reluctant to recognize a "new" human right if its content is uncertain. To be sure that a right will be taken seriously, it is important to be clear

about its implications. The Special Rapporteur notes that one of the primary goals of his work on the mandate has been to clarify what human rights law requires with respect to environmental protection, including through the mapping project and these framework principles. As a result, the "human right to a healthy environment" is not an empty vessel waiting to be filled; on the contrary, its content has already been clarified, through recognition by human rights authorities that a safe, clean, healthy and sustainable environment is necessary for the full enjoyment of the human rights to life, health, food, water, housing and so forth. Even without formal recognition, the term "the human right to a healthy environment" is already being used to refer to the environmental aspects of the entire range of human rights that depend on a safe, clean, healthy and sustainable environment.

The report said that states should respect, protect and fulfil human rights in the actions they take to address environmental challenges and pursue sustainable development. The obligations of States to respect, protect and fulfil human rights apply when States are adopting and implementing measures to address environmental challenges and to pursue sustainable development. That a State is attempting to prevent, reduce or remedy environmental harm, seeking to achieve one or more of the Sustainable Development Goals, or taking actions in response to climate change does not excuse it from complying with its human rights obligations. Pursuing environmental and development goals in accordance with human rights norms not only promotes human dignity, equality and freedom, the benefits of fulfilling all human rights. It also helps to inform and strengthen

policymaking. Ensuring that those most affected can obtain information, freely express their views and participate in the decision-making process, for example, makes policies more legitimate, coherent, robust and sustainable. Most important, a human rights perspective helps to ensure that environmental and development policies improve the lives of the human beings who depend on.

4.5. Air pollution and Environmental human rights

Air pollution has long been an environmental and health problem - but now it should now be viewed as a human rights issue as well, according to the U.N. special rapporteur on human rights and the environment. Air pollution is leading to 7 million premature deaths a year around the world, including 600,000 among children. To put that 7 million figures in context, that's more deaths every year than the combined total of war, murder, tuberculosis, HIV, AIDs and malaria. It's a global health crisis that really needs to be addressed.[20] Air pollution violates the rights to life, to health, the rights of the child, and also violates the right to live in a healthy and sustainable environment.[21]

The reason of problems has been overlooked in many places is that the most visible air pollution often has been cleaned up, leaving behind pollution that is

[20] Retrieved from https://www.reuters.com/article/us-health-pollution-rights/time-to-see-air-pollution-as-a-human-rights-threat-un-idUSKCN1QL268

[21] In this regard, a report (2018), discussed in the Human Rights Council, provides a set of measures the government can take to reduce air pollution

harder to see and so easier to ignore. It is addressed some types of air pollution in some places, and so a lot of the air pollution that people are dealing with today people cannot really smell it, people cannot see it. It's these really microscopic particles that people are inhaling into their lungs.

Air pollution is not easy to identify the cause of the pollution, the area where it occurs, and the target of the damage. Pollution of automobile exhaust gas causes damage at the same time. In this respect, air pollution focuses on procedural rights rather than substantive aspects of environmental human rights. A systematic review of 108 individual studies of fine dust has shown that the risk of fine dust is higher in older people, women and low-income people.[22] Even if exposed to the same concentration of air pollution, damage may be unequal to each region or class depending on social, economic, biological, and policy factors. If there is inequality in socioeconomic dimension from the damage caused by air pollution, there is a need to approach air pollution management from the viewpoint of human rights. In particular, at present, the serious source of air pollution in Republic of Korea is super fine dust, the high concentration of PM 2.5, which is a particulate matter, is common in Korea. According to recent studies, the ratio of PM2.5 fine dust Because it acts harmful, ultrafine dust directly infringes on the health rights of the people. Therefore, government need to look at environmental issues from the

[22] 이종태, (2017), *대기오염 노출 위험군 특성과 정책관리 제언*, 환경정의 법·제도 개선방안 포럼 자료집

viewpoint of human rights, establish policies, make decision-making processes, and execute them with the recognition to guarantee the human rights.

4.6. Food safety and Environmental human rights

The right to food is a human right protecting the right for people to feed themselves in dignity, implying that sufficient food is available, that people have the means to access it, and that it adequately meets the individual's dietary needs. The right to food protects the right of all human beings to be free from hunger, food insecurity and malnutrition.[23] The Special Rapporteur on the Right to Food, Mr. De Schutter, urged the establishment in law of the right to food, so that it can be translated into national strategies and institutions. The United Nations' Article 11 on the Right to Adequate Food suggests several implementation mechanisms. The Special Rapporteur on the Right to Food, Mr. De Schutter, urged the establishment in law of the right to food, so that it can be translated into national strategies and institutions. The United Nations' Article 11 on the Right to Adequate Food suggests several implementation mechanisms.[24]

Republic of Korea is stable about the issue of sufficient food, but food safety issues are constantly being raised. Food safety is essential. Food quality and safety

[23] Ziegler, (2012), *What is the right to food?*

[24] Committee on Economic, Social and Cultural Rights, (1999), *General Comment No. 12. : The right to adequate food (Art. 11)*, United Nations.

are important aspects of the right to food. Food safety implies the absence or safe levels of contaminants, bacteria, naturally occurring toxins or any other substance that may make food injurious to health. To protect the health of consumers and ensure fair practices in the food trade, FAO and the World Health Organization established the Codex Alimentarius Commission in 1962. The commission is an intergovernmental body, currently comprising 165 members states, that prepares international food standards and other recommendations to promote food quality and safety. The Codex Alimentarius, or food code, has become the global reference point for consumers, food producers and processors, national food control agencies and the international food trade. It offers a framework for states to use in establishing national food control legislation and systems to protect the rights of consumers to safe and fairly marketed foods.[25]

Therefore, food safety issues should be recognized as the right to life and health. This is an important aspect of rights to food, consumers should always be able to claim this right, and the government should take the lead in protecting the human rights of these people.

5. Case Studies in U.S.

[25] Food and Agriculture Organization (FAO) of The United Nations, Retrieved from http://www.fao.org/FOCUS/E/rightfood/right2.htm

5.1. U.S. environmental laws and institutions

5.1.1. Executive Order No. 12898

Executive Order 12898 is that federal actions to address environmental justice in minority populations and low-income populations. The order was issued by President William J. Clinton in 1994. Its purpose is to focus federal attention on the environmental and human health effects of federal actions on minority and low-income populations with the goal of achieving environmental protection for all communities. The E.O. directs federal agencies to identify and address the disproportionately high and adverse human health or environmental effects of their actions on minority and low-income populations, to the greatest extent practicable and permitted by law. The order also directs each agency to develop a strategy for implementing environmental justice. The order is also intended to promote nondiscrimination in federal programs that affect human health and the environment, as well as provide minority and low-income communities access to public information and public participation. In addition, the E.O. established an Interagency Working Group (IWG) on environmental justice chaired by the EPA Administrator and comprised of the heads of 11 departments or agencies and

several White House offices.[26] Each Federal agency must make achieving environmental justice part of its mission by identifying and addressing, as appropriate, disproportionately high and adverse human health, environmental, economic and social effects of its programs, policies, and activities on minority and low-income populations, particularly when such analysis is required by NEPA. The EO emphasizes the importance of NEPA's public participation process, directing that each Federal agency shall provide opportunities for community input in the NEPA process. Agencies are further directed to identify potential effects and mitigation measures in consultation with affected communities. The E.O. requires agencies to work to ensure effective public participation and access to information. Thus, within its NEPA process and through other appropriate mechanisms, each federal agency should, translate crucial public documents, notices and hearings, relating to human health or the environmental for limited English speaking populations when it is practical and appropriate.[27]

The Presidential Memorandum accompanying the Order underscores certain provisions of existing law that can help ensure that all communities and persons across this nation live in a safe and healthful environment. In its role under E.O.

[26] United States Environmental Protection Agency, Retrieved from https://www.epa.gov/laws-regulations/summary-executive-order-12898-federal-actions-address-environmental-justice

[27] U.S. Department of Homeland Security (FEMA), Retrieved from https://www.fema.gov/executive-order-12898-environmental-justice-low-income-minority-populations-1994

12898, EPA has generally defined environmental justice as the “fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income, with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies.” Other federal departments and agencies may tailor their definition of environmental justice to their respective missions. As such, the United States is taking strong steps to prioritize environmental justice and human rights when government departments formulate environmental policies.

5.1.2. Clean Air Act

November 15, 1990 marks a milestone in Clean Air Act history, the signing of the 1990 Amendments. These amendments set the stage for protecting the ozone layer, reducing acid rain and toxic pollutants, and improving air quality and visibility. Actions to implement the Clean Air Act have achieved dramatic reductions in air pollution, preventing hundreds of thousands of cases of serious health effects each year. The Act calls for states and EPA to solve multiple air pollution problems through programs based on the latest science and technology information. The Clean Air Act requires EPA to set National Ambient Air Quality Standards (NAAQS) for six criteria pollutants; particle pollution (also known as particulate matter) is one of these. EPA works with partners at state, local, and tribal air quality agencies to meet these standards. The lists provide a collection of

rules and guidance documents for implementation the more recent particulate matter (PM) standards.[28]

The Clean Air Act (42 U.S.C. § 7401) is a United States federal law designed to control air pollution on a national level. It is one of the United States' first and most influential modern environmental laws, and one of the most comprehensive air quality laws in the world.[29] As with many other major U.S. federal environmental statutes, it is administered by the U.S. Environmental Protection Agency (EPA), in coordination with state, local, and tribal governments. Its implementing regulations are codified at 40 C.F.R. Sub-chapter C, Parts 50-97.

The 1955 Air Pollution Control Act was the first U.S. federal legislation that pertained to air pollution; it also provided funds for federal government research of air pollution. The first federal legislation to actually pertain to "controlling" air pollution was the Clean Air Act of 1963.[30] The 1963 act accomplished this by establishing a federal program within the U.S. Public Health Service and authorizing research into techniques for monitoring and controlling air pollution.

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[28] Retrieved from https://www.epa.gov/pm-pollution/particulate-matter-pm-implementation-regulatory-actions

[29] Natural Resources Defense Council, *Environmental Laws and Treaties*, Retrieved from https://www.nrdc.org/how-we-work

[30] Shekhtman, Lonnie, *"Beijing smog: What makes some cities cleaner than others?"*, Christian Science Monitor.

It was first amended in 1965, by the Motor Vehicle Air Pollution Control Act, which authorized the federal government to set required standards for controlling the emission of pollutants from certain automobiles, beginning with the 1968 models. A second amendment, the Air Quality Act of 1967, enabled the federal government to increase its activities to investigate enforcing interstate air pollution transport, and, for the first time, to perform far-reaching ambient monitoring studies and stationary source inspections. The 1967 act also authorized expanded studies of air pollutant emission inventories, ambient monitoring techniques, and control techniques. While only six states had air pollution programs in 1960, all 50 states had air pollution programs by 1970 due to the federal funding and legislation of the 1960s.[31] Amendments approved in 1970 greatly expanded the federal mandate, requiring comprehensive federal and state regulations for both stationary (industrial) pollution sources and mobile sources. It also significantly expanded federal enforcement. Also, EPA was established on December 2, 1970 for the purpose of consolidating pertinent federal research, monitoring, standard-setting and enforcement activities into one agency that ensures environmental protection.[32]

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[31] John Bachmann, David Calkins, Margo Oge, (2017), *Cleaning the Air We Breathe: A Half Century of Progress*, EPA Alumni Association

[32] Rinde, Meir, (2017), *Richard Nixon and the Rise of American Evironmentalism,* Distillations

Further amendments were made in 1990 to address the problems of acid rain, ozone depletion, and toxic air pollution, and to establish a national permit program for stationary sources, and increased enforcement authority. The amendments also established new auto gasoline reformulation requirements, set Reid vapor pressure (RVP) standards to control Evaporative emissions from gasoline, and mandated new gasoline formulations sold from May to September in many states. Reviewing his tenure as EPA Administrator under President George H. W. Bush, William K. Reilly characterized passage of the 1990 amendments to the Clean Air Act as his most notable accomplishment.[33]

The Clean Air Act was the first major environmental law in the United States to include a provision for citizen suits. Numerous state and local governments have enacted similar legislation, either implementing federal programs or filling in locally important gaps in federal programs.

Since the initial establishment of six mandated criteria pollutants (ozone, particulate matter, carbon monoxide, nitrogen oxides, sulfur dioxide, and lead), advancements in testing and monitoring have led to the discovery of many other significant air pollutants.

