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Resilience of the Community against Environmental Pollution: The Knowledge Production Process of Local Activism on PFAS Contamination on US Military Bases in Okinawa

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Keywords

PFAS contamination, unseen science, undone science, US Military, environmental activism

Introduction

This paper clarifies how local communities have recognized and responded to the per- and polyfluoroalkyl substance (PFAS) contamination caused by US military bases in Okinawa Prefecture and how they have shaped PFAS pollution control as a public issue. Firefighting agents containing PFASs (Aqueous Film-Forming Foam, or AFFF), which have been widely used in military bases and chemical plants since the 1960s, have recently become internationally known for their harmful effects on the human body and the environment and being subjected to international regulation since the 2000s. However, because PFAS contamination has not been disclosed to the public, it has made the current situation of contamination more complicated. In this paper, I will show how local activism has made PFAS pollution caused by military bases a public issue by considering a case study in Okinawa.

After World War II, the Ryukyu Islands, including Okinawa Island, were governed by a US military government until 1972, when the US government returned administrative control of the islands to the Japanese government. The US military government (United States Civil Administration of the Ryukyu Islands), which reigned over the native government, was able to maximize its own military interests against the democratic will of the local people through governance largely insulated from local input. As a result, a vast number of US military bases were built in Okinawa, and the majority of US bases in Japan still remain there even today.

The stationing of the US military in Okinawa Prefecture after 1972, when Okinawa was re-integrated into Japan, was redefined under the Japan–US security treaty, namely

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the Status of Forces Agreement (SOFA). Because the SOFA is an international treaty and therefore limits intervention by parties other than both the national governments and their security agencies, environmental agencies and local governments face limits in dealing with PFAS pollution control. The purpose of this paper is therefore to clarify how local communities, faced with the difficulties of decontamination, have problematized the issue of PFAS pollution through environmental activism and local media.

Purpose and Analytical Scope

This paper sociologically clarifies the process of problematization of PFAS pollution at the intersection of environmental and military issues. Specifically, it will focus on the process of PFAS contamination in Okinawa and the production and distribution of knowledge related to PFASs contamination through environmental activism and local media from 2016 through 2020.

PFASs are chemically synthesized, non-water-soluble compounds that have been widely used as waterproof coatings and fire extinguishing agents. Due to their nature, they are very slow to decompose, so they are often called forever chemicals, and they accumulate in the environment as well as inside the human body and are strongly linked to a host of cancers, developmental disorders, immune dysfunction, and infertility (United States Environmental Protection Agency 2015; U.S. Fire Administration 2020). Extinguishing agents containing PFASs have been used in firefighting drills for aircraft and factories at military bases on a regular basis. In the US, the nature of the substances was recognized by the companies that produced them in the 1970s, but due to the strong connection between the US environmental administration and chemical companies, the compounds were not strictly regulated, and thus began to accumulate in the environment over time (Agency for Toxic Substances and Disease Registry 2019; Environmental Working Group 2021; Mitchell 2020b). The substances were finally subject to regulation by environmental agencies from the 2000s onwards. The delayed response to the problem has had a tremendous impact on the quality of life of residents who have long been unaware of the effects of PFASs.

Environmental Contamination in Relation to the Military Presence

Sociologists have been studying the impact of various environmental problems on local communities to date.¹ Although there is not enough previous research on PFAS pollution because it is a newly emerged contamination, the latest research has been submitted mainly from the perspective of public sociology and the sociology of science and society (Cordner, Richter, and Brown 2019; Richter, Cordner, and Brown 2020; Richter 2018). This research shed light on the fact that scientific enterprises influence both the chemical regulatory process and mechanisms by which chemicals are regulated, and therefore, they are underregulated in terms of their impact on the environment. Sociologists of science and society conceptualize the following aspects in their analysis of the regulation of

PFAS risks: first, *unseen science*, in which environmental regulators authorize the use of new chemicals without disclosing the original company's research on the environmental impact of the chemicals (such as corporate-sponsored science) (Richter 2018); and second, *undone science*, in which the regulatory process does not provide scientific assessments that match the specific environmental pollution situation despite the needs of the community and social movements concerned (Frickel et al. 2010; Hess 2009; Richter, Cordner, and Brown 2020). With the overlap of unseen and undone science, the implementation of pollution control measures that match the specific situation of PFAS pollution becomes a challenge.

In addition, the PFAS contamination caused by military bases is characterized by the fact that it develops in combination with the strategy of politically concealing US military base operations through the SOFA. Even when solving local environmental pollution, if it is considered by the US military authorities to interfere with its military operations, the actual information will not be disclosed. Furthermore, the Japanese security administration rarely discloses information related to US military operations. As a result, PFAS contamination caused by military bases has emerged as a major risk to residents living near the bases in the host country. This inability of the community to procure information on military operations is one of the characteristics of base politics.

