Economic and Political Consequences of Widespread Recognition of PFAS Emissions:

Evidence from US Military Bases in Japan

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Abstract

When executive remediation of environmental contamination lags behind widespread recognition, local land prices remain persistently dampened according to previous studies. I analyze a case with swift remediation that causes no ex-post exposure to find the effectiveness of executive responsibility in the wake of public awareness. With PFAS emissions from US military bases in Japan, I examine economic and political consequences of the sudden public attention to the incidents since October 2022. Using a difference-in-differences event study, I find no decline in land prices or in vote share of the incumbent government. By contrast, traditional leftist parties, which take an opposing stance to US military forces, lost vote share by 1.57% as a result of their ideological mobilization that associated this contamination with US military affairs. Their vote share loss suggests the importance of valid political claims whose intensity matches the intensity of the issue among voters. In this current case, the leftist parties lacked sufficient reason behind their claims as executive bodies had already eliminated the contamination.

1 Introduction

In mature economies, environmental quality holds large residential value so environmental impairment may cause substantial effect on the local economies. In fact, widespread public recognition of environmental contamination causes sharp and persistent decline in local land prices when executive remediation lags behind (Marcus and Mueller, 2024; Christensen et al., 2023; Greenstone and Gallagher, 2008). They discuss that the depreciation persistent after the remediations may stem from local mistrust in the executive body. To this end, swift executive resolution of the contamination may mitigate such negative impacts even if awareness about ex-ante pollution spread. However, it remains unknown whether swift remediation prevents depreciation or the widespread news alone might lower the demand.

This paper firstly examines the impact of the widespread recognition of environmental pollution since 2022 on the real estate market. To this end, I shed light on PFAS emissions from US military bases in mainland Japan where the incumbent government swiftly remediated the contamination in response to international regulatory changes. This prevented ex-post exposure to PFAS through drinking tap water before public attention to PFAS expanded nationwide. The estimations are run by a difference-in-difference (DID) model using cities that have certain types of US bases as treatment group while neighboring ones as control group.

In the estimations, I exploit the onset of widespread coverage of the news on PFAS emissions in mainland Japan in October 2022 as the binary treatment variable. The climb of public recognition of

PFAS emissions was triggered by the expansion of PFAS emissions in mainland Japan since the same time period. Given the remediation preceded, the estimation showcases the role of the swift remediation in economic consequence in the aftermath of public awareness of the emissions.

About the local reaction, I turn to estimate the local evaluation of the executive response to the emission using the vote share of the incumbent government in the parliamentary elections. This estimation reveals whether voters evaluate the executive remediation to stop ex-post exposure despite the widespread of relevant news. This also helps reveal whether the persistent depreciation even after remediation may come from mistrust in the executive entities for their lack of accountability.

In evaluating the executive performance, traditional leftist vote share is also useful as they criticized the incumbent government for their ill management of US military forces about the PFAS emissions. The leftist parties posed their criticisms for their traditional opposition to Status of United States Armed Forces in Japan (Ministry of Foreign Affairs of Japan, 1960) despite the absence of ex-post exposure. Local evaluation of the leftist parties helps to reveal how voters evaluate the executive responses to the PFAS emissions from US bases. The estimations illustrate whether the incumbent remediation is appreciated or the leftist agitation determines their perception to the event.

We find no drop in land prices since the onset of recognition. This indicates that the widespread recognition does not trigger depreciation with no ex-post exposure. In fact, attention to avoidance behaviour from PFAS in tap water did not rise in the course of public awareness. This illustrates that public attention to the PFAS emissions from US bases did not create negative residential disamenity in the cities that have US bases.

Next, the incumbent government received no vote share loss, which is in line with the absence of depreciation. By contrast, the leftist parties lost vote share by 1.57%. This contrast demonstrates that the executive performance of remediation was appreciated among local voters while the ideologically-driven agitation was unsuccessful. Therefore, voters decide on their votes based on the materialized state of the PFAS emissions instead of taking the leftist vocal criticism. The leftist vote share loss suggests the importance of valid political claims whose intensity matches the intensity of the issue among voters. In this current case, the leftist parties lacked sufficient reason behind their claims as executive bodies had already eliminated the contamination. The results are robust when using a triple-difference event study to compare the treatment group to placebo treatment group created around US bases that would not use PFAS in activity.

This study contributes to the literature on how recognition of environmental hazards affects property markets. This study demonstrates the role of the executive authority in the wake of widespread recognition of local contamination. My results add evidence that swift remediation may prevent property depreciation despite public awareness of the incident to Marcus and Mueller (2024), Greenstone and Gallagher (2008) and Christensen et al. (2023). Furthermore, this study contributes to their discussion that possible public mistrust in the executive body may remain after the remediation. This study reveals swift remediation can divert such public mistrust in the executive boundary.

This study secondly contributes to literature on how ideologically-driven mobilization is evaluated in the aftermath of relevant events. Related work demonstrates that parties whose claims represent voters' views can gain electoral support even if the claims are built upon ideology (Mehic, 2023; Bredtmann, 2022). This study demonstrates that such claims may cause backfire when they depend excessively on ideological stance without validating it.

The rest of this paper is organized as follows: section 2 describes the context of the event, section 3 describes data and classification of treatment and control groups, section 4 explains estimation strategies, section 5 displays the results, section 6 discusses the results, and section 7 concludes this paper.

2 Empirical Context

This section consists of three parts. Section 2.1 describes international and domestic regulatory changes and disclosure of the emission levels. Section 2.2 explains the recognition of PFAS in response to the regulation. Section 2.3 discusses the validity of Oct 2022 as exogenous binary treatment timing.