[33] EPA Alumni Association: EPA Administrator William K. Reilly describes why passage of the 1990 Clean Air Act amendments was vitally important. Reflections on US Environmental Policy

However, with the act in place and its many improvements, the U.S. has seen many pollutant levels and associated cases of health complications drop. According to the EPA, the 1990 Clean Air Act Amendments has prevented or will prevent:

	Year 2010 (cases prevented)	Year 2020 (cases prevented
Adult Mortality - particles	160,000	230,000
Infant Mortality - particles	230	280
Mortality - ozone	4,300	71,000
Chronic Bronchitis	54,000	75,000
Heart Disease - Acute Myocardial Infarction	130,000	200,000
Asthma Exacerbation	1,700,000	2,400,000
Emergency Room Visits	86,000	120,000
School Loss Days	3,200,000	5,400,000
Lost Work Days	13,000,000	17,000,000

< Figure 3>

The health benefits of the Clean Air Act programs

This chart shows the health benefits of the Clean Air Act programs that reduce levels of fine particles and ozone.

The 1970 Clean Air Act required states to develop State Implementation Plans for how they would meet new national ambient air quality standards by 1977.[34]

[34] EPA Alumni Association, *Early Implementation of the Clean Air Act of 1970 in California*

Although the 1990 Clean Air Act is a federal law covering the entire country, the states do much of the work to carry out the Act. The EPA has allowed the individual states to elect responsibility for compliance with and regulation of the CAA within their own borders in exchange for funding. For example, a state air pollution agency holds a hearing on a permit application by a power or chemical plant or fines a company for violating air pollution limits. However, election is not mandatory and in some cases states have chosen to not accept responsibility for enforcement of the act and force the EPA to assume those duties.

In order to take over compliance with the CAA the states must write and submit a state implementation plan (SIP) to the EPA for approval. A state implementation plan is a collection of the regulations a state will use to clean up polluted areas. The states are obligated to notify the public of these plans, through hearings that offer opportunities to comment, in the development of each state implementation plan. The SIP becomes the state's legal guide for local enforcement of the CAA. For example, Rhode Island law requires compliance with the Federal CAA through the SIP.[35] The SIP delegates permitting and enforcement responsibility to the state Department of Environmental Management (RI-DEM).

The federal law recognizes that states should lead in carrying out the Clean Air Act, because pollution control problems often require special understanding of local industries, geography, housing patterns, etc. However, states are not allowed

[35] Rhode Island General Law, Title 23, Chapter 23, Section 2

to have weaker pollution controls than the national minimum criteria set by EPA. EPA must approve each SIP, and if a SIP isn't acceptable, EPA can take over CAA enforcement in that state. For example, California was unable to meet the new standards set by the Clean Air Act of 1970, which led to a lawsuit and a federal state implementation plan for the state.[36]

The United States government, through the EPA, assists the states by providing scientific research, expert studies, engineering designs, and money to support clean air programs.

By promoting pollution reduction, the Clean Air Act can help reduce heightened exposure to air pollution among communities of color and low-income communities. Environmental researcher Dr. Marie Lynn Miranda notes that African American populations are "consistently over represented" in areas with the poorest air quality.[37] Dense populations of low-income and minority communities inhabit the most polluted areas across the United States, which is considered to exacerbate health problems among these populations.[38] High levels of exposure to air pollution is linked to several health conditions, including asthma,

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[36] EPA Alumni Association, *Early Implementation of the Clean Air Act of 1970 in California*

[37] Miranda, Marie Lynn; Edwards, Sharon E.; Keating, Martha H.; Paul, Christopher J, (2017), *"Making the Environmental Justice Grade: The Relative Burden of Air Pollution Exposure in the United States".* International Journal of Environmental Research and Public Health

[38] Massey, Rachel, (2004), *"Environmental Justice: Income, Race, and Health",* Tufts University Global Development And Environment Institute, Tufts University

cancer, premature death, and infant mortality, each of which disproportionately impact communities of color and low-income communities. The pollution reduction achieved by the Clean Air Act is associated with a decline in each of these conditions and can promote environmental justice for communities that are disproportionately impacted by air pollution and diminished health status.

The EPA analyzes violators of the Clean Air Act and addresses the violators accordingly. For companies or parties that do not comply with the act monetary penalties can be cited. Per day the EPA could fine civil administrators $37,500 per day, with a maximum of about 8 days; unless otherwise mandated by the EPA. For a field citation which is against federal facilities which are not abiding by EPA standards can get fines up to $7,500 per day.[39]

A 2017 study found that the Clean Air Act of 1970 led to an over 10 percent reduction in pollution ("ambient TSP levels") in counties that exceeded the pollution thresholds set by the Act in the three years after the regulation went into effect. The study found that this regulation-induced reduction in air pollution has caused affected workers to work more and earned one percent more in annual earnings. The authors estimate that cumulative lifetime income gain for each affected individual is approximately $4,300 in present value terms.[40]

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[39] US EPA, *"Clean Air Act (CAA) and Federal Facilities"*

[40] Isen, Adam; Rossin-Slater, Maya; Walker, W. Reed, (2017), *"Every Breath You Take—Every Dollar You'll Make: The Long-Term Consequences of the Clean Air Act of 1970",* Journal of Political Economy

In addition, because air quality across the United States improved; it is estimated 205,000 premature deaths and millions of other respiratory complications were prevented which resulted in an economic savings of $50 trillion versus the $523 billion invested to meet the Clean Air Act standard.

Mobile sources including automobiles, trains, and boat engines have become 99% cleaner for pollutants like hydrocarbons, carbon monoxide, nitrogen oxides, and particle emissions since the 1970s. The allowable emissions of volatile organic chemicals, carbon monoxide, nitrogen oxides, and lead from individual cars have also been reduced by more than 90%, resulting in decreased national emissions of these pollutants despite a more than 400% increase in total miles driven yearly.

Since the 1980s, 1/4th of ground level ozone has been cut, mercury emissions have been cut by 80%, and since the change from leaded gas to unleaded gas 90% of atmospheric lead pollution has been reduced.[41] A 2018 study found that the Clean Air Act contributed to the 60% decline in pollution emissions by the manufacturing industry between 1990 and 2008.[42]

5.1.3. FDA Food Safety Modernization Act

[41] Union of Concerned Scientists, *"The Clean Air Act"*

[42] Berkeley News, *"Environmental regulations drove steep declines in U.S. factory pollution"*.

The FDA Food Safety Modernization Act (FSMA) is transforming the nation's food safety system by shifting the focus from responding to foodborne illness to preventing it. Congress enacted FSMA in response to dramatic changes in the global food system and in our understanding of foodborne illness and its consequences, including the realization that preventable foodborne illness is both a significant public health problem and a threat to the economic well-being of the food system. FDA has finalized seven major rules to implement FSMA, recognizing that ensuring the safety of the food supply is a shared responsibility among many different points in the global supply chain for both human and animal food. The FSMA rules are designed to make clear specific actions that must be taken at each of these points to prevent contamination.[43] The legislation affects every aspect of the U.S. food system, from farmers to manufacturers to importers. It places significant responsibilities on farmers and food processors to prevent contamination—a departure from the country's reactive tradition, which has relied on government inspectors to catch tainted food after the fact The legislation requires food producers and importers to pay an annual $500 registration fee, which would help fund stepped-up FDA inspections, enforcement and related activities such as food-safety research About 360,000 facilities in the United States and abroad would be subject to the fees. The Congressional Budget Office reported

[43] U.S. Food & Drug Administration, Retrieved from https://www.fda.gov/food/guidance-regulation-food-and-dietary-supplements/food-safety-modernization-act-fsma

that the fees would not cover the cost of the new system, leaving the FDA to incur a net cost of $2.2 billion over five years.[44]

The food safety management system transformed into a safety management system that emphasizes prevention. For the first time, the FDA will have a legislative mandate to require comprehensive, science-based preventive controls across the food supply, including pet food and animal feed. Food facilities are required to implement a written Hazard Analysis and Risk-based Preventive Controls (HARPC) plan. This involves: evaluating the hazards that could affect food safety, specifying what preventive steps, or controls, will be put in place to significantly minimize or prevent the hazards, specifying how the facility will monitor these controls to ensure they are working, maintaining routine records of the monitoring, and specifying what actions the facility will take to correct problems that arise. Animal food manufacturers must implement current Good Manufacturing Practices and Preventive Controls. In addition, the FDA must establish science-based, minimum standards for the safe production and harvesting of fruits and vegetables. Those standards must consider naturally occurring hazards, as well as those that may be introduced either unintentionally or intentionally, and must address soil amendments, hygiene, packaging, temperature controls, animals in the growing area and water. And firms must explicitly consider radioactive contamination as part of their hazard analysis, under chemical safety.

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[44] Layton, Lyndsey, (2009), *"House Approves Food-Safety Bill; Law Would Expand FDA's Power"*, The Washington Post

The FDA does not anticipate that this will be a hazard that requires continuous monitoring with a Geiger counter. Rather, as an example, a firm that uses spring water in its products should consider having the water tested regularly for the presence of dissolved radon, tritium and heavy metal contaminants. Finally, the FDA must issue regulations to protect against the intentional adulteration of food, including the establishment of science-based mitigation strategies to prepare and protect the food supply chain at specific vulnerable points. This is the first time language involving Food Defense has been incorporated into law.[45]

The FSMA recognizes that preventive control standards improve food safety only to the extent that producers and processors comply with them. FSMA provides the FDA with new authority to conduct inspections and ensure compliance. The FSMA establishes a mandated inspection frequency, based on risk, for food facilities and requires the frequency of inspection to increase immediately. All high-risk domestic facilities must be inspected within five years of enactment and no less than every three years thereafter. Within one year of enactment, the law directs the FDA to inspect at least 600 foreign facilities and double those inspections every year for the next five years. To accomplish this projected goal, the USFDA and other agencies in the United States will work in partnership or collaborate with foreign governing bodies for help, due to lack of resources to meet the demand. FDA will have access to records, including industry

[45] U.S. Food and Drug Administration, *"Food Safety Legislation Key Facts"*

food safety plans and the records firms will be required to keep documenting implementation of their plans. The FSMA requires certain food testing to be carried out by accredited laboratories and directs the FDA to establish a program for laboratory accreditation to ensure that U.S. food testing laboratories meet high-quality standards. During an unannounced inspection by the FDA, a visual inspection will be conducted. During the inspection they will look at the building and equipment to see if there is any possibility of food contamination. The will probe into poor welds, condensation leaks especially over open product lines. During their cursory walk, the agent will also look for any areas and niches that they feel may be a harborage point for bacteria. The agents can and will take anywhere form 150- 200 swabs depending on how big the facility is. The agent will also take raw material samples as well as finished product. It is advised that the company does not take companion samples because this can double the chances of a lab error, and does not look good if the FDA's samples come up negative and the facilities positive and vice versa.[46] The bill gives the FDA the authority to recall food in the case of contamination or illness. In addition, it requires farms to track their food and implement plans to deal with recalls or outbreaks of disease. FDA officials will also be given access to food growers records in the case of an outbreak. The bill also requires food importers to verify that they meet U.S. food

[46] Mushrush, Laura, (2017), *"Three things to expect during unannounced FDA inspections."*, Food Safety News, Retrieved from http://www.foodsafetynews.com/2017/03/three-things-to-expect-during-unannounced-fda-inspections/#.WPexjfnythE

safety standards. The FDA can suspend registration of a facility if it determines that the food poses a reasonable probability of serious adverse health consequences or death. A facility that is under suspension is prohibited from distributing food. The FDA is directed to establish a system that will enhance its ability to track and trace both domestic and imported foods. In addition, FDA is directed to establish pilot projects to explore and evaluate methods to rapidly and effectively identify recipients of food to prevent or control a food borne illness outbreak. The FDA is directed to issue proposed rule-making to establish record keeping requirements for facilities that manufacture, process, pack, or hold foods that the Secretary designates as high-risk foods.

The FSMA gives the FDA authority to better ensure that imported products meet U.S. standards and are safe for U.S. consumers, with the vision that imported foods should be held to the same standards as domestic foods. These standards will be met by implementing the following components: Importers have an explicit responsibility to verify that their foreign suppliers have adequate preventive controls in place to ensure that the food they produce is safe. The FSMA establishes a program through which qualified third parties can certify that foreign food facilities comply with U.S. food safety standards. This certification may be used to facilitate the entry of imports. The FDA has the authority to require that high-risk imported foods be accompanied by a credible third-party certification or other assurance of compliance as a condition of entry into the U.S. The FDA must establish a voluntary program for importers that provides for expedited review and

entry of foods from participating importers. Eligibility is limited to, among other things, importers offering food from certified facilities. The FDA can refuse entry into the U.S. of food from a foreign facility if the FDA is denied access by the facility or the country in which the facility is located.