Political scientist Shinji Kawana refers to this function of concealing information as security *blocking*, which is a strategy to politically cover up the actual operations of the US military bases. The operation “of the SOFA, for example, is substantially a black box in Japan. As is well known, the minutes of the Japan–US Joint Committee, where the operation of the SOFA is discussed, or consensus documents, are not made public” (Kawana 2021, 273–4). The SOFA and its operating regulations, the Supplementary Agreement, stipulate whether or not domestic law applies to environmental pollution caused by military bases. While domestic law is basically applied under the NATO SOFA (Mori 2020), for example, the framework of the environmental pollution measures in the Japan–US SOFA are basically based on closed consultations within the Joint Committee, which is comprised of non-elected administrative elites from both countries. Local governments and residents who are the stakeholders in pollution damage and who desire to understand the actual operation of the agreement are thus excluded from the detecting process of the environmental impacts.

The revelation of the PFAS problem in Okinawa after 2016 is a reminder to local governments of the limits of what can be done to deal with environmental pollution problems caused by the military bases. Under these circumstances, environmental activism has contributed to the way knowledge is produced to overcome the limitations of this status quo. In what ways, then, have local residents attempted to overcome the blocking strategy of base politics? This is the first point to be clarified in this paper. Second, such environmental activism may produce new knowledge, but if it is not shared with the public, it may become unseen knowledge (or science). To turn pollution into a public issue, therefore, it is necessary to use mass media as a medium to achieve public awareness.

How does the mass media mediate the issue of PFAS contamination? I conduct a quantitative text analysis of local newspapers in Okinawa Prefecture to clarify this question.

Communication Community Made by Discursive Interaction

The community formed by environmental activism and local media, which is the target of this paper, is defined as a *communication community* (Delanty 2018). A communication community is a meaningful delineation to make the ambiguity implied by the polysemous term community more operational. This is not a communitarian model in which community and the identity that underlies it are given. Rather, it is a more communicative model that is socially constructed in the acquisition process of individual and collective goods.

Pollution of local communities by chemical compounds, combined with factors such as scarcity of natural resources in island regions and the diminutive amount of land, has a high probability of causing direct damage to local residents in Okinawa. Therefore, a communication community to deal with PFAS pollution is being set up to address this problem. The actors that comprise this community are, in this paper, environmental experts who are familiar with chemical pollution and its international development and the local mass media, which has the infrastructure to communicate this expertise to the public at large. These actors' efforts to raise awareness of PFAS contamination and to educate the public discourse on the contamination will be one of the factors that supports the resilience of the local population against PFAS contamination. In sociology, resilience is defined as not limited to individuals or individual actions but achieved collectively. In this sense, a communication community plays a significant role as infrastructure that supports collective resilience (Estêvão, Calaso, and Capucha 2017).

This paper will first analyze what structural barriers exist for combating PFAS contamination in Okinawa, tracing the genesis of the PFAS problem from 2016 to 2020. Second, as environmental activists confront the PFAS problem as military-environmental pollution, an interview survey will reveal what strategies activists have mobilized to acquire information and make it public.² Third, I will clarify how a local newspaper reported on the PFAS issue through a quantitative text analysis.

Emergence and Development of the PFAS Contamination Problem in Okinawa 2016–2020

The detection in 2016 of high concentrations of PFOS, a type of PFAS, in the rivers and groundwater that are the intake source for the Chatan water purification plant, which is located adjacent to the US Kadena Air Base in the central part of the main island of Okinawa, triggered a growing interest in PFAS contamination (Shimabukuro 2020). In particular, in April 2020, pollution from firefighting agents containing PFASs (AFFF) that have spilled in large quantities from US Futenma Air Base into the surrounding waters and areas became a major issue.³ The AFFF contamination that leaked from Futenma

Airbase is supposed to be addressed in accordance with the Environmental Supplementary Agreement to the SOFA (signed in 2015) (Ministry of Foreign Affairs of Japan 2019; Okinawa Prefecture 2020; Sato 2017).

As of April 20, 2020, the Okinawa Defense Bureau was still in the process of reviewing with the US the application from Okinawa Prefecture and Ginowan City for an on-site investigation of Kadena Airbase (*Okinawa Times* 2020). The Japan-US Joint Committee on Entry Agreement states that when the US military is notified of a leak, the Japanese government as well as prefectures “may apply” to be allowed a site visit, but the agreement only states that “reasonable consideration will be given” and “a response will be made as soon as practicable.” There is thus no obligation to accept the request from the US military side (Shimabukuro 2020, 58).

