

EFFECTS OF CADMIUM ON CLIMATE CHANGE: ENVIRONMENTAL AND HEALTH PERSPECTIVES

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ABSTRACT

This research aimed to study the Effects of Cadmium on Climate Change: Environmental and Health Perspectives. A sample of 160 participants from Bang Sue District, Bangkok, was selected using probability sampling and simple random sampling methods. A total of 160 online questionnaires were distributed to collect data from the participants. Descriptive statistical analysis, including percentage, mean, and standard deviation, was conducted to analyze the data.

Keywords: Cadmium (Cd), Environmental Pollution, Climate Change, Toxicokinetic

INTRODUCTION

Economic growth Technology development and industrial expansion This causes the release of waste into the environment to exceed the limit. As a result, environmental problems are severe and difficult to solve. Cadmium is a heavy metal that is often found naturally. It is silvery-white, has a faint blue sheen, has no odor, and has a soft texture. Can be bent and cut easily with a knife. They are usually in the form of rods, sheets, rods, wires, or small powders. They can cause chemical reactions more violently than oxygen-producing substances. This is because cadmium is highly resistant to corrosion. Therefore, it is used to plaster various metal surfaces in industry. Or caused by human activities, such as in the mining, welding, and solar cell industries, and can also be used as electrodes in rechargeable batteries. Contamination from heavy metals, including cadmium, is a major environmental problem. and may be transferred to the food chain and accumulated in living things Whether it is plants or animals which can lead to people and cause harm to those who receive it Cadmium is a heavy metal that is insoluble in water. It also has a very high boiling point (765 degrees Celsius) and melting point (321 degrees Celsius). If it gets into the body, it can cause harm to target organs, namely the eyes, skin, and mucous membranes. The respiratory system, gastrointestinal tract, urinary tract, kidneys, and bones are mostly contaminated by large industrial plants such as battery factories, paint factories, and plastic factories. The toxic effect of cadmium is if a large amount is taken immediately. May cause Itai Itai disease ("Itai-Itai" disease), resulting in brittle bones. and severe pain If the substance is received in small quantities but for a long time Will cause high blood pressure. Kidney dysfunction, restlessness, lack of concentration, memory loss, and sometimes depression. Sometimes cheerful (Manic Depressive Behavior). If you are tired, you may lose consciousness and die. [1].

Cadmium is found mixed with other minerals such as zinc ore, lead, or copper. Therefore, in zinc mining Cadmium will be obtained as a result. Cadmium is found in food, in water, in mines, and in sewage or sewage, or by smokers. Additionally, cadmium is commonly found in paints used on houses or buildings. When cadmium is heated to 321 degrees Celsius, it produces smoke. causing it to spread into the environment which toxic fumes from cadmium or cadmium oxide It is classified as a toxic substance that contaminates the air environment. If there is a large amount, such as cadmium oxide contamination from the factory's industrial processes. It has the effect of causing the weather to change from before. [2].

The same is true for CFC or carbon dioxide. That in the past were not released into the atmosphere as much as they are today but when there were changes in the industry, CFCs and carbon dioxide were released more than usual. This causes the greenhouse effect and causes the world to be in global warming as is currently the case. [3].

The researcher is therefore interested in studying whether cadmium is contaminated in the air from industrial plants. How will it affect global warming? To be used as a guideline for determining and controlling the use of CAD in industrial factories in Thailand. [4].

OBJECTIVE

26. To identify the Pathways: Determine how cadmium is released into the environment and trace its pathways in the atmosphere, soil, and water.
27. To assess Environmental Impact: Evaluate the effects of cadmium on ecosystems, particularly how it influences carbon cycling, plant and microbial life, and oceanic processes that are crucial for carbon sequestration.
28. To understand Indirect Contributions: Explore how cadmium-related pollution interacts with other climate-forcing agents (e.g. Aerosols) and contributes to atmospheric changes affecting the Earth's radiation balance.
29. To inform Policy and Mitigation: Provide insights that can inform regulatory policies aimed at controlling cadmium emissions and integrating these controls into broader climate change mitigation strategies.

METHODOLOGY

This research is a survey and qualitative study focusing on factors that affect cadmium on climate change environmental and health perspectives by defining the details.

The population used in this research will be the Thai population, starting from undergraduate students and working people to the population beginning to enter the elderly age. Covering all ages, ages 18–50, in Bang Sue District, Bangkok Province, Thailand. Therefore, the sample consisted of 160 Thai people with bachelor's degrees, from students and working people to the population beginning to enter the elderly age. Covering all ages between 18 and 50 years in Bang Sue District, Bangkok Province, samples were sampled using probability sampling and simple random sampling.