The FSMA builds a formal system of collaboration with other government agencies, both domestic and foreign. In doing so, the statute explicitly recognizes that all food safety agencies need to work together in an integrated way to achieve our public health goals. The following are examples of enhanced collaboration: The FDA must develop and implement strategies to leverage and enhance the food safety and defense capacities of State and local agencies. The FSMA provides the FDA with a new multi-year grant mechanism to facilitate investment in State capacity to more efficiently achieve national food safety goals. The law directs the FDA to develop a comprehensive plan to expand the capacity of foreign governments and their industries. One component of the plan is to address training of foreign governments and food producers on U.S. food safety requirements. The FDA is explicitly authorized to rely on inspections of other Federal, State and local agencies to meet its increased inspection mandate for domestic facilities. The FSMA also allows the FDA to enter into inter-agency agreements to leverage resources with respect to the inspection of seafood facilities, both domestic and foreign, as well as seafood imports.

5.1.4. Office of Environment Justice (OEJ)[47]

The United States has approached the realization of environmental rights with justice. In 1982, the Office of Environment Justice was established under the EPA. For over 25 years, OEJ has worked to address the disproportionately adverse human health and environmental impacts in overburdened communities by integrating environmental justice considerations throughout the Agency.

Created in 1992, the Office of Environmental Justice (OEJ) coordinates Agency efforts to address the needs of vulnerable populations by decreasing environmental burdens, increasing environmental benefits, and working collaboratively to build healthy, sustainable communities. OEJ provides financial and technical assistance to communities working constructively and collaboratively to address environmental justice issues. The Office also works with local, state, and federal governments; tribal governments; community organizations; business and industry; and academia, to establish partnerships seeking to achieve protection from environmental and health hazards for all people regardless of race, color, national origin, or income. To accomplish this mission, OEJ has created the following programs, policies, and activities to assist communities in building their capacity; to better engage federal agencies to help them understand environmental justice issues; to incorporate the voices of communities into agency decisions; and to provide tools and resources for promoting the principles of environmental justice.

[47] Retrieved from https://www.epa.gov/environmentaljustice

At present, ODJ is carrying out various core tasks to improve environmental justice, and its approach is cooperative and strategic. The office is working with several partners to achieve this, and these approaches have been captured through successive EJ strategic plans for the Agency. the office currently focuses on three key strategic areas. First of all, the office strives to strengthen and expand our governmental partnerships, particularly focusing on the proactive efforts of state, tribal, and local governments to advance environmental justice.

Office of Environment Justice is carrying out various tasks related to environmental human rights, and it will be talked about the OEJ program. OEJ programs have established the following tools and resources to facilitate and support the incorporation of environmental justice considerations into agency actions. These cross-cutting efforts aim to create consistency and clarity around how EPA identifies and addresses environmental justice concerns. First of all, there is an 'EJSCREEN'. To better meet the Agency's responsibilities related to the protection of public health and the environment, EPA has developed an environmental justice mapping and screening tool. EJSCREEN provides users with a nationally consistent dataset and approach for combining environmental and demographic indicators. EPA made this tool publicly available online to be more transparent about how we consider environmental justice in our work, assist our stakeholders in making informed decisions, and create a common starting point for dialogue with partners and the public. EJSCREEN allows users to access high-resolution environmental and demographic information for locations in the United

States, and compare their selected locations to the rest of the state, EPA region, or the nation. The tool may help users identify areas with: Minority and/or low-income populations, Potential environmental quality issues, A combination of environmental and demographic indicators that is greater than usual, Other factors that may be of interest. This screening tool and data may be of interest to community residents or other stakeholders as they search for environmental or demographic information. It can also support a wide range of research and policy goals. The public has used EJSCREEN in many different locations and in many different ways. In addition, EPA is sharing EJSCREEN with the public to be more transparent about how we consider environmental justice in our work, to assist our stakeholders in making informed decisions about pursuing environmental justice and to create a common starting point between the agency and the public when looking at issues related to environmental justice. Anyone can access related materials, search by topic, or download related indexes.

Policy EPA released two documents related to the consideration of environmental justice during rulemaking processes. The first of these, Guidance on Considering Environmental Justice During the Development of an Action, fosters an understanding and ensures consistency by EPA staff as they consider environmental justice during rulemaking actions. The second document, Technical Guidance for Assessing Environmental Justice in Regulatory Analysis, provides the technical underpinnings to fully consider environmental justice during rulemakings.

Training and Workshops OEJ provides training and coordinates workshops for internal and external stakeholders on a broad range of issues relating to environmental justice and equitable development. OEJ ensures that Agency staff are trained on the most current data and resources available for the successful integration of environmental justice principles in their work. OEJ continually engages the public and other governmental partners to enhance the tools, methods, and practices for full integration and consideration of environmental justice concerns.

Science plays an important role in providing a strong basis for action to protect the health and environment of populations that may be especially vulnerable to environmental hazards. EPA's new technical guidance for assessing environmental justice in regulatory actions was developed with participation from the public. OEJ is working with the Office of Research and Development to implement a new Environmental Justice Research Roadmap, which integrates environmental justice-related research across six National Research Programs.

5.2. The California environmental justice program

California first codified environmental justice in its statutes. The Government Code Section 65040.12 defines environmental justice as 'treating everyone equally, regardless of race, culture or income, in environmental law, regulation, or policy'. In California, environmental justice is not just a legal statement, but a practical

activity that reflects and supports environmental pollution-affected areas in decision-making processes. The principles of environmental justice call for fairness, regardless of race, color, national origin or income, in the development of laws and regulations that affect every community's natural surroundings, and the places people live, work, play and learn. California was one of the first states in the nation to codify environmental justice in statute. Beyond the fair treatment called for in code, leaders in the environmental justice movement work to include those individuals disproportionately impacted by pollution in decision making processes. The aim is to lift the unfair burden of pollution from those most vulnerable to its effects.[48] The California Office of Environmental Health Hazard Assessment (OEHHA) identifies areas of high levels of environmental pollution and vulnerability, identifies people and areas sensitive to pollution, and discloses information about hazardous chemicals.

5.2.1. California environmental screening

California environmental screening (CalEnvroScreen) is one of the environmental justice programs that the California EPA (Environmental Protection Agency) and OEHHA run together. It is based on Senate Bill 535, the California statute, to identify vulnerable areas that are unequally affected by the cumulative impact of various pollutants. CalEnviroScreen uses vulnerable areas

[48] Retrieved from https://calepa.ca.gov/EnvJustice/

with environmental complaints on the map and provides policy support. After developing version 1.0 of CalEnviroScreen in 2012, version 3.0 has been utilized since it was improved by adding indexes and increasing resolution.

CalEnviroScreen performs cumulative impact assessments using data on various pollutants and socioeconomic characteristics. According to the California EPA, "cumulative impacts" refer to the combined effects of environmental pollutants on public health and the environment, which are emitted in a variety of ways from all sources in a particular area. To reflect the cumulative impact, CalEnviroScreen uses a wide range of data from the government's published environmental, health, and socioeconomic characteristics to produce indicators.

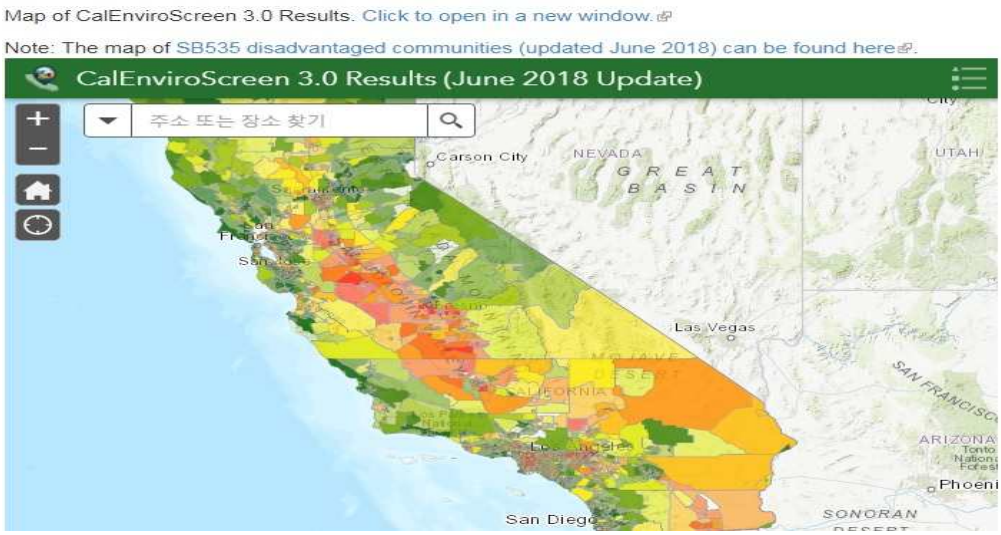
CalEnviroScreen model consists of various components that contribute to the cumulative impact. The model consists of two components of pollution burdens: exposure and environmental impact - and two factors that characterize population characteristics - sensitive groups and socioeconomic factors. Each component is quantified through a series of indicators.

Exposure factors include pollutant measures such as ozone, diesel PM, drinking water pollutants, pesticides, plant toxicants, and traffic volume. The environmental impact factor shows the status of contaminated clean-up sites, groundwater pollution, hazardous waste facilities, water pollution, and solid waste facilities related to the release of toxic chemicals.

Sensitive population elements that indicate population characteristics are asthma, heart disease patients, and low birth weight infants who are more seriously

affected by pollution due to health or health. Socioeconomic factors are conditions that make the impact of pollution more sensitive, including education level, residential burden, linguistic isolation, poverty, and unemployment.

CalEnviroScreen 3.0 is a screening methodology that can be used to help identify California communities that are disproportionately burdened by multiple sources of pollution. It is an important tool in meeting CalEPA's commitment to environmental justice for all. The following figure is an actual map used.



< Figure 4>

CalEnviroScreen map

CalEnviroScreen is a mapping tool that helps identify California communities that are most affected by many sources of pollution, and where people are often especially vulnerable to pollution's effects. CalEnviroScreen uses environmental, health, and socioeconomic information to produce scores for every census tract in the state. The scores are mapped so that different communities can be compared.

An area with a high score is one that experiences a much higher pollution burden than areas with low scores. CalEnviroScreen ranks communities based on data that are available from state and federal government sources.[49]

The tables below describe the changes to each indicator in greater detail. As a result of these changes, CalEnviroScreen 3.0 now uses 20 indicators covering pollution burden and population characteristics of California's approximately 8,000 census tracts. One of the two new indicators, Cardiovascular Disease, is based on emergency department visits for acute myocardial infarction (heart attack), and is an indicator of subpopulations that may be especially vulnerable to the health effects of pollution. The other new indicator, Housing-burdened Low Income Households, takes housing costs for low income households into consideration as an additional socioeconomic factor that can reflect a community's vulnerability to pollution. The Age indicator from Version 2.0 has been removed based on concerns that the measure of populations of children and the elderly in individual census tracts does not adequately represent these vulnerable populations. New data are added to several indicators, including three additional drinking water contaminants to the Drinking Water Contaminants indicator, one additional pesticide to the Pesticide Use indicator, the addition of produced water ponds from oil and gas operations to the Groundwater Threats indicator, and the addition of

[49] Retrieved from https://oehha.ca.gov/calenviroscreen

scrap metal recyclers to the Solid Waste Sites and Facilities indicator. Also, the Solid Waste indicator provides an increased buffer distance for composting facilities to reflect odor complaints at greater distances than in earlier versions of CalEnviroScreen.