After the PFAS leak at Futenma in 2020, the US military agreed to the Japanese government and Okinawa Prefecture’s request to enter the base and conduct soil sample surveys. However, the actual implementation of scientific policy during the sample survey is determined exclusively by the Japan-US Joint Committee, which is unique in that it leaves no room for negotiation on the establishment of the sample site except by the parties concerned (*Okinawa Times* 2020a). In addition, when the current situation regarding pollution is disclosed, the national government and local governments are expected to reconcile their respective results in advance, and the independence of individual organizations in the process of scientific reasoning, determination of methodology, and evaluation of results becomes a scientific black box prior to disclosure.

Institutionally, the US-Japan Joint Committees were designed to have a high degree of exclusive freedom (*Ryukyu Shimpo* 2020). Furthermore, the current Japan Environmental Governing Standards (2018 version), which were created by the US military and functions as an environmental standard that has no judicial obligation, being disconnected from domestic environmental regulations, only include PFOS regulation among PFASs (Mitchell 2020a). The standards also only stipulate environmental standards with which the US military must comply and hardly include any administrative procedures such as notifications, on-site inspections, or remediation recommendations (Sato 2017, 17). As a result, only water source management of AFFF leaking into the nearby area was being conducted by Okinawa Prefecture in 2020.

Research alongside/within the Fences: Patterns of Knowledge Production of PFAS Contamination through Environmental Activism

As we saw above, the problematization of PFASs in Okinawa began in 2016. The emergence of this problem inevitably led environmental activists and journalists who had been working on military environmental pollution for decades to focus their knowledge production activities on the PFASs (Mitchell 2020b; The Informed-Public Project 2019c; 2018). These actors produced diverse information on PFASs, using strategies and technologies that address the particularities of the environmental problems in Okinawa, which

can be summarized as follows: (1) breaking through security blocking, (2) breaking through linguistic barriers and promoting knowledge distribution, (3) building direct networks with public agencies, and (4) creating a coalition with the local mass media. These four strategies will be discussed in detail below, using interviews conducted with activists who have played a central role in the production of knowledge about PFAS in the unique context of PFAS contamination in Okinawa since 2016.

Breaking through Security Blocking

The first strategy was to obtain Japanese and US administrative documents through the Freedom of Information Act (FOIA) to break through the security blocking (Kawana 2021) surrounding the base issue and thereby reveal the genealogy of the pollution on the military bases. Using this strategy, environmental pollution surrounding US military bases in Japan has been historically revealed by journalists and environmental activists (Mitchell 2020b). In his pursuit of journalism on environmental pollution from military bases, anonymous informant #1, who, like the other anonymous sources we interviewed, agreed to speak on condition of anonymity due to the political sensitivity on this issue, has conducted investigative reporting on the impact of environmental destruction by the military on humans and the environment (Interview with informant #1, February 5, 2021). While researching the effects on people of defoliants used in US military operations during the Vietnam War, informant #1 became aware of the military base problem in Okinawa. Interacting with Japanese journalists and activists pursuing the military base issue, informant #1 learned that official documents play a much more significant role in investigative reporting than interviews.

The issue of military environmental pollution in Japan is difficult to disclose as it is. Therefore, informant #1 attempted to use the US FOIA to break through the information blockade by accessing US military archives. In order to effect the release of administrative materials through access to such information, one must have a good understanding of the relevant culture and language of the administration. Understanding the administrative language will give one a chance to expose better, more relevant materials. Informant #1 also developed, through trial and error, a method of gaining access to people inside the administration to understand what kinds of negotiations took place within the administration, and through this, to review new materials and apply for information disclosure. As a result, it was revealed that leaks of AFFF at the Kadena and Futenma bases had been occurring continuously since before 2016. This raised the probability that the PFAS contamination at both bases is long-term in nature.

Breaking through the Language Barrier and Promoting Knowledge Distribution

The second strategy is to form a communication community by presenting to the Japanese public through experts not only the scientific truths about PFASs that are circulating in the Japanese language community but also the broader risks of environmental exposure to PFASs. This includes translating information in foreign languages into Japa-

nese. Through research on documentaries on US veterans of the Vietnam War, informant #1 came to realize that the history of the Vietnam War, such as is studied in the US, has not received much attention in Japan. By traveling between the two languages in this way, informant #1 learned about the differences in discourse between the English- and Japanese-speaking worlds, so to speak, through translational differences.

Anonymous informant #2 has been involved in a wide range of environmental issues in Okinawa. Informant #2 has experienced activism at the intersection of the environmental and military base issues, especially through the dugong trial against US Secretary of Defense Donald Rumsfeld in the late 2000s, when the plan to build a new US Marine base at Henoko became a political issue (Interview with informant #2, January 15, 2021). In the course of research on waste issues, military environmental pollution, and the use of reclaimed land on US military bases and surrounding areas, informant #2 has used the Japanese FOIA to publicize the risks of environmental pollutants. Informant #2's first encounter with the PFAS issue was the water-source contamination at the Chatan water treatment plant in 2016. It was an event that emerged while already investigating environmental pollution in the surrounding area for another project.