2.1 Regulation of PFAS and Emission Disclosure

PFAS has been regulated internationally since 2009, with PFOA added to the Stockholm Convention in May 2019 (E1). In response, Japan's Ministry of the Environment issued advisory guidelines in March 2020 (E2) and disclosed nationwide PFAS levels in June 2020 (E3). High concentrations were detected near US military bases, particularly Yokota Airfield and Zama Camp. However, local water utilities swiftly cut contaminated sources from supply based on these guidelines, preventing ex-post exposure through tap water.[1]

2.2 Public Attention to PFAS

Media Coverage Mass media acted as key information conveyers of the incidents to the public. Figure 1 shows the number of articles relevant to PFAS among major mass media in Japan. This figure shows the media did not sensitively respond to the events E1, E2 and E3 in Table 2. They featured news on PFAS emissions from US bases in Okinawa (shown in bottom line graph) as a minor topic because of higher attention to US bases in Okinawa (as seen in Figure B.2). Articles have expansively propagated since Q3 2022 as they started featuring mainland US bases (in middle line graph) and PFAS emissions outside US bases (in top line graph). This expansion has shifted the interest of this topic onto the mainlands from Okinawa prefecture. At the same time, the news has become relevant to a wide population of Japan [2].

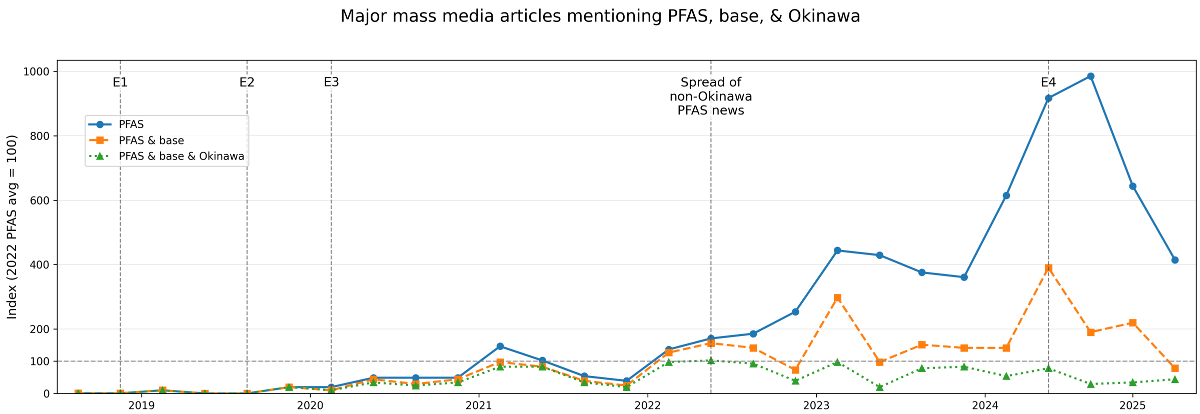


Figure 1: PFAS Mass Media Articles

Notes: The value in each period represents the number of articles containing respective keywords among 6 major mass media outlets (Asahi, Mainichi, NHK, Nikkei, Sankei, and Yomiuri). Each line represents the total quarterly count of PFAS-related articles normalized to an average of 4 quarters in 2022 for PFAS at 100. Data are collected from Asahi Shimbun (2026), Mainichi Shimbun (2026), NHK (2026), Nikkei Shimbun (2026), THE SANKEI SHIMBUN (2026), and Yomiuri Shimbun (2026). See Figure B.1 for individual outlet breakdowns.

Public Online Search Public attention to PFAS in Japan expanded in response to the expansion of articles since Q3 2022. Google Trends captures public attention to PFAS and relevant items in Figure 2.

[1] See Table 2 in Appendix A for the full regulatory timeline and Tables B.5 and B.6 for emission levels.

[2] Political parties also started showing high interest in PFAS in mainland Japan as well as PFAS in general according to the collection of parliamentary questions (Figure B.13 and B.14)

Public attention to "PFAS" and "organic fluorine" climbed in Oct 2022. Attention to PFAS increased sharply from less than 10 to nearly 100 on the relative scale within 5 months. Attention to PFAS kept growing towards Nov 2024 (E4) to exceed that of "US base" and "water pollution". Figure B.2 indicates that article issuance on PFAS created high attention to PFAS among those in mainland Japan rather than those in Okinawa. At the same time, public recognition of PFAS had been minimal despite relevant news in Okinawa and regulatory changes, due to the lack of nationwide media coverage.