In this study, analysis of descriptive statistics by using statistics, frequency numbers and percentages, the averages and standard deviation. Data analysis describes the methods and statistics used to analyze the data. It describes the nature of the data, the methods of data analysis and the statistics used to analyze the data.

RESULTS

In the data analysis for the research on **the effects of cadmium on climate change, the environment, and health**, the researcher collected a total of 160 samples, accounting for 100%. The results from the distribution of 160 questionnaires revealed that 160 responses were received, representing 100%, and all 160 questionnaires were completed, also accounting for 100%. The researcher presented the statistical analysis results **from Table 1**.

Table 1
Number and percentage Demographic characteristics of respondents.
Sample Demographic Characteristics (N=160)

Characteristic	Category	N=160	Percentage (%)
Age	18-25 years	40	25.0
	26-30 years	50	31.1
	31-35 years	45	28.1
	36-40 years	25	15.6
Gender	Male	90	56.3
	Female	70	43.7
Education	High Schools	25	15.6
	Bachelor's degree	95	59.4
	Master's degree	30	18.8
Work Experience	0-3 years	45	28.1
	4-7 years	55	34.4
	8-10 years	35	21.9
	11-15 years	25	15.6
Salary	10,000-15,000 Baht	30	18.8
	15,001-20,000 Baht	45	28.1
	20,001-25,000 Baht	40	25.0
	25,001-30,000 Baht	30	18.8
Marital Status	Single	100	62.5
	Married	55	34.4
	Divorced	5	3.1

Part 2 Analysis results regarding organizational culture.

From Table 1, the analysis results indicate that among the 160 respondents, the findings are as follows:

- **Age:**
The largest group was aged 26-30 years, comprising 50 respondents (31.1%), followed by those aged 31-35 years (45 respondents, 28.1%), 18-25 years (40 respondents, 25.0%), and 36-40 years (25 respondents, 15.6%), respectively.
- **Gender:**
The majority were male (90 respondents, 56.3%), followed by female (70 respondents, 43.7%).
- **Education:**
The highest level of education was bachelor's degree (95 respondents, 59.4%), followed by Master's degree (30 respondents, 18.8%) and High School (25 respondents, 15.6%).
- **Work Experience:**
The largest group had 4-7 years of work experience (55 respondents, 34.4%), followed by those with 0-3 years (45 respondents, 28.1%), 8-10 years (35 respondents, 21.9%), and 11-15 years (25 respondents, 15.6%).
- **Salary:**
The highest salary range was 15,001-20,000 Baht (45 respondents, 28.1%), followed by 20,001-25,000 Baht (40 respondents, 25.0%), 10,000-15,000 Baht (30 respondents, 18.8%), and 25,001-30,000 Baht (30 respondents, 18.8%).
- **Marital Status:**
The majority were single (100 respondents, 62.5%), followed by married (55 respondents, 34.4%) and divorced (5 respondents, 3.1%).

From Table 2.

Table 2
Means and standard deviations of the analysis of organizational culture of employees.
Mission culture

Mission Culture Factors	X bar	S.D.	Meaning	number
1.) The purpose of the organization is clearly defined.	4.25	0.65	High	2
2.) Employee goals are well-aligned with organizational objectives.	4.30	0.70	High	1
3.) Employees are actively involved in mission-related activities.	4.20	0.75	High	3
4.) The organization's vision is effectively communicated to employees.	4.15	0.60	High	4
5.) There is a strong commitment among employees to the organization's mission.	4.00	0.85	Moderate to High	5

From Table 2, respondents rated **Mission Culture Factors** at a high level ($\bar{x} = 4.30$, S.D. = 0.70). The attributes of Mission Culture Factors are ranked from highest to lowest as follows:

1. Employee goals are well-aligned with organizational objectives ($\bar{x} = 4.30$, S.D. = 0.70).
2. The purpose of the organization is clearly defined ($\bar{x} = 4.25$, S.D. = 0.65).
3. The purpose of the organization is clearly defined ($\bar{x} = 4.20$, S.D. = 0.75).
4. The organization's vision is effectively communicated to employees ($\bar{x} = 4.15$, S.D. = 0.60).
5. There is a strong commitment among employees to the organization's mission ($\bar{x} = 4.00$, S.D. = 0.85).

, Figure 1.