Informant #2 similarly found that the discourse on the environmental risk on PFASs in Japanese is limited in comparison to in the English-speaking world. Learning that the knowledge possessed by governments and local societies is limited and unevenly distributed, informant #2 has networked with environmental organizations in the US to advocate the Japanese environmental administration to compare scientific findings and data with the latest research from around the world through cross-national comparisons. Both informant #1 and informant #2 similarly contributed to the dissemination of information on PFAS in Japan through official documents and academic findings by transforming the information distribution network, which is often limited by the level of linguistic competence, into a mutually convertible flow by disseminating the same issues in Japanese and English.

Building Direct Networks with Public Agencies

The third strategy is to approach local governments directly to establish a network. This will increase the range of options for countermeasures for local governments that do not have sufficient information on PFAS contamination. Informant #2 wondered why local governments and administrators who oppose environmental pollution act as if the SOFA prevented them from doing anything about it. Informant #2 mentioned that while the SOFA is indeed of little use in dealing with environmental pollution, there are still many other ways to deal with it. Informant #2 actually discovered unknown administrative procedures by contacting government officials directly to find out information related to pollution that was not revealed. Informant #2 has also tried to increase the knowledge of government officials and politicians about PFASs through policy recommendations regarding the US National Defense Authorization Act for Fiscal Year 2020, which regulates the administrative process of the US Department of Defense and related administra-

tions regarding PFASs (The Informed Public Project 2019d).

Administrators are often ignorant of a variety of ways to execute laws and administrative procedures. By providing information to such insiders, one could be the “tough negotiator” able to influence policy making decisions directly. This is an advisory practice to make environmental administrators aware of their own lack of knowledge so that they can open up new policy development avenues.

In addition, a detailed investigation of the actual administrative processes will reveal what is hidden by the SOFA (the practice of obtaining unknown knowledge). This will reveal which types of scientific knowledge are not disclosed by the military authorities (unseen science) and which types of science are required by local administrations in response to contamination (undone science).

Coalitions with Local Mass Media

The fourth strategy is to reach out to the mass media. The discoveries made through the environmental activism described above will not be recognized as social problems if they are not publicized. They will become social problems in the community when these discoveries get on the information distribution circuit of the local mass media. In particular, in the early stages of a problem’s emergence, the support of the mass media becomes an important opportunity (Benford and Snow 2000). Drawing on experience as an environmental activist, informant #1 has been working with newspaper reporters to get the issue of PFAS pollution into the press. Recognizing the unique information production process of the newspaper media, informant #1 advised journalists to write articles at important times and provided them with the information they needed to write the articles. This coalition between activists and reporters interested in the issue has facilitated newspaper coverage of the PFAS pollution issue.

Informant #2, on the other hand, points out that if problems are only reported in regional newspapers, the importance of the problem will not reach the elites in Tokyo, and there is a danger that the problem will be left as a regional problem. In fact, informant #2 stated, the Ministry of the Environment only started to act on PFAS contamination after the national media reported that the contamination was also found around US military bases in the Tokyo metropolitan area. In Japan, as a centralized country, it is difficult to reform security policies without the mediation of the central administration. This can be pointed out as a problem that differs in phase from federal states such as Germany and the US.

Problematization of PFAS Contamination by a Local Newspaper (the *Okinawa Times*)

Next, I used a quantitative analysis of article titles to clarify how the PFAS issue was reported in a local newspaper (the *Okinawa Times*) in parallel with the local community’s awareness of PFAS pollution as revealed by the production of expert knowledge in environmental activism.⁴ The analysis used morphological analysis of newspaper article titles, which allows us to examine what topics appeared frequently during a particular period. In

this section, I clarify (1) the changes in discourse during the indicated time periods and (2) the development of PFAS-related articles in 2019-2020 in relation to the political administrative process.

The Changing Number of Articles on PFASs in a Community Newspaper (the Okinawa Times)

The first newspaper report on PFAS pollution in the *Okinawa Times* appeared in 2002, reporting on the spread of PFAS pollution in Tokyo Bay and other areas (*Okinawa Times* 2002). Later, in 2007, a Kyoto University survey of residents in Osaka reported that particular types of PFASs had accumulated in the blood of residents (*Okinawa Times* 2007). The number of media reports on the PFAS issue began to increase in Okinawa in 2016, following the contamination of the Chatan water purification plant, which uses the Kadena Airbase area as its water source. In 2018, the main content of news coverage dealt with the results of water quality surveys around Kadena and Futenma Airbase. Subsequently, the number of articles increased dramatically in 2019 (fig. 1).