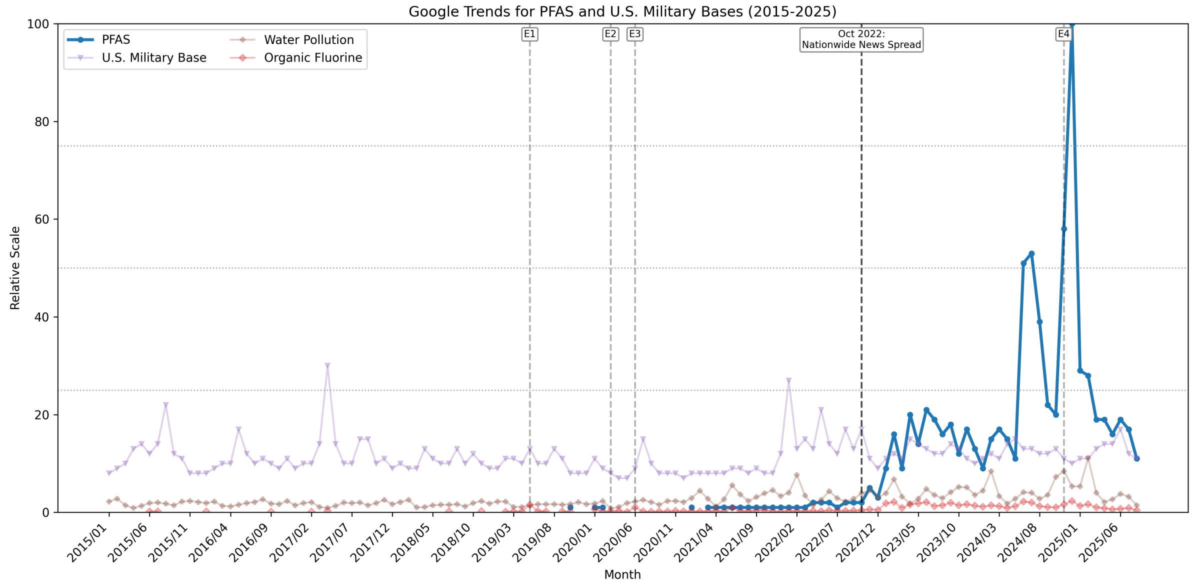


Figure 2: Google Trend

Notes: Japanese keywords used: "pfas", "有機フッ素" (organic fluorine), "水質汚染" (water pollution), "米軍基地" (US base). Values normalized to max = 100.

2.3 Exogenous Treatment Timing

I use October 2022 as the exogenous onset of widespread recognition of PFAS emissions from US bases in mainland Japan. This timing is justified by the jump in attention to PFAS in response to the expansion of media articles about incidents the public was previously unaware of. Google Trends illustrates that areas with US bases such as Tokyo had low attention to PFAS until October 2022, even though they had US bases that had emitted high concentrations of PFAS (while Okinawa had held some attention earlier). This justifies that their recognition was driven by mass media articles featuring the mainlands. Attention to PFAS became substantial enough to possibly change outcomes; PFAS became more searched in Japan than terms such as "US base" and "water pollution." This expansion is much more substantial than the jump after E1, E2 and E3 due to the lack of relevant articles.

3 Data

My estimations use several sources of data; land price data, city boundary data, parliamentary election data, information of US military bases, and PFAS emission levels. First, the land price data source is obtained from (MLIT, 2025). The data provide land prices of the fixed points as of 1st January in each year. I use the data for lands of cities of interest from 2012 to 2025. The data are restricted to lands of residential use as my interest is in evaluating residential amenity.

Secondly, city boundary data are accessed from MLIT (2023) to construct city-level treatment and control groups.

Thirdly, parliamentary election data are obtained from Mizusaki and Mori (2021) to measure the evaluation of political parties. Specifically, I use proportional representation elections for the House of Representatives, collected at the city level. I use voter turnout rate and electorate size from this source. The periods for the data are from the 46th to 50th elections and the timing of the sth iteration is

$$s = \begin{cases} 46 & \text{(the 46th election took place in Dec 2012)} \\ 47 & \text{(the 47th election took place in Dec 2014)} \\ 48 & \text{(the 48th election took place in Oct 2017)} \\ 49 & \text{(the 49th election took place in Oct 2021)} \\ 50 & \text{(the 50th election took place in Oct 2024)} \end{cases}$$

During all the cycles, the incumbent government is the coalition of Liberal Democratic Party (LDP) and Komeito.

Fourth, data about US military bases are obtained through The Portal Site of Official Statistics of Japan (2022). This dataset includes a list of US bases with size occupied by the US, size occupied by Japan, and use (drill sites, ports, airfields, telecommunication, ports, storage, residence, and others). This data source also lists cities that each US base lies in for me to define treatment groups.

Fifth, PFAS emission data are collected for the collection of natural water sources and that of tap water supply. I assembled both of the data on the city level for the main treatment group (Main treatment group) and Okinawa prefecture. The detections of natural water sources are collected from MOE (2020) and municipal official pages in 2020 to 2024. Data for tap water supply are collected from MOE (2024) and municipal homepages. The assembled data are summarized in Table B.5 and B.6.

3.1 Treatment and Control Groups

US Bases for Treatment I use types of US bases that emit PFAS or are suspected to emit PFAS for treatment. I denote such "treated" US bases as "Main" US bases, which consists of "Main-A" and "Main-B" US-bases. "Main-A" bases denote ones whose use is either military exercise or airfield. These uses of activity often release PFAS for using fire extinguishing water. In fact, high density of PFAS is detected near US bases of these uses (Yokota and Atsugi US bases for instance).

"Main-B" US bases are ones whose facility size is large ($\geq 100,000m^2$) for any uses except for telecommunications, ports, residence, and others. This selection is based on the idea that physical size may create local perceptual changes more easily when residents hear negative news about the facility. I exclude types of US bases for telecommunications, ports, residence, and others because these sites conduct no activity relevant to PFAS emissions. The classification of the treatment group g is displayed in Table 1 and the list of individual bases is in Table B.4. The geographical locations of Main US bases are painted in black in Figure 3.