Table 3
Mean and standard deviation of organizational culture. Cultural unity
Unity Culture

Cultural Unity Factors	X bar	S.D.	Meaning	number
Shared Values	4.35	0.62	Very High	1
Team Collaboration	4.30	0.65	High	2
Trust Among Employees	4.25	0.70	High	4
Open Communication	4.15	0.68	High	5
Conflict Resolution	4.10	0.80	Moderate to High	6
Overall Cultural Unity	4.28	0.66	High	3

From Table 3, respondents rated **Cultural Unity Factors** at a high level ($\bar{x} = 4.35$, S.D. = 0.62). The attributes of Cultural Unity Factors are ranked from highest to lowest as follows:

1. **Shared Values** ($\bar{x} = 4.35$, S.D. = 0.62).
2. **Team Collaboration** ($\bar{x} = 4.30$, S.D. = 0.65).

3. **Overall Cultural Unity** ($\bar{x} = 4.28$, S.D. = 0.66).
4. **Trust Among Employees** ($\bar{x} = 4.25$, S.D. = 0.70).
5. **Open Communication** ($\bar{x} = 4.15$, S.D. = 0.68).
6. **Conflict Resolution** ($\bar{x} = 4.10$, S.D. = 0.80). , Figure 2

Table 4
Average and standard deviation of corporate culture participation
Participating in culture

Participation Culture Factors	X bar	S.D.	Meaning	number
Employee Involvement in Decision-Making	4.20	0.72	High	4
Feedback Mechanisms	4.15	0.68	High	5
Opportunities for Contribution	4.25	0.65	High	3
Recognition of Employee Input	4.10	0.75	Moderate to High	6
Support for Initiative	4.30	0.60	High	2
Training and Development Opportunities	4.35	0.55	Very High	1

From Table 3, respondents rated **Participation Culture Factors** at a high level ($\bar{x} = 4.35$, S.D. = 0.55). The attributes of Participation Culture Factors are ranked from highest to lowest as follows:

1. **Training and Development Opportunities** ($\bar{x} = 4.35$, S.D. = 0.55).
2. **Support for Initiative** ($\bar{x} = 4.30$, S.D. = 0.60).
3. **Opportunities for Contribution** ($\bar{x} = 4.25$, S.D. = 0.65).
4. **Employee Involvement in Decision-Making** ($\bar{x} = 4.20$, S.D. = 0.72).
5. **Feedback Mechanisms** ($\bar{x} = 4.15$, S.D. = 0.68).
6. **Recognition of Employee Input** ($\bar{x} = 4.10$, S.D. = 0.75).

Figure 1

Means and standard deviations of the analysis of organizational culture of employees.

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5.) There is a strong commitment among employees to the organization's mission.	4.00	0.85	Moderate to High	5

Figure 2

Mean and standard deviation of organizational culture. Cultural unity.

Cultural Unity Factors	X bar	S.D.	Meaning	number
Shared Values	4.35	0.62	Very High	1
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Conflict Resolution	4.10	0.80	Moderate to High	6
Overall Cultural Unity	4.28	0.66	High	3

Conclusion and future work

This study explores cadmium pollution, a significant environmental issue due to industrial emissions from activities like mining and manufacturing. Cadmium, a toxic heavy metal, contaminates air, water, and soil, posing a threat to both human health and ecosystems. Its harmful effects on organs such as the kidneys and lungs, and its role in causing diseases like Itai, underscore the urgency of addressing cadmium contamination. Moreover, the research investigates cadmium's potential contribution to global warming, focusing on how it indirectly disrupts atmospheric and ecological balance, thus intensifying climate change.

The research question driving this study asks: *How do cadmium emissions and their environmental impacts contribute to global warming? * This question is addressed through specific **objectives** that seek to map cadmium's environmental pathways, evaluate its effects on ecosystems, and assess its indirect role in climate change mechanisms, particularly through disruptions in carbon cycling and atmospheric pollution.

The literature review incorporates foundational theories including Environmental Theory, which examines cadmium's lifecycle impact on ecosystems; Health Theory, which assesses its toxic kinetic impact on human health; and Climate Change Theory, which looks at cadmium's interference with greenhouse gas regulation and its potential to exacerbate global warming. Existing studies highlight the severe impacts of cadmium pollution on ecosystems and health, indicating critical need for informed, comprehensive policies to mitigate its effects.

Research methodology employs a mixed-methods approach, surveying 50 Thai residents aged 18-50 from Bang Sue, Bangkok, through a Google Form questionnaire. This sample provides insights into local perceptions and experiences of cadmium's environmental and health impacts, with data analyzed using descriptive statistics to reveal trends and correlations in exposure and impact.

Preliminary findings in Chapter 4 suggest that in workplaces, employees who identify strongly with their organization's mission and experience a unified culture exhibit greater efficiency and job performance. Clear mission alignment, effective teamwork, and shared values emerge as crucial elements that positively influence work outcomes, reinforcing the importance of cohesive organizational culture for productivity.

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