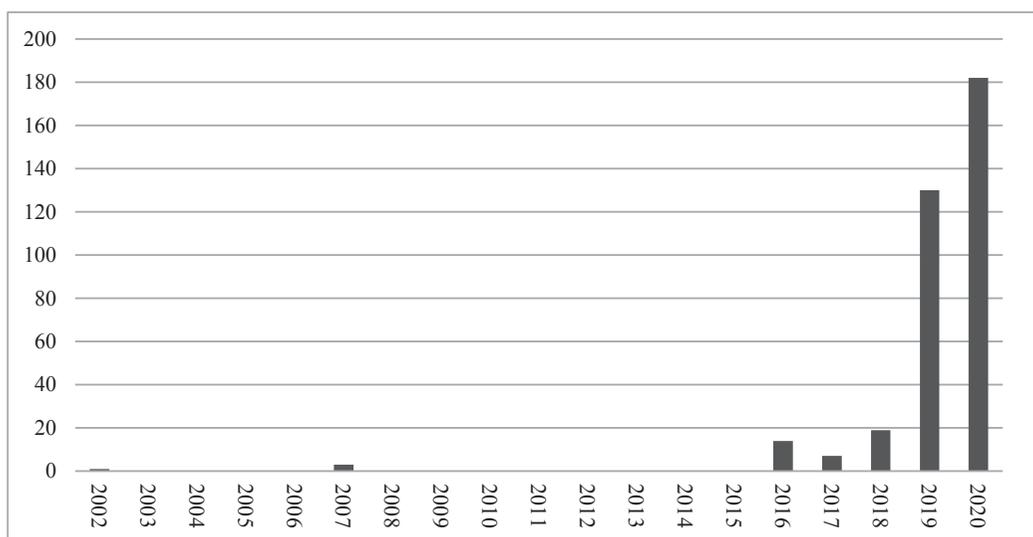


FIGURE 1. Number of articles related to PFAS in the *Okinawa Times* 2002–2020

Tap-Water Contamination Perceived by the Community in 2019

Why has there been an increase in articles since 2019? The first reason is that a water quality survey conducted by Okinawa Prefecture detected PFOS (a subcategory of PFASs) in concentrations exceeding water quality standards at the Chatan water purification plant near Kadena Airbase, which prompted the surrounding municipality, Chatan Town, to raise concerns about the contamination (see fig. 2). Chatan Town launched its own water quality investigation and asked Okinawa Prefecture and the Japanese government to solve the problem.