Table 1: US Base Treatment Type Definitions

Group g	Definition	US bases	US-base cities	Ring-1	Ring-2	Clusters
Main	Main-A $\cup$ Main-B	21	26	73	97	6
PlaceboA	Use = ports,telecom,office	9	11	58	108	5
PlaceboB	Former US bases	42	80	332	420	9

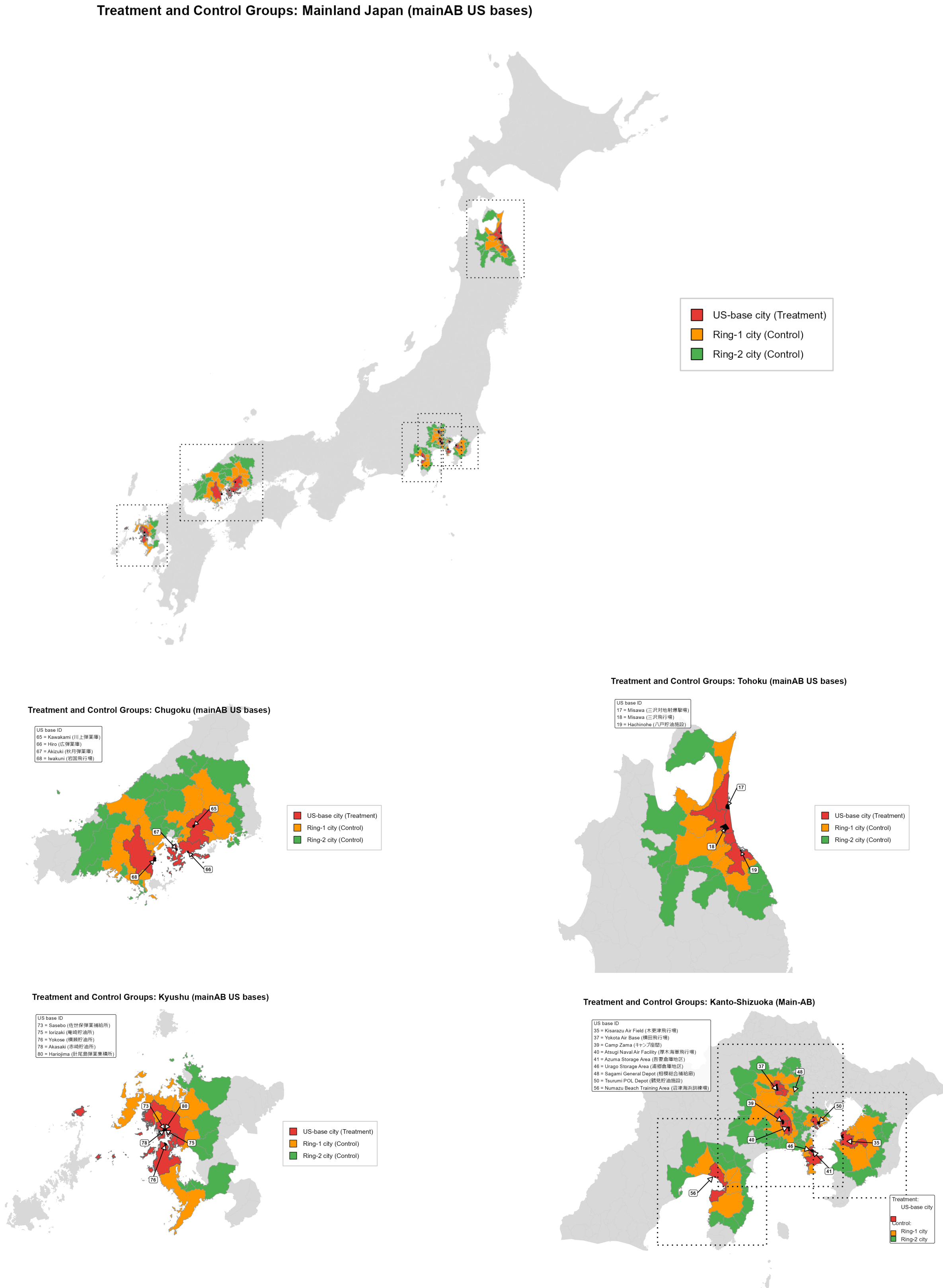


Figure 3: US Bases in Japan (Main Treatment)

Notes: Top: Geographic distribution of Main US bases across Japan. Bottom: Regional details showing Chugoku (top-left), Tohoku (top-right), Kyushu (bottom-left), and Kanto-Shizuoka (bottom-right). Treatment cities (US-base cities) shown with darker borders. Ring-1 and Ring-2 cities are neighboring municipalities. ID in legends follows full list of US bases in Table B.3.

Treatment and Control Groups This section explains treatment and control groups used in DID event study estimations. I assign the treatment group at the city level: a city is in the treatment group if it has a Main US base. Such cities are named "US-base cities" (cities in red in Figure 3). Control groups are defined at the city level in two ways: "ring-1 cities" and "ring-2 cities" (cities in orange and green, respectively). "Ring-1 cities" are cities that border a US-base city. Ring-2 cities are cities that border ring-1 cities but are not US-base cities. Combined together, I refer to both groups as "ring cities."

Consideration of Pollution in Control Cities I consider alternative classification of control groups to account for contamination in ring cities. This is because the contaminated ring cities also reacted to the onset of the widespread recognition similarly to US-base cities, which may mitigate the treatment effect towards 0. Therefore, the alternative control group is constructed by removing ring cities that had PFAS 40 or 50 ng/l from natural water sources from the entirety of ring (1 & 2) cities. This way, the event study estimation compares US-base cities to unpolluted ring cities.