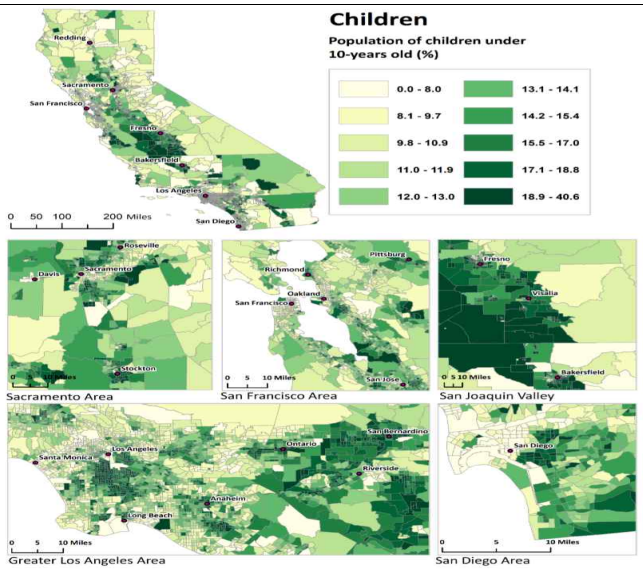
Indicator	Improvements
Air Quality: Ozone	The air monitoring data used in this indicator have been updated to reflect ozone measurements for the years 2011 to 2013. The measure for CalEnviroScreen 3.0 is the average daily maximum ozone concentration. In CalEnviroScreen 2.0, the measure was the sum of the ozone concentrations above the state's ozone standard at a given air monitoring station. The change to a more straightforward calculation of average concentration is easier to interpret. This change also allows the incorporation of information on ozone for all areas of the state, not only census tracts with levels estimated to be over the standard. As a result of this change, areas with no exceedances of the state ozone standard that previously had a zero score now have a score greater than zero. Data from two new air monitoring sites near the California–Mexico border at San Ysidro and Otay Mesa are also included in the CalEnviroScreen 3.0 calculations. In addition, ozone concentrations for census tracts further than 50 kilometers from an air monitor are

	now reported. Previously, ozone concentrations for census tracts whose center was more than 50 kilometers from the nearest air monitor were not reported.
Air Quality: PM 2.5	The air monitoring data used in this indicator have been updated to reflect PM 2.5 measurements for the years 2011 to 2013. Additional data from two new air monitoring sites near the California–Mexico border at San Ysidro and Otay Mesa are also included in the calculations. PM 2.5 concentrations for census tracts further than 50 kilometers from an air monitor are now taken into account. Previously, census tracts with centers more than 50 kilometers from the nearest PM2.5 air monitor were not included. Some satellite data was incorporated to provide full state coverage for the PM2.5 indicator.
Diesel Particulate Matter	Diesel PM emissions were updated for the year 2012. Emissions from sources of diesel PM in Mexico near the US are also included in this update. Diesel PM emissions estimates are provided to OEHHA by the California Air Resources Board (CARB) for 16-square-kilometer grid cells that cover most of the state. In the previous version of CalEnviroScreen, these grid estimates were converted to the census tract scale based on the total geographic area of the census tract. In

	CalEnviroScreen 3.0, the grid estimates were converted using only the populated areas of each maps will also allow viewers to click on individual census tracts and view age statistics along with statistics on race/ethnicity for each tract. The charts below show the age composition of all census tracts when placed into 10 groups from lowest to highest CalEnviroScreen score. The results are very similar between the CalEnviroScreen 3.0 and 2.0 versions with respect to the fraction of children and elderly in each group.

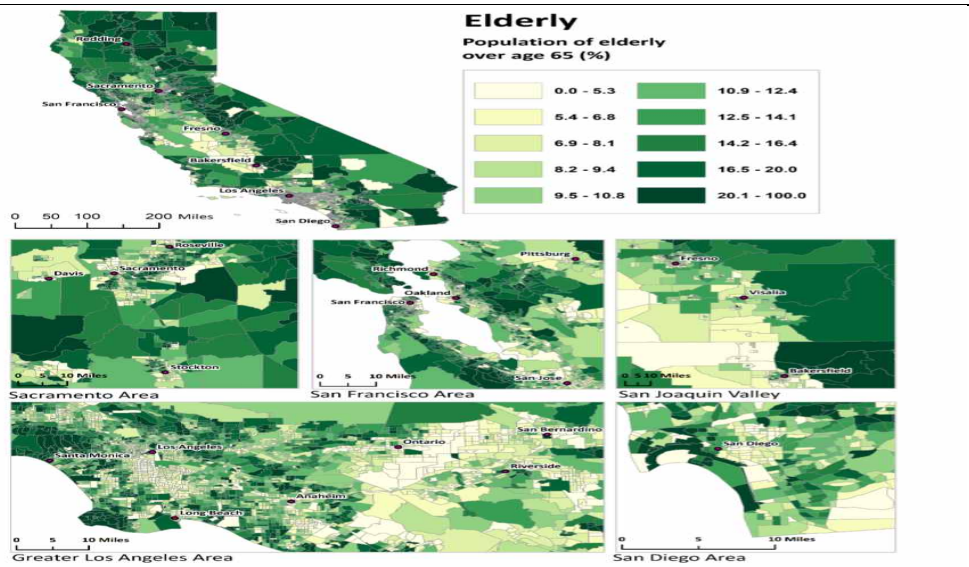
CalEnviroScreen is used to provide policy support by designating relatively inefficient environmental inequalities. Under the Senate Law 535 (De Leon, Statutes of 2012) and Parliament Act 1550 (Gomez, Statutes of 2016), the State of California will provide 25% of the proceeds from GHG funds to environmental inequalities It should be used for business. In addition, at least 10% of the revenues must be used for low-income families or regions.

In 2017, the California EPA designated the top 25% of CalEnviroScreen scores as environmental inequality areas. Low-income neighborhoods "that are less than 80 percent of the state's overall median income or that are set as low-income by the California Housing and Regional Development Department. Low Income Buffer Area", which is located within 0.5 mile of the environmental inequality region among low income regions. The figure below shows the example of maps that related to children and the elderly.



< Figure 5>

The statewide distribution of California's population of children under 10 years old.



< Figure 6>

The statewide distribution of California's population of elderly over 65 years old.

5.2.2. Other justice program

The California environmental justice program covers a variety of environmental issues and information in addition to the California Environment Screening (CalEnvroScreen). Some programes that are going well will be introduced below.

5.2.2.1. Biomonitoring California

The California Environmental Contaminant Biomonitoring Program (CECBP, or Biomonitoring California) was established in 2006 by Senate Bill 1379 (Perata and Ortiz, Chapter 599, Statutes of 2006; codified at Health & Safety Code Sections 105440 et seq.). The Biomonitoring California program measures and tracks the amount of environmental chemicals accumulated in the human body. It measures the amount of environmentally harmful substances accumulated in the body by measuring chemicals or metabolites in the blood or urine. Biomonitoring provides useful information on the amount of chemicals that enter the body from all sources such as air, water, dust, soil, food, etc. This information helps to block harmful chemicals when purchasing the environment and products. California has established a separate homepage to facilitate access to information, and it regularly handles education, and publicity to make it easier for citizens to understand. Below

are some excerpts from a brochure of Biomonitoring California that anyone can easily find.[50]

Chemicals in Everyday Life

We come into contact with many chemicals each day. They are used in industry and agriculture. They are in common products, such as cosmetics, toys, and plastics.

Some of these chemicals get into our air, water, soil, dust, and food. As a result, all of us have chemicals in our bodies. We may have more or fewer chemicals—depending on the products we use, the jobs we do, and the places we live.

Chemicals and Our Health

Some chemicals can harm our health. They can cause birth defects, learning problems, weight gain, cancer, asthma, and other illnesses. However, many chemicals have not been well studied, so we do not know if they affect our health.

What is Biomonitoring?

Biomonitoring (bi-o-MON-i-tor-ing) is a way to measure the chemicals in a person's body. It can tell us which chemicals are there and how much.

Scientists usually test for chemicals in samples of blood and urine. There are only a few labs that can do this testing.

Like other parents, Tony wants to protect his son's health. "We need to learn which chemicals our kids are exposed to."

Why is Biomonitoring Important?

Biomonitoring helps us learn which chemicals get into our bodies.

This information can be used to:

- Learn more about how chemicals affect our health.
- Help keep harmful chemicals out of our environment and the products we buy.

Taking Part in a Biomonitoring Project

Biomonitoring California is a state government program. You may be asked to take part in one of the *Biomonitoring California* projects. If you agree to participate:

- You will be asked to provide blood, urine, or other samples for testing.
- You can see your results.
- Your results will be confidential.
- You will learn if you have chemicals in your body that might be harmful. However, safe amounts for most chemicals are not known.
- You will learn ways to help keep some chemicals out of your body.

Anna was asked to be part of a biomonitoring project with other pregnant women.

< Figure 7>

Brochure of Biomonitoring California

5.2.2.2. Climate change

It is a program for analyzing the impact of climate change on human health and identifying the most vulnerable groups. OEHHA studies health effects such as illnesses and deaths, such as visits to hospitals and emergency rooms due to climate

[50] Retrieved from https://biomonitoring.ca.gov/

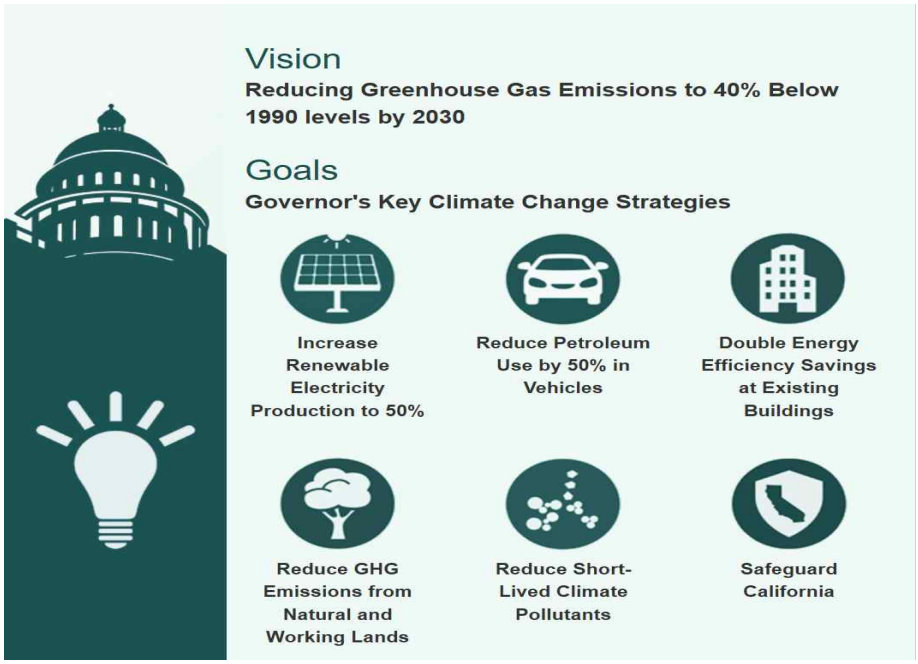
change, congenital anomalies, and identifies vulnerable groups. It also accumulates information on various climate change related indicators such as temperature changes, plant and animal influences, and the latest research literature.

California shares and leverages its experiences and policies on climate change, clean energy, and alternative transportation to maximize the benefits of climate action around the globe. A number of state agencies engage in intergovernmental climate cooperation coordinating activities through the Intergovernmental Climate Action Team (ICAT). Participating agencies in ICAT include the Governor's Office, the Governor's Office of Planning and Research, the California Environmental Protection Agency, the California Air Resources Board, the California Energy Commission, the California Natural Resources Agency, the Governor's Office of Economic Development, the California Public Employee's Retirement Agency, and the Department of Insurance. Through the ICAT members, California works with partners to take actions on climate change impacts.[51]

Climate change is already having significant and widespread impacts on California's economy and environment. California's unique and valuable natural treasures - hundreds of miles of coastline, high value forestry and agriculture, snow-melt fed fresh water supply, vast snow and water fueled recreational opportunities, as well as other natural wonders - are especially at risk. California

[51] Retrieved from https://www.climatechange.ca.gov/

recognizes, organizes, and acts on it. Below is an organizational strategy related to Climate Change in California State.



< Figure 8>[52]

Climate Change Strategy in CA

California is acting in accordance with these strategies and is always providing real-time news and events to the public. the state work with local governments and governments as well as our own policies, such as efforts to reduce California gas emissions, and are also work with overseas countries and cities. In addition, the state are actively engaged in research and development

[52] Retrieved from https://www.climatechange.ca.gov/

without neglecting investment in technology and business such as environment-friendly energy generation.

5.2.3.3. Children's health

Children are vulnerable to multiple environments compared to adults. California is aware of this and is building and implementing a program that focuses on the environment and health of children.

Children who eat, drink, and breathe more per unit of body weight than adults are more sensitive to chemicals. As children are still growing, the health effects of chemicals are even more deadly. There is an increasing awareness that exposure to life-time chemicals has an impact on lifetime health. According to the Child Environmental Protection Act (Escutia, Chapter 731, Statutes of 1999), the California EPA created the Children's Environmental Health Program.

For example, the California Education Act prohibits purchasing products containing toxic or carcinogenic substances in kindergartens and elementary schools. Secondary schools can only be used with labels that indicate the type of hazardous ingredients, potential health effects, and safe use. As a result, The Office of Environmental Health Hazard Assessment (OEHHA) has developed a list of art and craft materials and guidelines that cannot be purchased at kindergartens and elementary schools.