Resilience of the Community against Environmental Pollution

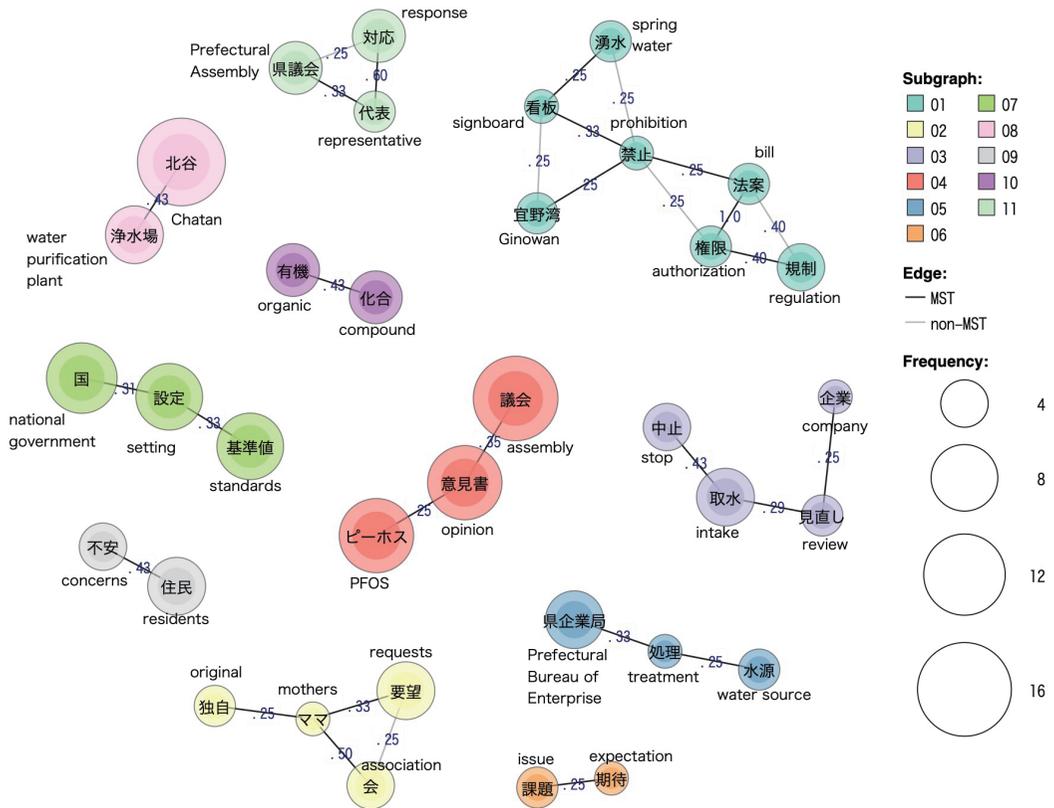


FIGURE 2. Co-occurrence network analysis after analysis of PFAS articles in the *Okinawa Times* 2019⁵

The reasons for this increase will be clarified below in detail using quantitative text analysis (co-occurrence network analysis). In quantitative text analysis, the frequency of occurrence of a word treated in an article title and the frequency of a group of words used simultaneously with a given word can be represented as a network of words. The size of the node (word) represents the frequency of occurrence of the word, and the edge (line) represents the strength of the connection between the particular words used at the same time in the article. In this way, it can be objectively analyzed that a co-occurrence network composed of specific word groups exists as a group of topics.

The resulting newspaper articles (N=130) contained high co-occurrence ratios for the following words: 北谷—浄水場; 県企業局—処理—水源 (Chatan—water purification plant; Prefectural Bureau of Enterprise—treatment—water source). Kadena Town and Ginowan City put up signs prohibiting the intake of spring water, informing residents of the contamination producing stories with the co-occurring words 看板—湧水—禁止—宜野湾 (signboard—spring water—prohibition—Ginowan). Local newspapers also reported on the proposed regulation of chemical compounds in the US National Defense Authori-

zation Act, which was being enacted, producing this grouping: 法案—権限—規制 (bill—authorization—regulation). This prompted other municipalities and prefectural assemblies to request that the Japanese government investigate PFOS and set pollution standards and regulations for water supplies, resulting in: 県議会—代表—対応; 国—設定—基準値; ピーホス—意見書—議会; 中止—取水—見直し—企業 (Prefectural Assembly—representative—response; national government—setting—standards; PFOS—opinion—assembly; stop—intake—review—company).

Second, a survey conducted by Kyoto University and other organizations reported that PFHxS (a subcategory of PFASs) levels in the blood of residents in urban areas such as Ginowan and Naha City were up to 50 times higher than the national average, and the suspension of the use of spring water raised concerns among local residents about PFAS contamination, producing: 有機—化合物 (organic—compound). Residents requested that the intake of water from the likely source of the contamination be stopped, and mothers with small children requested that the prefecture take immediate action to ensure the safety of tap water, with articles employing: 住民—不安; 要望—ママ—会—独自 (residents—concerns; requests—mothers—association—original).

In 2019, community newspapers played an important role in the process of expanding and circulating the issue of PFAS contamination, focusing on the issue of tap water sources and springs, while at the same time reporting on PFAS contamination, which had become a social problem. It also coincided with the fact that the Ministry of the Environment (MOE) began considering the setting of PFAS standards in tap water, which had not yet been established in Japan, but both local residents and newspapers had high expectations for the prompt amendment of water regulations.

AFFF Leak from Futenma Airbase in 2020

The rapid increase in the number of articles in 2020 was triggered by an incident in April of the same year, when a large amount of AFFF leaked from Futenma Airbase into the surrounding area of Ginowan City. As a result, there have been many reports about the leakage of AFFF into the surrounding areas, the measures taken in response to the leakage, and protests against the incident by local assemblies and residents, producing 泡消化剤—漏出 (firefighting agent—leakage) (see fig. 3). However, the US Department of Defense and the Ministry of Defense explained that it would take time to develop a replacement, and the AFFF has not been replaced, leading to: 交換—代替 (replacement—substitution).