US Bases for Placebo Tests For placebo tests, I use two additional sets of US bases. The first set, denoted as "PlaceboA," consists of US bases whose use is not included in Main, i.e., telecommunication, port, and others (residence and barracks are excluded). This is a valid set for placebo tests as none of these bases has excessive PFAS in surrounding areas based on the PFAS data. Furthermore, PlaceboA US bases are useful to extract impacts during periods related to US bases other than incidents involving PFAS. The second set, denoted as "PlaceboB," consists of bases that have been returned to Japan, so the US military has no activities in these facilities. Therefore, these sites are not featured when active US bases are featured in articles. The US-base cities in PlaceboB are not expected to react to the event similarly to Main US-base cities. The geographical distributions of PlaceboA and PlaceboB US-base cities and ring cities are displayed in Figure B.11 and B.12.

Descriptive Statistics Summary statistics are shown in Table B.1 for the respective outcome variable before and after Oct 2022. Figure B.3 displays the average land prices and vote shares of the incumbent government and leftist parties among treatment group and two control groups (ring-1 and ring-2 cities). The treatment group has a higher vote share of the incumbent government than control groups while having a lower share of leftist parties.

4 Estimation Strategies

Estimation Model for Land Prices To estimate the impact of the widespread of PFAS emissions, I take a two-way fixed effect model using US-base cities and ring cities for US bases for treatment explained in Section 3.1. The DID event study specification is organized as follows. For land i, city j and year $t \in \{2012, ..., 2025\}$,

$$\ln Y_{ijt} = \sum_{\tau \in [2012, \cdots, 2021, 2023, 2024, 2025]} \alpha_{\tau}^{g} \; 1[t = \tau] \cdot USbase_{j}^{g} + \nu_i + \mu_t + \varepsilon_{ijt} \tag{1}$$

$$
\begin{aligned}
\text{where}\quad & Y_{ijt}\ :\ \text{land price}\\
& USbase_j^g = 1[\text{city } j \text{ is a US-base city of type } g]\\
& \nu_i\ :\ \text{land-specific time-invariant component}\\
& \mu_t\ :\ \text{year-specific component}\\
& \varepsilon_{ijt}\ :\ \text{error term}\\
& g \in \{\text{Main-A, Main-B, Main, PlaceboA, PlaceboB}\} \text{ denotes the treatment group.}
\end{aligned}
$$

The coefficients of interest are α_τ for $\tau \geq 2023$, as the onset of recognition spread occurred in October 2022.

Estimation Model for Vote Share Similarly, the event study specification for vote share is built in the same DID form. Vote share is collected at the city level j for the election cycle $s \in \{46, 47, 48, 49, 50\}$, so the specification is

$$
\ln q_{js} = \sum_{\tau \in \{46,47,48,50\}} \beta_\tau^g \cdot 1[s = \tau] \cdot USbase_j^g + \nu_j + \mu_s + u_{js} \tag{2}
$$

$$
\begin{aligned}
\text{where}\quad & q_{js}\ :\ \text{vote share of certain parties}\\
& USbase_j^g = 1\big[\text{city } j \text{ is a US-base city of type } g\big]\\
& \nu_j\ :\ \text{city-specific time-invariant component}\\
& \mu_s\ :\ \text{election cycle-specific component}\\
& u_{js}\ :\ \text{error term}
\end{aligned}
$$

The effect of the event is seen in β_{50}^g as recognition spread between $s = 49$ and 50.

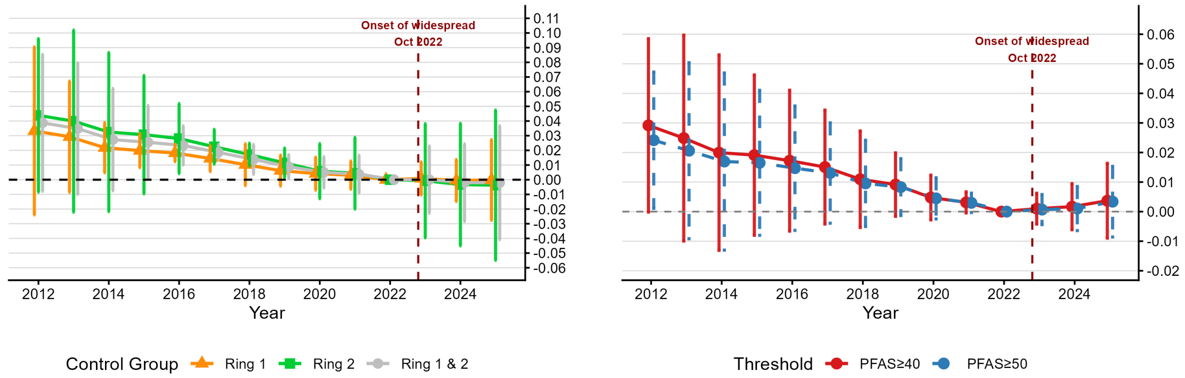
Cluster Classification In estimating standard errors, I correct standard errors by clustering the variance matrix by the region. For this, I use wild bootstrap with a small number of clusters. Main uses 6 clusters, PlaceboA uses 5 clusters, while PlaceboB uses 9 clusters. The full classification of clusters by prefecture is shown in Table B.1.

5 Results

5.1 All Ring Cities in Control Groups

Land Prices Figure 4a displays the event study estimators for land prices when we put all ring cities into the control group. The results reveal no land price changes near Main US bases after 2023 due to the onset of the widespread of PFAS emissions from US bases. This illustrates that there is no negative residential disamenity perceived despite public awareness. In fact, the attention to relevant avoidance behaviour stayed unchanged when the attention to PFAS climbed. Figure B.2 displays Google Trends for avoidance behaviours for PFAS through tap water, such as water filter and mineral water. This indicates that the nationwide recognition did not have to cause any special actions thanks to the executive remediation and that citizens kept placing credit in the executive water supply.