California Children's Services (CCS) is a state program for children with certain diseases or health problems. Through this program, children up to 21 years

old can get the health care and services they need. CCS will connect you with doctors and trained health care people who know how to care for your child with special health care needs. The CCS program provides diagnostic and treatment services, medical case management, and physical and occupational therapy services to children under age 21 with CCS-eligible medical conditions. Examples of CCS-eligible conditions include, but are not limited to, chronic medical conditions such as cystic fibrosis, hemophilia, cerebral palsy, heart disease, cancer, traumatic injuries, and infectious diseases producing major sequelae. CCS also provides medical therapy services that are delivered at public schools. The CCS program is administered as a partnership between county health departments and the California Department of Health Care Services (DHCS).

Thus, through the Environmental Justice Program, the California government encourages policies that are fair to everybody, and all of these programs are working well and growing every year.

5.3. U.S. national environmental health monitoring network

The National Environmental Public Health Tracking Network (Tracking Network) brings together health data and environment data from national, state, and city sources and provides supporting information to make the data easier to understand. The Tracking Network has data and information on environments and hazards, health effects, and population health.

For more than a decade, the Environmental Public Health Tracking Program has collected, integrated, and analyzed non-infectious disease and environmental data from a nationwide network of partners. The purpose of this Program is to deliver information and data to protect the nation from health issues arising from or directly related to environmental factors. The Tracking Program strives to achieve its vision of Healthy Informed Communities by empowering environmental and public health practitioners, healthcare providers, community members, policy makers, and others to make information-driven decisions that affect their health. At the local, state, and national levels, the Tracking Program uses a network of people and information systems to deliver a core set of health, exposure, and hazards data, information summaries, and tools to enable analysis, visualization and reporting of insights drawn from data.[53]

The Centers for Disease Control and Prevention (CDC) currently funds 26 state and local tracking programs as a part of the National Environmental Public Health Tracking Program. Tracking Program successes stem from its network of experts and partners who are committed to improving health outcomes across the United States. Everyone is able to find out many program's successes by clicking on the site.[54] The When the CDC has had good surveillance, it has succeeded in safeguarding

[53] Retrieved from https://www.cdc.gov/nceh/tracking/about.htm

[54] It is seen various success stories through the following links.
https://www.cdc.gov/nceh/tracking/successstories.htm

the health of Americans, stated McGeehin. For example, the greatest environmental health success in the United States in the past 30 years has been the lowering of blood lead levels in children. The environmental intervention that brought these results—removing lead from gasoline and other sources—was a collaborative effort of the EPA

and various health agencies that was based on good surveillance data. Further analysis and interpretation of blood lead level data showed health disparities in the population. For example, an African-American child living in older housing in the United States was found to be 22 times more likely to have an elevated blood lead level than was a white child living in newer housing. Efforts have shifted toward vulnerable populations in recognition that eliminating childhood lead poisoning in the United States will require targeting the children who are most likely to be affected. The rapid response to the outbreak of toxic shock syndrome in the early 1980s is another example of the public health benefit of sound surveillance data. In this case, a disease emerged that had never been encountered before, and surveillance was put into place quickly. The CDC has a long history of using surveillance to determine the cause and magnitude of public health problems. The CDC has 52 nationally notifiable infectious diseases—those for which regular, frequent, and timely information is considered necessary to control the disease. Uniform criteria are used for reporting each notifiable disease, and reports emanate from state and local health departments, health care providers, and laboratories. The CDC oversees 15 surveillance systems. The CDC also set up meetings to bring environmental and health groups together, not only at the federal level, but also at the state and local levels. The CDC has already begun pilot

programs in several states to bring collaboration between state and local health and environmental agencies, to evaluate existing databases, to examine linkages among databases, and to help develop a health outcome surveillance system. The CDC also plans to establish university-based centers for excellence in health monitoring to provide research and technical assistance to the states. Surveillance is considered essential to the work of the CDC and critical to all of public health. The CDC has taken on the task of improving its use and uniformity to make it yield more useful data and to reduce the burden on state and local health departments, health care providers, and laboratories.

The national institute for occupational safety and health (NIOSH) has much to contribute to the national health monitoring effort because of its long history in occupational health surveillance and the wealth of data and experience it can offer, said Kathleen Rest of NIOSH. For the past 25 years, NIOSH has played a key role in the surveillance of work-related illnesses, injuries, fatalities, exposures, and hazards. It also supports an active program of state-based surveillance, which can provide a model for collaborative efforts needed in environmental health monitoring. The occupational health community received a wake-up call in 1984, when Congress issued a report on occupational illness data collection (Committee on Government Operations, 1984). At that time, occupational health surveillance was described as 70 years behind communicable disease surveillance. The report called for a national data collection system to advance understanding of the link between workplace exposures and hazards and their related health effects. The

report noted many challenges, such as long latency periods, multiple exposures, illnesses with multifactorial etiologies, transience of the workforce, differential susceptibilities, lack of awareness among workers and employers, and lack of occupational health training among physicians and public health professionals. Environmental health tracking shares some of these challenges. The report also highlighted the fragmentation of existing surveillance systems and the resulting inadequacies.[55]

Good dialogue with the public must be maintained while the national health monitoring system is created. At the national level, the NCEH and ATSDR have recently completed a consolidation of the two agencies around environmental health. Another collaborative step has been the establishment of the National Electronic Disease Surveillance System to create a common architecture for all information systems that collect data. A third step is the E-Health Initiative, which will allow electronic access to the disease reporting of large information systems run by health insurance companies, pharmaceutical suppliers, and other reimbursement agencies. Three to four of the largest companies collect 85 percent of these data in the United States. Linking the CDC with that source makes more sense than having the CDC try to gather all of the information alone. The time is ripe for making this connection, and companies are open to working with the NCEH. The EPA has been a willing collaborator in many NCEH efforts, and communication has evolved over time.

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[55] Goldman L, Coussens CM, (2004), *Environmental Health Indicators: Bridging the Chasm of Public Health and the Environment*, National Academies Press

5.4. U.S. fine dust control measures

5.4.1. Overview

The United States is the first country to manage pollution sources systematically than any other country. In 1963, a clean-air technique was enacted to classify 188 air pollutant sources and to control how to manage them, by separating stationary pollutants such as power plants and mobile pollutants such as automobiles. These lists are reviewed and redefined every eight years.

In 1970, the United States established the Environmental Protection Agency (EPA), which initiated and enforced air pollution regulations. Parliament has set the National Air Quality Standards (NAAQS) for six hazardous substances: particulate matter, ozone, carbon monoxide, sulfur dioxide, nitrogen oxides and lead.

US EPA and state and local government agencies monitor and manage air pollutants in over 4,000 locations to monitor real-time NAAQS compliance. NAAQS are standards for harmful pollutants.[56] Established by the United States Environmental Protection Agency (EPA) under authority of the Clean Air Act (42 U.S.C. 7401 et seq.), NAAQS is applied for outdoor air throughout the country.

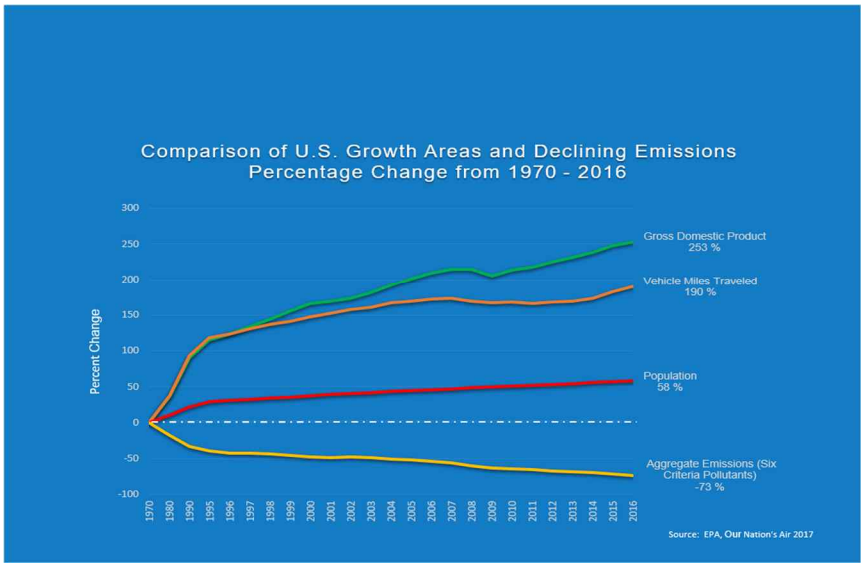
[56] Definition of National Ambient Air Quality Standards (NAAQS), Retrieved from http://ohioepa.custhelp.com/app/answers/detail/a_id/907/~/definition-of-national-ambient-air-quality-standards-(naaqs)

The standards are listed in 40 C.F.R. 50. Primary standards are designed to protect human health, with an adequate margin of safety, including sensitive populations such as children, the elderly, and individuals suffering from respiratory diseases. Secondary standards are designed to protect public welfare, damage to property, transportation hazards, economic values, and personal comfort and well-being from any known or anticipated adverse effects of a pollutant. A district meeting a given standard is known as an "attainment area" for that standard, and otherwise a "non-attainment area". Standards are required to "accurately reflect the latest scientific knowledge," and are reviewed every five years by a Clean Air Scientific Advisory Committee (CASAC), consisting of "seven members appointed by the EPA administrator."[57]

As such, US government agencies and corporations are leading the way in innovating air pollution monitoring and emission control technologies. The implementation of these government regulations and the resulting technological advances have been very successful in reducing the six standard composite air pollutants. The enormous reduction in air pollutants across the United States (20-50%) is due to the implementation of state and federal regulations to reduce NOx emissions from power plants and automobiles. This improvement in air quality throughout the United States is largely due to the leading role of cities and

[57] Goldstein, Bernard D, (2018). *"The latest chapter in EPA vs environmental science saga"*. The Hill

provinces in implementing and enforcing standards and regulations, monitoring, innovating and educating citizens.



< Figure 9>

Comparison of U.S. Growth Areas and Declining Emissions Percentage Change

EPA, State, local, and tribal air quality agencies can find assistance in developing their plans to implement PM standards. Tools include timeframes for submitting parts of the SIP, and how to use emissions data to demonstrate progress in reducing PM. States with areas that are starting to monitor attainment can check out: Redesignations and Clean Data Policy (CDP): Areas can demonstrate attainment using air quality modeling and other analyses. EPA has also developed training resources, various presentations and webinars to explain the implementation process and assist the air agencies. EPA evaluates the submitted

SIPs, then issues a notice, indicating that either the SIP has been approved or needs additional work. Once the SIP has been approved, the state implements its air pollution control strategies to gradually reduce PM pollution. Get information about the SIP status for each state.[58]

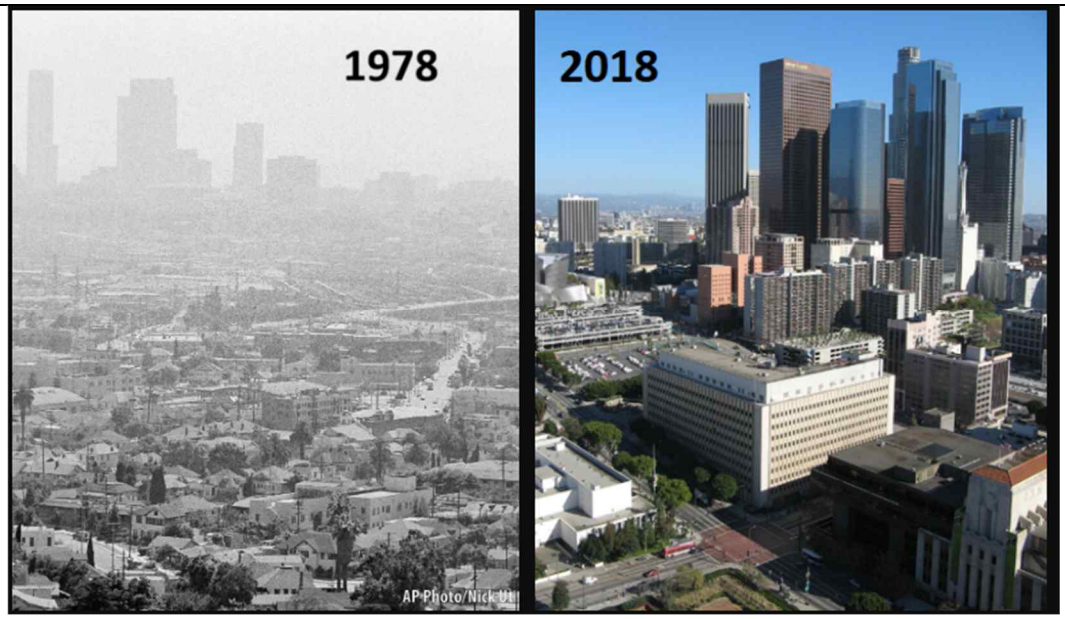
In other word, In the United States, the United States enforces strict regulations by reflecting the viewpoint of national health protection when drafting the Clean Air Act, the National Ambient Air Quality Standard, and the Reginal Haze rule and so on to eliminate air pollution. In addition, the government make policies as considering human rights to solve environmental problems, and cooperate with various groups such as environmental group.