Resilience of the Community against Environmental Pollution

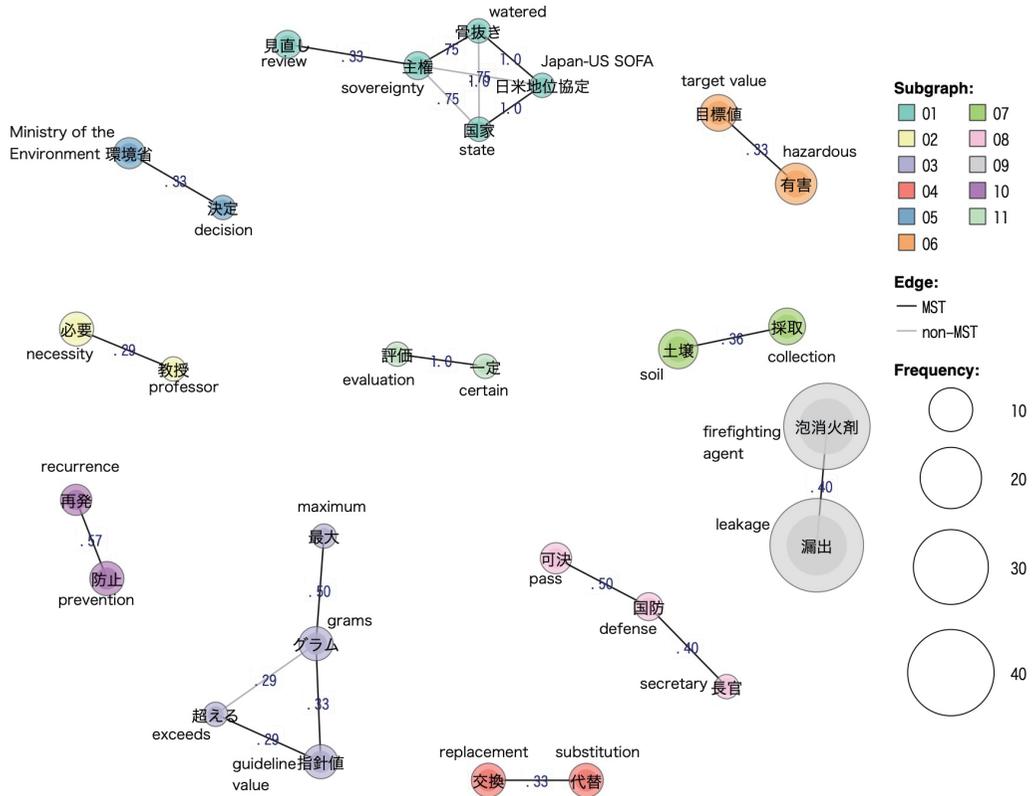


FIGURE 3. Co-occurrence network analysis after extraction of PFAS articles in the *Okinawa Times* 2020⁶

Following an amendment to the Defense Authorization Act in the US House of Representatives in 2017, which included funding for PFAS exposure studies at military installations, a provision against PFAS contamination was included for the first time in 2020. Okinawa Prefecture has recognized this, and there have been a significant number of reports (ex. *Okinawa Times* 2020b) about the applicability of the bill, engendering 可決—国防—長官 (pass—defense—secretary). In Japan, the MOE decided to set the recommended guideline value for PFOA and PFOS contamination at fifty nanograms in total, but the guideline was not legally binding yet, resulting in: 評価—一定; 環境省—決定; 指針値—グラム—超える—最大 (evaluation—certain; Ministry of the Environment—decision; guideline value—grams—exceeds—maximum).

The investigation of the source of the contamination at Futenma Airbase was conducted based on the Environmental Supplementary Agreement to the Japan-US SOFA, which was revised in 2015, but the US military holds the authority to select the sampling methods and sites, and an objective investigation by a third party is in principle impossible. Environmental experts pointed out that an independent investigation is necessary for an environmental impact assessment, producing: 必要—教授 (necessity—professor).

In response, local newspapers criticized the limitations of the Japan-US SOFA in dealing with environmental contamination: 土壌—採取; 見直し—主権—骨抜き—日米地位協定—国家 (soil—collection; review—sovereignty—watered—Japan-US SOFA—state). The prefecture and local municipalities demanded that the US and Japanese governments prevent similar incidents from recurring: 再発—防止 (recurrence—prevention).

To summarize, the coverage of the local newspapers in Okinawa Prefecture was comprehensive, including the political process involving the PFAS issue as well as the movements of local communities, local governments, and residents. At the same time, what became clear was the limitations on comprehensive decontamination by the SOFA and domestic laws and the delay in the Japanese government’s response in environmental administration.

Discussion: Knowledge Production alongside/within the Fences Concerning Unseen and Undone Science

As Richter et al. pointed out, improved knowledge production on PFAS contamination in Okinawa that this paper addresses also derived from “the result of entanglements of lay observation and understanding, legal action, independent science, media coverage and growing public awareness” (Richter, Cordner, and Brown 2018, 706). What is unique about the case of this paper is that the environmental regulations surrounding the stationing of troops in other countries have become a black box due to the stipulations of the SOFA (security blocking), and thus the scientific knowledge and risks of AFFF possessed by the US military have become unseen science that remains virtually hidden from local communities. In this situation, the current state of contamination has become known through the activities of small-scale individual environmental activists (table 1).