Vote Share of the Incumbent Government Figure 5a displays the event study estimators for vote share of the incumbent government (the sum of LDP and Komeito). The results demonstrate that the



(a) All Ring Cities

(b) Polluted Ring Excluded

Figure 4: Event Study: Land Prices (Main)

Notes: Panel (a) includes all ring cities in control group. Panel (b) excludes polluted ring cities (PFAS $\geq$40 ng/L or $\geq$50 ng/L) from control group. Wild bootstrap standard errors used. 95% confidence intervals shown.

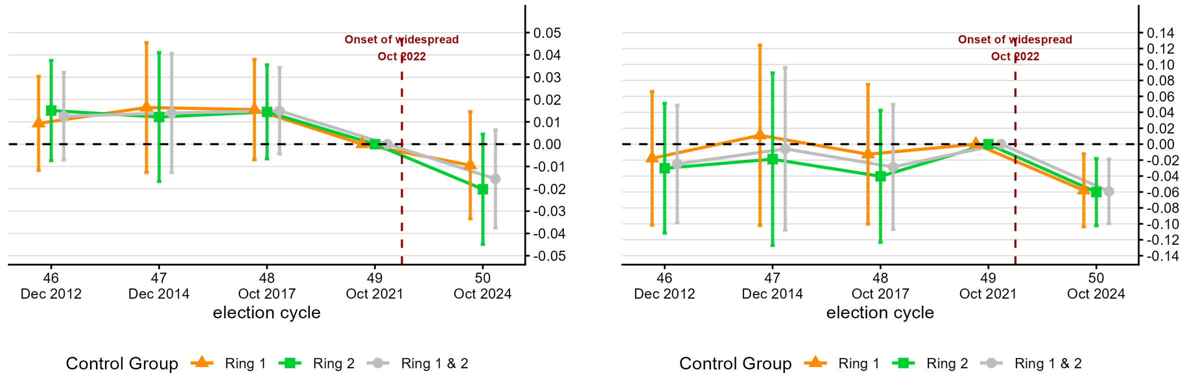
onset does not change the vote share due to the onset of the widespread. The vote share change at $s = 50$ continues the trend from $s = 49$. When examining the respective party (LDP and Komeito each), this trend derives from LDP and not from Komeito, while neither of them received vote share decline in Figure B.4a and B.4b. Therefore, the widespread of PFAS emissions from US bases was unlikely to have induced mistrust in the incumbent government among the Main US-base cities.

Vote Share of the Leftist Parties I turn to see the vote share of the leftist parties (Constitutional Democratic Party (CDP), Japanese Communist Party (JCP), and Social Democratic Party (SDP)) as these parties showed a critical stance toward the PFAS emissions from US military bases for their ideological stance. Figure 5b displays the event study estimators of the summed vote share and demonstrates the vote share declined by about $\{\exp(-0.06) - \exp(0)\} \times 27\% = -1.57\%$ given their prior vote share is 27% at $s = 49$. When decomposing the summed share into CDP and JCP+SDP, similar declines are seen in both groups. CDP shows a stronger decline of approximately -0.07, compared to -0.03 for JCP+SDP (Figure B.5a and B.5b). These distinctive degrees of decline are reasonable given CDP holds a larger vote share and wider socio-economic composites as the largest opposition party as opposed to JCP and SDP, which are established more ideologically.

Only Unpolluted Ring Cities in Control Group Here, I account for PFAS contamination in ring cities by excluding ring cities with excessive PFAS from the control group. This event study can eliminate possible treatment effects among polluted ring cities that may violate the stable unit treatment value assumption. I dropped ring cities that had $\geq$40 or 50 ng/l detected in any year between 2020 and 2024 from natural water sources (see the columns of natural water supply in Table B.5). The results show consistent findings in Figure 4b, and the incumbent government received no vote share decline in Figure 6a. Likewise, the leftist parties robustly show a decline of -0.06 in Figure 6b. These robust results demonstrate that polluted ring cities have similar ex-post consequences to unpolluted ring cities.

5.2 Placebo Tests

I run several placebo tests using PlaceboA and PlaceboB US bases. Event study results using PlaceboA US bases show that land prices and vote share of the incumbent government both show similar results to those for Main US bases (in Figure B.7 and B.8a). The vote share of the leftist parties changes

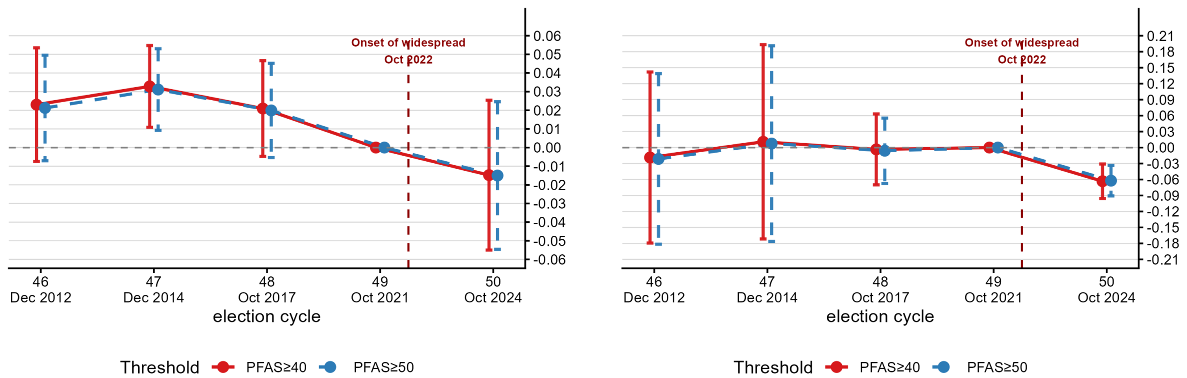


(a) Incumbent Government

(b) Leftist Parties

Figure 5: Event Study: Vote Share

Notes: Event study coefficients from Equation (2). Wild bootstrap standard errors used. 95% confidence intervals shown.