5.4.2. Cases of Southern California air quality authorities

It will be discussed about a policy in California that once suffered the worst air pollution. California establishes a "fine dust reduction plan" for residents' health. In addition, unpacked roads including parking lots are packaged, measures to stabilize dust, and the construction of unpaved roads are suppressed. In addition, it will apply sprinkling, soil stabilization, dust screen installation, dust reduction measures for each construction stage, and arrange personnel to monitor dust occurrence at the construction site. Below is a picture of Los Angeles, California's once famous city, once called Smog City, where the air is always clean now. The

[58] Retrieved from https://www.epa.gov/

figure below shows the air quality change of Los Angeles (L.A.), California's leading city, in 1978 and 2018.



< Figure 10>

L.A. air quality change

The California Air Resources Board operates the Particulate Matter Program. A technical report on the characteristics of PM10 and PM2.5 in California gives an assessment of the PM10 and PM2.5 characteristics in each of the atmospheric zones of California in each air basin. As a first step in the implementation of Senate Bill 656 (SB 656, Sher, 2003), the ARB approved a list of the most readily available, feasible, and cost-effective control measures that can be employed by air districts to reduce PM10 and PM2.5 (collectively referred to as PM) at the November 18, 2004 Board meeting. The list is based on rules, regulations, and programs existing in California as of January 1, 2004, for stationary, area-wide,

and mobile sources. As a second step, in 2005, air districts adopted implementation schedules for selected measures from the list. The implementation schedules identify the appropriate subset of measures, and the dates for final adoption, implementation, and the sequencing of selected control measures. In developing the implementation schedules, each air district prioritized measures based on the nature and severity of the PM problem in their area and cost-effectiveness. Consideration was also given to ongoing programs such as measures being adopted to meet national air quality standards or the State ozone planning process. Air districts are currently working on the evaluation and adoption of rules in their implementation schedules. The implementation of the air district schedules, coupled with ARB's ongoing programs, will ensure continued progress in reducing public exposure to PM and attainment of the State and federal standards. Finally, no later than January 1, 2009, the ARB must prepare a report describing actions taken to fulfill the requirements of the legislation as well as recommendations for further actions to assist in achieving the State PM standards. In addition, with the implementation of Senate Bill SB 656 in 2003, the state of the state of California is taking measures to reduce PM.

The California Air Resources Board (CARB) publishes mandatory reports annually. The reports contain information on various aspects of air pollution programs administered within the CARB. Health and Safety Code, Section 39619.5(g) requires the California Air Resources Board (CARB) to provide an update each year on the status and results of the fine particulate matter (PM2.5)

monitoring program. This report provides a summary of PM2.5 monitoring activities in 2018 and how the data are being used to support CARB programs.

California's PM2.5 air quality monitoring program provides information used for determining which areas violate PM2.5 standards, characterizing the sources that contribute to PM2.5 pollution, determining background concentrations, assessing pollution transport, and supporting health studies and other research. Monitoring data also provide information to develop and evaluate programs for improving air quality. Newly emerging technologies are evaluated and incorporated continuously in California's PM2.5 monitoring program to provide improved monitoring data.

California's PM2.5 monitoring network began collecting data in 1998. A number of different types of PM2.5 monitors are operated to provide information on PM2.5 mass and chemical composition which are summarized below. Types and numbers of the PM2.5 monitors vary each year. Figure 8 displays the locations of PM2.5 monitors throughout the State as of the end of 2018.

< Figure 11>[59]

Federal Reference Method monitor

[59] Federally-approved monitors that measure PM2.5 mass over a 24-hour period are currently located at 59 sites throughout the state.

The California Air Resources Board monitors particulate matter pollutants to demonstrate attainment or non-attainment of national and state ambient air quality standards (standards). Particulate monitoring can be divided into two main categories: monitoring of particulate matter with an aerodynamic diameter of 10 microns or less (PM10) and monitoring for particulate matter with a diameter of 2.5 microns or less (PM2.5). PM2.5, of course, is a constituent of PM10. The CARB particulate matter monitoring programs under these two programs are described below.PM10 is a mixture of various substances. These substances occur in the form of solid particles or as liquid drops. Some particles are emitted directly into the atmosphere. Other particles result from gases that are transformed into particles through physical and chemical processes in the atmosphere. A variety of emission sources and meteorological conditions contribute to ambient PM10.

PM10 Mass is that the PM10 standards are expressed as a weight of PM10 particles per volume of air (micrograms per cubic meter). PM10 mass is collected using a high volume sampler (40 cubic feet per minute) and a quartz fiber filters (8" x 10"). The standards do not consider the size distribution or the chemical make-up of the particles, although these are important factors in terms of control strategies and of the health risks associated with PM10.

Ion Analysis is that this program measures some of the major secondary components of PM10. Secondary PM10 is not emitted as particles but is formed through chemical reactions in the atmosphere. Knowledge of the components of

PM10 can indicate the source of the PM10 and provide insight into how to control PM10. The inorganic ion analyses of PM10 are performed at the request of the Planning and Technical Support Division (PTSD). Chloride (Cl-), nitrate (NO3-), sulfate (SO42-), ammonium (NH4+), and potassium (K+) are routinely measured from samples collected in the network.PM2.5 particulate matter, called "fine" particulate, is primarily a result of combustion products emitted into the atmosphere as well as those particles that are formed in the atmosphere from gaseous pollutants as a result of atmospheric chemistry (secondary formation). Generally, the fine particulate poses a greater health risk because these particles can deposit deep in the lung and contain chemicals that are particularly harmful to health. In addition to health impacts, these particles can reside in the atmosphere for long periods of time and are the main contributors to reduced visibility.

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collected using a high volume sampler and quartz fiber filters, PM2.5 mass is collected using a low volume sampler (16.7 liters per minute) and a small (47 mm) Teflon filter. Because much less mass is collected by the PM2.5 sampler, the samples are weighed to the nearest microgram (one millionth of a gram) by special, ultra-sensitive balances under exacting conditions. Extreme care must be taken to insure accurate results. Laboratories performing these analyses must be pre-qualified and are monitored to insure acceptable performance.

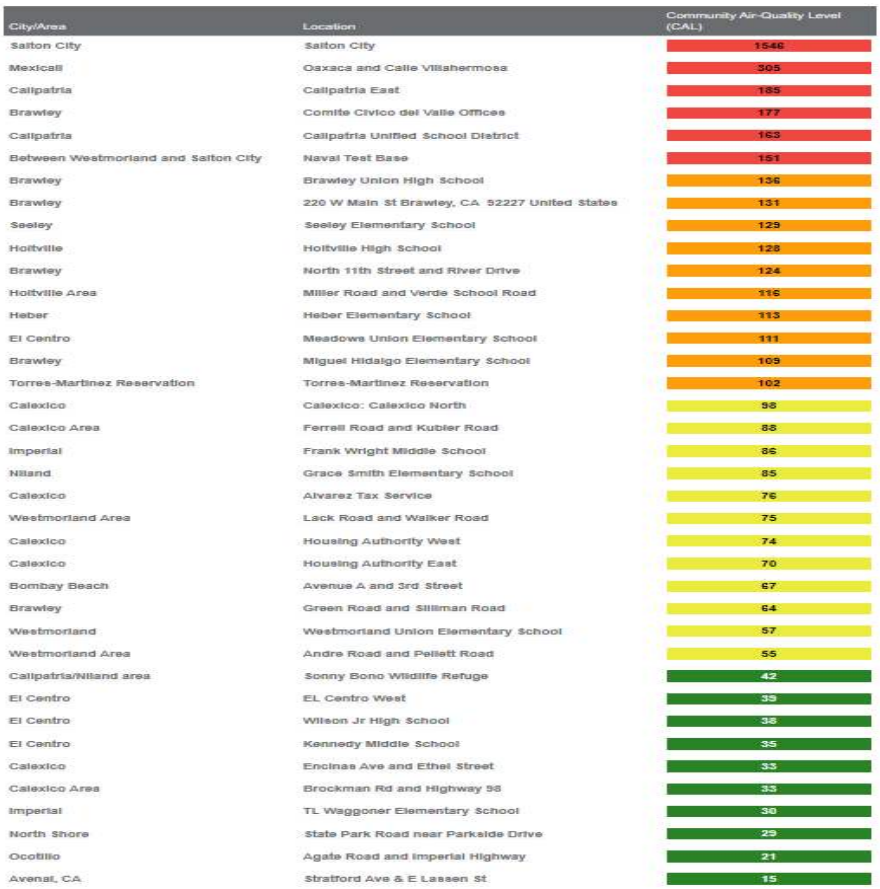
During 1992, the California Air Resources Board's (CARB) Monitoring and Laboratory Division initiated system audits for laboratories conducting PM10 mass analysis as data-for-record. The audits of the mass determinations complement ongoing performance audits of field samplers which began in1985 and provide a complete assessment of PM10 mass data. This paper presents the CARB's findings of the PM10 mass analysis system audits and highlights the most common problems encountered by mid- to small-sized organizations. Given the discrepancies that we discovered and the possibility of new and different requirements for a fine particulate National Ambient Air Quality Standards (NAAQS), laboratories need to be better prepared to meet the challenge of performing consistent particulate matter mass weighings in the future. The system audits include an assessment of filter handling and storage, standard weight checks, balance calibrations, equilibration techniques, tare and gross weight checks

(duplicate weighings) and data management. They also include performance audits of the balances used to weigh the PM10 filters.[60]

The installation of federally-approved PM2.5 mass monitors throughout California began in 1998. As of the end of 2018, Federal Reference Method (FRM) monitors are operated at 59 sites. These monitors collect particulate samples on filters, which are later weighed and analyzed in a laboratory. Continuous PM2.5 mass monitors provide valuable information for public reporting, temporal representation, health studies, transport studies, and background monitoring. PM2.5 mass can be measured continuously with several different commercially available technologies. We chose the Beta Attenuation Monitor (BAM) for use in California and several other types of continuous monitors (e.g., laser light scattering monitor) in limited use. There are 113 sites continuously measuring PM2.5 mass. The U.S. Environmental Protection Agency (U.S. EPA) designated certain models of the continuous monitors as Federal Equivalent Method (FEM) monitors. They are considered equivalent to the FRM monitors and therefore may be used to determine compliance with federal standards. Sixty-nine of California's continuous monitoring sites have FEM monitors. PM2.5 mass can be continuously measured with air quality sensors. Air quality sensors for PM2.5 are newly emerging, low cost methods using optical sensors to count PM2.5 or measure PM2.5 concentrations. PM2.5 data can be accessed instantly via the

[60] Retrieved from https://www.arb.ca.gov/aaqm/partic.htm

Internet. As of January 2019, more than 2500 non-regulatory air quality sensors have been purchased and deployed across California by community groups, government agencies, private citizens, and others. Figure 9 displays the locations of PM2.5 sensors across the State as of January 2019.