TABLE 1. Repertoires of Activism and Type of Knowledge Production

Repertoires of activism	Type of the knowledge production
Break through the security blocking	<ul style="list-style-type: none"> • Release the information covered by the security blocking • Find out unseen science of AFFF held by military institutions • Find out undone science by tracking records of AFFF use on base • Find insiders’ support • Research within the fences
Break through the language barrier and promote knowledge distribution	<ul style="list-style-type: none"> • Distribute information on PFASs in Japanese • Spread the unseen science on PFASs and undone science to the Japanese audience in order to take countermeasures against contamination
Build direct networks with public agencies	<ul style="list-style-type: none"> • Report information on PFASs and undone science to the local administration, enabling them to take countermeasure against contamination outside the SOFA agreement

	<ul style="list-style-type: none"> • Research along the fences
Form coalitions with local mass media	<ul style="list-style-type: none"> • Distribute information on unseen science and undone science to the public • Pressure the local political/economic elites through information distribution

A limiting reality in the remediation of PFAS pollution according to the Japan-US SOFA is that even if the issue of improving environmental pollution control in the SOFA is clarified, the actual pollution itself will not be improved in any manner if we wait for the revision of the SOFA. In response to this situation, environmental activism tackled the issue of PFAS as a form of military environmental pollution, drawing on the expertise it has accumulated through past practice.

In the case of Okinawa, the absence of a regulatory framework for PFAS in Japan also poses a challenge for pollution control under domestic law. Under such circumstances, the community newspaper reported on the PFAS pollution problem caused by military bases from a broad perspective, including the political process and the impact on community life, and contributed to building a communication community regarding PFAS contamination in Okinawa.

Conclusion

First, this paper clarified the strategies of environmental activism to make knowledge on PFASs public in the face of difficulties in dealing with pollution caused by military bases. Second, this paper analyzed how local newspapers reported the PFAS pollution problem on a local scale.

In Okinawa, as an island region with a small physical area, contamination of soil and groundwater by PFASs with high environmental persistence has a significant impact on water and environmental resources, which are limited in an island region. In addition to the problem of unseen and undone science, the fact that PFAS contamination information is not shared with the community due to a SOFA is a major barrier to recovery from local environmental pollution. While facing these limitations, local environmental activism has been able to raise in governmental bodies awareness of the need for change in the current situation by forming a communication community in cooperation with the local mass media through knowledge production alongside/within the fences and by communicating the risks to local residents based on transparency of information.

In Japan, as a centralized nation, both physical and intellectual resources tend to be unevenly distributed in the center, and there seems to be nothing that can be done about policies that are decided at the governmental level. However, the environmental activism and local mass media discussed in this paper have strategically produced the information necessary to thrive in the region in a practical manner without falling into a sense of powerlessness in the face of such a centralized bureaucracy. What this experience shows is

that even in social scientific analysis, theoretical models that assess the current situation by analyzing only governance mechanisms and organizational *forms* can only explain at most half of the actual phenomena. To overcome this shortcoming, attention to governance and organizational *practices* is once again needed. It is important to reintroduce the analysis of governance practice as a point where structures are renewed or *re-structured* by practice rather than contributing to the *reproduction* of formal structures, thereby constructing a new theoretical model with a knowledge production process that does not stop at a simple, comparative analysis of the environmental regulatory system and SOFAs.

Notes

1. Although it has a relatively different genealogy from that of the English-speaking world, environmental sociology in the Japanese-speaking world has also produced a number of research results on the relationship between pollution problems and local communities. For more information, refer to Hasegawa (2004).

2. Two activists who played a major role in the production of information on PFAS were interviewed on zoom (January–February 2021). All interviews were confidential; the names of interviewees were withheld by mutual agreement. The purpose of the interviews and the method of publication were agreed upon in advance, and the research subjects were asked to review the manuscript before the publication of the paper to confirm the validity of the descriptions.

3. For PFAS contamination prior to 2020, detailed GIS studies are being conducted by an environmental NPO in Okinawa on the effects of PFAS contamination in Kadena and Futenma air bases and the surrounding rivers and soil (The Informed-Public Project 2019a; 2019b). In addition, Kadena, Yokota, and Iwakuni air-bases have experienced numerous cases of water, soil, and air pollution caused by fuel and toxic substance leaks (Yokoyama 2016).

4. The *Okinawa Times* database was used for the analysis. Search keyword: *yuki fusso* (perfluorocarbons). Search date: December 4, 2020. N=356. KH Coder was used to analyze the data.

5. N=130. Divided by Jaccard coefficient. The top 20 most frequently occurring words were extracted. The division of subgroups is based on modularity.

6. N=182. Divided by Jaccard coefficient. The top 20 most frequently occurring words were extracted. The division of subgroups is based on modularity.

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