(a) Incumbent Government

(b) Leftist Parties

Figure 6: Event Study: Vote Share - Polluted Ring Excluded

Notes: Polluted ring cities excluded from controls. Cutoff for polluted ring = PFAS ≥40 ng/L or ≥50 ng/L. Wild bootstrap standard errors used. 95% confidence intervals shown.

insignificantly, as opposed to when using Main US bases (Figure B.8b). Thus, disfavor towards those parties does not occur near US bases that do not use PFAS. Similarly, PlaceboB US bases present insignificant effects of the treatment as they do not have the event of PFAS emissions by US military activities (displayed in Figures B.9 for land prices, B.10a for the incumbent government, and B.10b for the leftist parties). The null effect in the leftist vote share is also consistent with the fact that PFAS emissions from Japan's Self-Defense Forces constitute a much smaller portion of their parliamentary questions, as shown in Figure B.15.

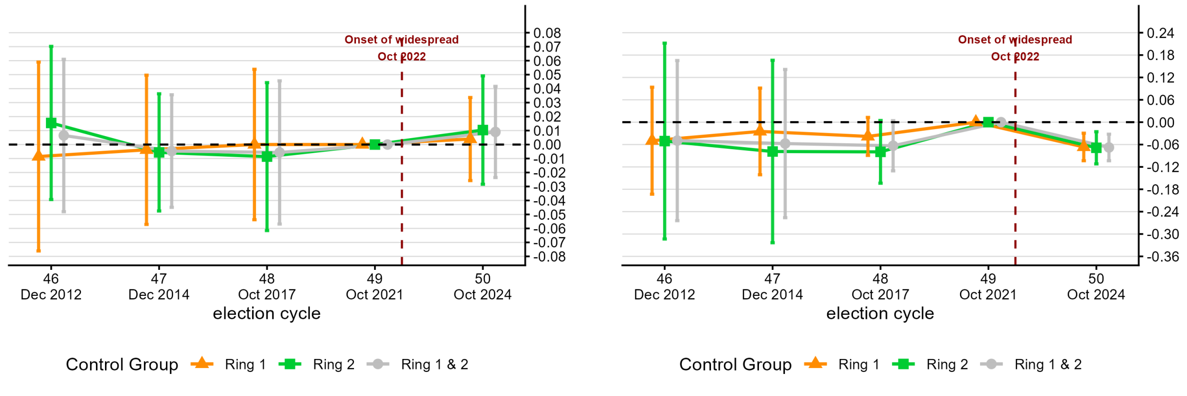
5.3 Triple-Difference Specification

This section employs an alternative identification strategy to demonstrate the robustness of the treatment timing being (around) Oct 2022 instead of earlier times such as E1, E2 and E3. Earlier onset of the recognition seems possible as the negative trend seen in the DID event study for the incumbent government may reflect this story. I demonstrate earlier onset is unlikely using a triple-difference model using the DID estimators for $g = Main$ and $g = PlaceboA$. This comparison eliminates trend specific to cities that have US bases. Still, treatment effect of being in US base cities whose activity may use PFAS remains. The estimator is

$$DDD_\tau = \beta_\tau^{Main} - \beta_\tau^{PlaceboA}$$

where β_τ^{Main} and $\beta_\tau^{PlaceboA}$ are the DID event study estimators for Main and PlaceboA US bases at $\tau \in \{46, 47, 48, 50\}$. Standard errors for the DDD estimator are computed via pairs cluster bootstrap with 999 iterations, resampling regional clusters separately within Main (8 clusters) and PlaceboA (4 clusters). See Appendix B for the detailed derivation.

The DDD estimators for the incumbent government show that the negative trend seen in the DID estimators is suppressed in Figure 7a. This indicates an earlier onset of collective recognition is unlikely. In contrast, the negative treatment effect remains among the leftist parties robustly at -0.06 in Figure 7b. Therefore, their vote share decline is peculiar to Main US-base cities rather than the trend near general US bases.



(a) Incumbent Government

(b) Leftist Parties

Figure 7: DDD: Vote Share

Notes: Difference-in-Difference-in-Differences estimators: $DDD_\tau = \beta_\tau^{Main} - \beta_\tau^{PlaceboA}$. Pairs cluster bootstrap standard errors with 999 iterations. Main sample uses 6 regional clusters; PlaceboA sample uses 5 clusters. 95% confidence intervals shown. See Appendix B.2 for derivation.

Demographic sorting Lastly, I measure the change in electorate size and turnout to see if the political transition is caused by the change in the residential composites. Figure B.6a and B.6b show neither of them changes due to the recognition. Electorate size shows a positive trend continuously from the prior period despite no drop in the land prices. Unchanged turnout indicates no change in political participation occurred in Main US-base cities. These results suggest the vote share change in the leftist parties is created by elevated disfavor towards the parties among voters of the same socio-economic composites, not by changes in those.

6 Discussion

6.1 Evaluation of Executive Responses

This study finds that the swift remediation plays a crucial role in the economic and political consequences in the wake of the widespread recognition of the emissions. The remediation inhibited land price depreciation due to residential disamenity even if the recognition was widespread and the leftist acted negatively. In other words, public awareness of the pollution alone does not decrease land prices when residential environmental amenity is unaffected. This finding demonstrates the executive prevention of ex-post exposure was appreciated even though the leftist stance proved unsuccessful. This suggests that persistent depreciation covered in Christensen et al. (2023), Marcus and Mueller (2024), and Greenstone and Gallagher (2008) may be diverted if remediation materialized without a lag.