City/Area	Location	Community Air-Quality Level (CAL)
Salton City	Salton City	1546
Mexicali	Oaxaca and Calle Villahermosa	305
Calipatria	Calipatria East	185
Brawley	Comite Civico del Valle Offices	177
Calipatria	Calipatria Unified School District	163
Between Westmorland and Salton City	Naval Test Base	151
Brawley	Brawley Union High School	136
Brawley	220 W Main St Brawley, CA 92227 United States	131
Seeley	Seeley Elementary School	129
Holtville	Holtville High School	128
Brawley	North 11th Street and River Drive	124
Holtville Area	Miller Road and Verde School Road	116
Heber	Heber Elementary School	113
El Centro	Meadows Union Elementary School	111
Brawley	Miguel Hidalgo Elementary School	109
Torres-Martinez Reservation	Torres-Martinez Reservation	102
Calexico	Calexico: Calexico North	98
Calexico Area	Ferrell Road and Kubler Road	88
Imperial	Frank Wright Middle School	86
Niland	Grace Smith Elementary School	85
Calexico	Alvarez Tax Service	76
Westmorland Area	Lack Road and Walker Road	75
Calexico	Housing Authority West	74
Calexico	Housing Authority East	70
Bombay Beach	Avenue A and 3rd Street	67
Brawley	Green Road and Silliman Road	64
Westmorland	Westmorland Union Elementary School	57
Westmorland Area	Andre Road and Pellett Road	55
Calipatria/Niland area	Sonny Bono Wildlife Refuge	42
El Centro	EL Centro West	39
El Centro	Wilson Jr High School	38
El Centro	Kennedy Middle School	35
Calexico	Encinas Ave and Ethel Street	33
Calexico Area	Brockman Rd and Highway 98	33
Imperial	TL Waggoner Elementary School	30
North Shore	State Park Road near Parkside Drive	29
Ocotillo	Agate Road and Imperial Highway	21
Avenal, CA	Stratford Ave & E Lassen St	15

< Figure 12>[61]

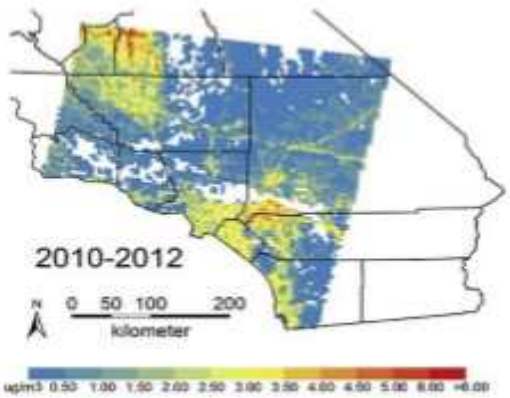
List of Air Monitors Imperial in CA

California has divided the Community AirQuality Level into four levels: Green is a low-risk range (0-50), Yellow is a suitable range (51-100), Orange is a harmful range (101-150) You can find out more detailed data by clicking each area and

[61] Retrieved from https://ivan-imperial.org/air/list

location. Monitoring is updated every 5 minutes and information is being provided in real time.

Satellite remote sensing has been used to evaluate the spatial variabilities of PM2.5 concentrations. Technologies have improved such that certain Aerosol Optical Depth data can be used to estimate the concentrations of PM2.5 components, such as nitrate, sulfate, organic carbon, and elemental carbon. Satellite remote sensing can fill in PM2.5 data in areas without PM2.5 monitors. Satellite remote sensing refine our understanding of PM2.5 spatial distribution and track PM2.5 trends.

	
< Figure 13>[62] Beta Attenuation Monitor	< Figure 14>[63] Satellite Remote Sensing

Another major stage of network implementation is the deployment of PM2.5 speciation monitors. Speciation monitoring provides valuable information about

[62] Samplers that quantify PM2.5 mass continuously at 113 sites

[63] Spatial Distribution of nitrate predicted by the satellite remote sens

the composition, and ultimately, the sources of PM2.5 pollution. In 2014, along with states, U.S. EPA conducted a nationwide assessment of the PM2.5 speciation network to determine whether the sites were meeting the objectives and still needed. The review determined that all of the sites in California were needed and should continue to operate. Recently, CARB is conducting evaluation of the PM2.5 monitoring sites to make appropriate size of network to meet the objectives.

Data collected as part of California's PM2.5 monitoring program can be obtained in several ways. Daily PM2.5 values as well as summary statistics can be accessed through the interactive query program on CARB's web page.[64] Real-time hourly PM2.5 data from California's continuous monitors can also be found.[65]

The Clean Air Act requires the U.S. EPA to set national 24-hour and annual PM2.5 ambient air quality standards, and to designate nonattainment areas for the national standards. CARB established a more health protective State PM2.5 ambient air quality standard as required by California State law. California State law also requires CARB to designate each area as attainment, nonattainment, or unclassified for the State standard. Progress in reducing PM2.5 levels has occurred throughout the State. The South Coast 2016 Air Quality Management Plan (2016 AQMP) includes a comprehensive approach for attaining multiple PM2.5 air quality standards, including the 12.0 μg/m3 annual and the 35 μg/m3 24-hour

[64] https://www.arb.ca.gov/adam

[65] https://www.arb.ca.gov/aqmis2/aqdselect.php PM2

standards. The South Coast 2016 AQMP was approved by CARB and transmitted to U.S. EPA in 2017. The San Joaquin Valley prepared a comprehensive SIP in 2018 to address multiple PM2.5 standards: the 65 μg/m3 24-hour and the 15.0 μg/m3 annual standards; the 35 μg/m3 24-hour and the 12.0 μg/m3 annual standards. The SIP was adopted by the District in 2018 and approved by CARB in January 2019. Imperial County submitted the PM2.5 SIP for the annual standard in 2018 for the nonattainment area, which represents a portion of Imperial County. The SIP was approved by CARB and transmitted to U.S. EPA in 2018. The Plumas County SIP for the annual PM2.5 standard was submitted to U.S. EPA in 2017.[66]

5.5. U.S. Food Safety measures

5.5.1. Safety management of Agricultural products in U.S

U.S. agricultural products safety management is the responsibility of U.S. department of Agriculture (USDA), U.S. department of Health & Human Services (DHHS), Environmental Protection Agency (EPA) and U.S. department of Commerce (USDC). The Food Safety and Inspection Service (FSIS) under USDA and Animal and Plant Health Inspection Service (APHIS) manage animal products. Center for Food Safety and Applied Nutrition (CFSAN) under FDA and Center

[66] California air resources board, (2019), *Annual Report on the California Air Resources Board's Fine Particulate Matter Monitoring Program*

for Veterinary Medicine (CFVM) are in charge of general food. EPA establishes the residual pesticide criteria, and National Marine Fisheries Service (NMFS) under USD is responsible for the safety management of aquatic products. As such, there is no central period or coordination agency for the safety management of agricultural products, and many ministries are engaged in agricultural and food safety related work.

Food safety and quality control in the United States is very complex and is being implemented by 15 agencies. Major federal agencies are responsible for food safety, and food is safely supplied by each state's infrastructure. USDA and FDA play a pivotal role in food safety assurance. USDA is responsible for food safety and censorship of meat, poultry, and turbulent products, and FDA conducts risk assessment and management for all foods, including milk, aquatic products, fruits, and vegetables. The EPA establishes pesticide standards and the NMFS guarantees the safety and quality of marine products through quarantine.

U.S. agricultural safety management does not concentrate tasks, powers, and responsibilities on specific agencies, but is dispersed and balanced by many departments. Decision-making policy related to agro-food safety in the United States is transparent and based on a scientific basis. It can also be accessed and participated by businesses and the private sector. In carrying out agricultural safety management tasks, the federal and local governments maintain a complementary relationship, and work relations are coordinated.

5.5.2. Neha: Expert training institute

The National Environmental Health Association (NEHA) had its origins in the state of California where it was incorporated in 1937. The original impetus behind the creation of a national professional society for environmental health practitioners was the desire by professionals of that day to establish a standard of excellence for this developing profession. This standard, which has come to be known as the Registered Environmental Health Specialist/Registered Sanitarian credential, signifies that an environmental health professional has mastered a body of knowledge, and has acquired sufficient experience, to satisfactorily perform work responsibilities in the environmental health field.

NEHA currently serves 5,000 members to advance the environmental health and protection professional for the purpose of providing a healthful environment for all. Professionals who earn a Registered Environmental Health Specialist/Registered Sanitarian credential from NEHA are recognized as having achieved an established standard of excellence. These environmental health professionals master a body of knowledge (which is verified by examination), and acquire sufficient experience to satisfactorily perform work responsibilities in the environmental health field.

In addition to maintaining high standards of practice and testing for its credentialing programs, NEHA provides training and resources for continuing education through online courses and an online bookstore; holds an annual

conference; fosters networking and career growth; and publishes the widely-respected peer-reviewed Journal of Environmental Health.

NEHA is governed by a 14-member board of directors and benefits from various committees and technical advisors who serve as subject matter experts. NEHA employs approximately 30 paid professionals dedicated to providing quality programs to the NEHA Membership.

Drawing on the original effort that led to the creation of NEHA, the association today stands as a strong professional society with 5,000 members across the nation. Clearly NEHA's mission, "To advance the environmental health professional for the purpose of providing a healthful environment for all" is as relevant today as it was when the organization was founded.

Advancement has been defined by NEHA in terms of both education and motivation. The basis for the association's activities is the belief that the professional who is educated and motivated is the professional who will make the greatest contribution to the healthful environmental goals which we all seek. Accordingly, great emphasis is placed on providing, through each of NEHA's programs, both an educational as well as a motivational opportunity. At NEHA's conferences, for example, tremendous attention is paid to developing a quality educational program that not only imparts knowledge to the attendee but, also, through the very quality of the presentations, inspires the attendee to do more upon returning to his or her job.

5.5.3. Prevention Controls Qualified Individuals

The Preventive Controls for Human Food regulation (often referred to as FSMA) is a law enacted to ensure safe preparation of food products for human consumption in the US in order to prevent food borne illnesses. In September of 2015 the FDA announced the deadlines for businesses to comply with the new rule. These deadlines are rapidly approaching and the law requires many businesses to be compliant with the Preventive Controls for Human Food Final Rule as early as September 2016.

The regulation requires that certain activities be performed by a Preventive Controls Qualified Individual (PCQI) who has successfully completed training in the development and application of risk-based preventive controls.

A Preventive controls qualified individual "means a qualified individual who has successfully completed training in the development and application of risk-based preventive controls at least equivalent to that received under a standardized curriculum recognized as adequate by FDA or is otherwise qualified through job experience to develop and apply a food safety system.". This is the definition is from Current Good Manufacturing Practice, Hazard Analysis, and Risk-based Preventive Controls for Human Food regulation § 117.3 and the Current Good Manufacturing Practice, Hazard Analysis, and Risk-based Preventive Controls for Food for Animals regulation § 507.3.

Under the Preventive Controls for Human Food rule, the responsibilities of a "preventive controls qualified individual" include to oversee or perform 1) preparation of the Food Safety Plan, 2) validation of the preventive controls, 3) records review, 4) reanalysis of the Food Safety Plan, and other activities as appropriate to the food.

One way to become a PCQI, is to take the Preventive Controls for Human Food Course. This course, taught by a Preventive Controls for Human Foods Lead Instructor was developed by FSPCA in collaboration with the FDA. You will then receive your training certificate which is issued by the Association of Food and Drug Officials (AFDO).[67]

5.6. Case study of response related to food safety in U.S.

The U.S. Food and Drug Administration (FDA) and the U.S. Environmental Protection Agency (EPA) announced mercury toxicity in fish and shellfish to consumers as soon as mercury was detected in aquatic products in 2004. In particular, they advised that pregnant women, pregnant women, children with young children, and children should be aware of the intake of fish and shellfish. they recommend that do not eat high mercury contents such as sharks, mackerels, and so on, fish and shellfish with low mercury content should be eaten only twice a week, and so on. This is an example of providing accurate and fast information

[67] Retrieved from https://www.22000-tools.com/pcqi.html

to consumers and has provided a variety of information on health food choices on the FDA and EPA homepages. In addition, an educational campaign was conducted for consumers when the incident occurred.

The United States also responds immediately to research abroad. In 2002, a large amount of acrylamide was found in potatoes and breads cooked at high temperatures in Sweden. Animal experiments have shown that this ingredient is a carcinogenic substance. The FDA has set up an action plan for acrylamide in food, and has provided new FDA business goals and guidelines related to it. This includes in development of analytical methods for acrylamide, research on reduction of acrylamide production, exposure of acrylamide to US consumers, and collection of acrylamide toxicity information. Through this work, FDA has established appropriate risk management and communication steps. FDA has also established extensive cooperation with international organizations, research institutes, industry and other related experts and provide information on these components. In this regard, FDA held workshops with Joint Institute for Food Safety and Applied Nutrition (JIESAN) and National Center for Food Safety and Technology (NCFST) to conduct research and education to secure food safety, held a meeting with the food advisory committee. Subsequently, the committee held conferences with Codex Alimentarius Commission (CAC), and conducted joint research with the World Health Organization, the United Nations Food and Agriculture Organization, and JIFSAN.

FDA has sought to minimize the production of benzene in products against beverage companies. To do this, the FDA worked with beverage companies to determine the factors that cause benzene formation. FDA also met beverage companies that detected more than 5 ppb benzene, and the manufacturer had to re-adjust the ingredients to minimize or eliminate benzene levels. In addition, the FDA has developed guidelines for minimizing the production of benzene to all beverage companies and the FDA implements a program to test the amount of benzene in beverages. The FDA is leading the study of pandemic substances, and based on the results of the research, it notifies the relevant companies of the results of the research and makes them adjustments. In addition, when it is reported that even a small amount of benzene is detected in beverages, the safety of beverage products is prioritized, such as initiating an investigation immediately.

6. Alternatives related to Environmental Human rights

6.1. Environmental human rights and environmental policy

Human rights include rights to enjoy a healthy environment as rights related to human basic social life. Environmental rights also include the right to access natural resources such as water, air and food. It is a concept of fundamental rights, should be a priority over any value, and should be the basis of all policies. Basically, the government has a duty to ensure a safe, healthy and sustainable environment for human rights respect and protection. When policies are implemented,

discrimination should be prohibited and guaranteed equal protection of discrimination. The government must respect the freedom of expression and the right to freedom of expression in environmental matters, collect relevant information, and provide information to everyone effectively and appropriately. In addition, the state should provide education on environmental issues and involve the public in environmental decision-making. Finally, the government will have to provide effective remedies for human rights violations and environmental laws. The government should embrace these principles and deal with all environmental problems. The Office of Environment Justice and the National Environmental Justice Advisory Committee will be good guidelines for this. The United States is approaching environmental issues from the perspective of justice, and policy coordination of environmental violations among ministries in advance. In addition, the revision of the related legislation places the highest priority on the safety of the people. In Republic of Korea, related departments are required to carry out these tasks, and the National Human Right of Commission in Korea should present the human rights direction of the policy. The government should also try to benchmark California's Environmental Justice program to provide accurate and timely information, thereby reducing public anxiety. To this end, the National Human Right of Commission should propose a theory that combines human rights with public hopes for the right to live clean, and establish guidelines for protecting the human environment and human rights through a leading role in the field of human rights.

6.2. Improvement of laws and institutions

Executive Order 12898 has a great deal to suggest to Republic of Korea. The act considers minority and low-income groups in the environment, set protection goals for the environment and health of these groups, and let the federal government focus on achieving them. The United States analyzed data, and thus ensured that everyone, regardless of race, national origin, income, would live in a healthy environment. The strong action of the Clean Air Act also suggests a great deal to Republic of Korea.

Republic of Korea is trying to protect the environment in various aspects, but with its weak policy, people still live in anxiety about fine dust and food safety. The Clean Air Act encompasses solving many pollution problems through the development of new science, technology and information-based programs and encourages technical and research support. In addition, all environmental standards are strict, and sanctions are also strong. In addition, the United States is enforcing environmental laws that include civil lawsuits, which we believe will be benchmarked in order to guarantee citizens' basic rights. The United States, which has strong sanctions against companies, is comparable to Republic of Korea. The United States impose strong sanctions and fines on the environment, hold relevant hearings, and impose obligations to companies to inform the related information. It is considered urgent to revise laws which should be more powerful and include the concept of justice. Compared to the recent lack of response to events related to

food safety in Republic of Korea, the United States immediately responds and invests. In addition, the relevant departments have responsibilities, and the strengthening of the responsibility of each institution is the key. The recently revised FDA Food Safety Modernization Act focuses on prevention of food safety, which is a good example of food safety directly linked to the right to life. The revised law requires each company to revise its regulations, and it is required to conduct risk assessment and facility management guidelines for the human body. In addition, as the EPA increases its authority over food safety, the frequency of tests increase, and the government grants the EPA authority to suspend facilities through food safety risk diagnosis. The United States has a traceable system for all foods distributed in the United States, the Act established an official cooperative system with other government agencies in Republic of Korea and abroad and stipulated that integrated efforts are needed. The policy of establishing specialized educational institutions related to food safety and the system that the professionally trained PCQI performs related tasks not only enhances the trust of the public, but also contributes substantially to the improvement of food safety. Therefore, Republic of Korea should also draft and implement policies in terms of environmental justice, and benchmark the cases in the United States to establish stronger legislation and efficient and professional institutions. In addition, the National Human Rights Commission of Korea should express its opinion to improve the detailed legal system which do environmental justice and support the environment equality.

6.3. Building partnerships among government, company and citizen

The United States has stipulated the concept of cooperation in environmental law. Environmental problems are problems that a single entity cannot solve. Above all, a network of cooperation between government, companies and citizens should be firmly established. Republic of Korea still has government-led environmental policies. Regarding environmental policies, it is essential to collect opinions from such as environmental groups and human rights organizations as well as related residents. In addition, the government must provide immediate and accurate information to all citizens. Beyond solving environmental problems, the government need to establish policies for prevention, and sanction and cooperation at the same time. Businesses should consider their environmental impact when producing goods or services, and be active in protecting the environment with a sense of community. Citizens must be aware of environmental issues, actively express their opinions, and participate. No matter how good a policy is, it can hardly be a good result without a cooperative network in the field of environment. The United States is actively investing in developing systems to provide accurate and immediate information, and information is provided efficiently. Republic of Korea also impose strict sanctions on the environment and sanctions. The United States are also promoting and encouraging companies that comply with environmental principles. Residents can always express their opinions about the right to live healthily, and environmental lawsuits are legally possible. In particular,

California State has a well-established network of collaborations, and as a result of doing well, it has noticeably become environmentally friendly state. Republic of Korea should recognize this and have to go the direction emphasized the cooperation network.

6.4. Establishment of human rights as substantive rights

It is tended to ignore substantive rights in environment problems because it is difficult to identify the cause of pollution, the area where it is generated, and the target of the damage. However, for advanced Korea, it is necessary to set up alternative measures to consider human rights as substantive rights in environmental policy. Substantive rights include the right to freedom from discrimination in relation to actions and decisions affecting the environment, the right not to undermine the same rights of future generations, the right to freedom from pollutants and environmental adverse effects, and the right to freedom from acts threatening life, and health. The government should recognize the human rights of a healthy environment as an obligation. Recognizing human rights as an obligation and pursuing environmental and development goals in accordance with norms not only promotes human dignity, equality and freedom, the benefits of realizing all human rights, but also helps inform and strengthen policy decisions. In addition, it makes policies more legitimate, consistent, robust and sustainable by ensuring that the most affected people are informed, free to express their views and participate in the decision-making process. Most importantly, the human rights

perspective helps to ensure that environmental and development policies will improve the lives of the people on which they depend. Fine dust and food safety issues are both a problem of right to health and a right to life. These problems have greater impact on children, which can lead to child rights violations. In other words, the government will need to analyze the inequalities by region and tier and establish a policy to solve the inequalities at socio-economic level. In the United States, data analysis by race, income, region, country, and age is thorough and is provided to the public. Based on this data, we are implementing strong policies to eliminate environmental inequality. Therefore, Republic of Korea should have a broader view and have to consider policies to ensure the substantive rights of human rights.

6.5. Policy direction about fine dust and food safety

Fine dust and food safety issues are serious environmental issues related to the right to life, leading to death in severe cases. It is available to be found common suggestions through the United States case analyzed earlier. First, in the related policy, strict regulation should enforce from the point of view of national health protection, and law revision and policy should be drafted according to the standard of justice. It is necessary to review the Clean Air Act and the Food Safety Modernization Act and apply them to the situation in Republic of Korea. Second, the importance of a collaborative network should be emphasized. External cooperation is important. This is because that the atmosphere is an important factor

in geographical influences and the direction of the wind, and food is also provided actively in import and export due to globalization. In addition, communication and cooperation with related organizations, companies, NGOs and citizens are important. It is recommended to stipulate about cooperation like the United States and to establish a culture of cooperation. Third, technical support and professional training are important. The United States builds advanced programs for air pollution control and shares them in real time. Beta Attenuation Monitor and satellites to measure air quality accurately, and through strong legislation, all states and corporations strive to establish and implement fair and effective environmental policies. Regarding food safety, the United States strives to nurture relevant experts, which has been practically effective. Therefore, Republic of Korea should invest to solve environmental problems. Fourth, the responsibilities and authority of related departments should be strong. In the United States, there are several agencies responsible for food safety, and they are also empowered to take strong sanctions. Relevant departments increased the number of inspections on food safety and increased the probability of detection, which was effective. The US government has given each state the responsibility of attaining air pollution standards, and has given it authority. The United States has separate specialized departments for food safety and air pollution, and the United States spares no manpower investment. Republic of Korea also needs to prioritize policies to invest in the workforce and to increase the actual authority and responsibility of the relevant departments. Finally, Republic of Korea should consider establishing

policies for substantive rights from a broader perspective. As discussed above, fine dusts have different influences depending on volume and are more vulnerable to pregnant women, children and the elderly. In addition, regional influence on fine dust is different. Foods that are consumed mainly by income may be different, and there are various substantive factors in environmental problems. In other words, the government should minimize health damage and strengthen human rights protection for the underprivileged by customizing support for vulnerable groups and regions. For example, we provide letter notification services for heart and asthmatic patients, and provide preventive products such as disease prevention, prevention guidelines, masks, etc. for vulnerable people such as elderly people living alone. It should be establish a culture of human respect by maximizing human rights protection based on human environment guarantee.

7. Conclusion

Environmental justice is fair treatment and meaningful involvement of all people with respect to development, implementation, and enforcement of environmental laws, regulations, and policies. Fair treatment means that no population bears a disproportionate share of negative environmental consequences resulting from industrial, municipal, and commercial operations or from the execution of federal, state, and local laws; regulations; and policies. Meaningful involvement requires effective access to decision makers for all, and the ability in

all communities to make informed decisions and take positive actions to produce environmental justice for themselves. Environmental justice is actually a principle of American democracy that combines civil rights with environmental protection. It demands that that those who have historically been excluded from environmental decision making, traditionally minority, low-income, and tribal communities, have the same access to environmental decision makers, decision-making processes, and the ability to make reasoned contributions to decision-making process as any other individuals.

Republic of Korea tends to neglected the environmental justice, while giving priority to the economy so far. Rather than reflecting human rights concepts and focusing on prevention when establishing environmental policies, Republic of Korea has pushed for post-processing when problems arise. Human rights include rights to enjoy a healthy environment as rights related to human basic social life. At the United Nations Conference on Human Environment, it is highlighted the need for environmental protection and linked it to the right to life. Environmental rights are the right to access natural resources such as water, air and food, and include the right to be informed and participate in decision-making. In other words, both substantive (The right to be free from discrimination in relation to environmental behavior and decision-making, and freedom from acts that threaten life and health) and procedural rights (The right to be able to access information about the environment and express opinions on the environment) need to be

considered. In particular, Republic of Korea tends to neglect substantive rights, so data bases and guidelines for substantive rights are required.

At present, the public interest in fine dust and food safety has increased in Republic of Korea. This is considered to be an urgent problem because it is a problem that is directly related to the life of the people. The environment is a common problem worldwide. Advanced case studies can be a good foundation before making a policy decision. This case study suggests a great deal to Republic of Korea. The U.S. EPA publishes the Environmental Justice Progress Report annually. The report (FY 2017), published in 2018, covered three key areas: micro dust, lack of drinking water, and low-income problems. In addition, the Obama administration has issued the EJ 2020 Action Agenda, which outlines plans to incorporate environmental justice into its mandate from 2016 to 2020.[68] In addition, the United States has the National Environmental Justice Advisory Council and reflects its recommendations in to the policies. EPA has a separate Office of Environment Justice, and U.S. environmental laws include strong sanctions and standards, and civil environmental litigation. The United States cases, which enforces environmental policies that prioritize justice, imply a lot to Korea. The US. Clean Air Act which has strong sanctions and the FDA Food Safety Modernization Act which is a preventive centered food safety law, are able to be a good inspiration for Korean law reforms. In addition, Republic of Korea should

[68] Robert Esworthy, David M. Bearden, (2018), *Role of the U.S. Environmental Protection Agency in Environmental Justice,* Congressional Research Service

actively benchmark relevant departments and committees that prioritize justice in U.S., the various California Environmental Justice Programs, national environmental heath monitoring network, food safety education institutions, and trained expert. Based on the above research, it is proposed policy directions. First, environmental policy should be implemented in terms of public health protection. Second, the importance of collaboration networks should be emphasized both domestically and internationally. It is also important to establish a cooperative culture. Third, technical support and professional training should be provided. Fourth, the responsibility and authority of related departments should be raised at the same time. Finally, it should reflect the substantive rights when establishing the policy. Through this, it will be expected the settlement of human respect culture of Republic of Korea by realizing human rights protection value based on human environment guarantee and maximizing social value.

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