6.2 Evaluation of Ideological Mobilization

The leftist vote share's decline suggests that the political agitation to demean the government may not be successful when the government performs effective accountability. Contrary to the executive responses, voters did not value their stance since the claims on PFAS are driven ideologically from their traditional opposition to SOFA. Their loss of 1.57% vote share illustrates the leftists had excessive intensity of this issue compared to voters and this gap seems to stem from their ideology.

Contrary to other political parties, the leftist parties criticized the ill management of the government on US military affairs for their ideology, which seems to end up inviting disfavor from voters. In fact, Appendix C.6 shows that they tend to associate PFAS with US bases or SOFA and show higher interest in PFAS than in other environmental issues. Likewise, they tend to request answers from MOD[3] and MOFA[4] rather than from MOE and MLIT in Figure B.16 (similarly, they have higher attention to PFAS than other environmental issues in Figure B.15.). Such ideological stance did not capture voters' interest because voters did not share the same level of concern about this issue. This shows the importance of the alignment of their ideology to the objective observations. Ideological stance may turn out successful when there is alignment between the intensity of the stance and the perceived intensity among voters (Mehic, 2023; Bredtmann, 2022).

7 Conclusion

Lagged remediation after the widespread recognition of contamination causes persistent land price depreciation even after the harmful substances were removed. The persistent depreciation may stem from the executive mistrust as discussed in Marcus and Mueller (2024), Christensen et al. (2023) and Greenstone and Gallagher (2008) in the wake of public awareness. This study examines whether such consequences

[3]Ministry of Defense.
[4]Ministry of Foreign Affairs.

can be inhibited if the executive entity remediated the contamination swiftly. To examine this question, this study sheds light on PFAS emissions from US bases in Japan where the executive remediation preceded rather than lagged behind public awareness. I demonstrate that the remediation maintains land prices despite nationwide attention thanks to preventing negative ex-post residential amenity. The incumbent government consequently kept vote share, which suggests that voters evaluated the executive remediation.

In contrast, the leftist parties, which criticized the government for their mismanagement since they have a traditional opposing stance to SOFA, lost vote share by 1.57%. This shows that voters disfavored their ideological stance while showing that they are aware that the executive remediation has been completed with no ex-post exposure. The decline of the leftist parties illustrates that they experienced vote share decline as a result of their stance associated to US military affairs. Their accusation on the government mismanagement was not evaluated when exposure was promptly cut. Their vote share loss suggests the importance of valid political claims whose intensity matches the intensity of the issue among voters. In this current case, the leftist parties lacked sufficient reason behind their claims as executive bodies had already eliminated the contamination.

Appendix A PFAS Regulation Details

Regulation Timeline PFAS (Per- and polyfluoroalkyl substances) had been used for industrial purposes; PFOS and PFOA had been used in particular (PFOS for coating and PFOA for fire extinguishing water, for example). PFOS has been regulated under the Stockholm Convention on Persistent Organic Pollutants (POPs) since 2009 for its persistence in nature. PFOA was listed in May 2019 for the same reason (I denote this event as "E1" in Table 2 for relevance).

Disclosed PFAS emissions The nationwide disclosure of PFAS in natural water sources revealed high concentrations of PFAS in many sites in Japan at E2. In particular, PFAS emission levels in cities near Yokota Airfield, Zama Camp, several airfields and exercise fields in Okinawa showed many spots contaminated with excessive concentrations (shown in Table B.5 and Table B.6). Those spots near US military bases detected high concentrations of PFAS since PFOA in fire extinguishing water used in military activities flowed out to nearby locations.

Contaminated tap water sources, however, have been swiftly cut from supply or cleansed by local water utilities based on the advisory guidelines by MOE. Local utilities have been continuously testing possible polluting sites since the 2020 guidelines were issued (Tokyo Metropolitan Government, 2025; Kanagawa Prefectural Government, 2025; Okinawa Prefectural Enterprise Bureau, 2024). These executive reactions have minimized the exposure of PFAS to residents through drinking tap water, which is the primary intake channel of PFAS.

Table 2: International and Domestic Regulation of PFAS

	Date	Event
	May 2009	PFOS added to POPs in Stockholm Convention[1]
E1	May 2019	PFOA listed in POPs under Stockholm Convention[1]
E2	Mar 2020	Executive advisory regulation (PFOS+PFOA$\leq$50 ng/L) to water suppliers[2,a]
E3	June 2020	Gov disclosed nationwide PFAS density from nature[3,b]
	Jun 2022	PFHxS added to Stockholm Convention[1]
E4	Nov 2024	Gov disclosed nationwide PFAS density from tap water[4]
	June 2025	PFOS+PFOA added to mandatory test[5]

[1] Stockholm Convention (2023).
[2] MHLW (2020).
[3] MOE (2020).
[4] MOE (2024).
[5] MOE (2025).
[a] MHLW: Ministry of Health, Labour and Welfare.
[b] MOE: Ministry of the Environment.

Appendix B Bootstrap Standard Error Derivations

B.1 Wild Bootstrap SE for DID Event Study

For the DID event study estimators in Equations (1) and (2), I compute wild bootstrap standard errors using the `fwildclusterboot` package (Roodman et al., 2019). The procedure is illustrated below for the vote share model; the land price model follows analogously with $\ln Y_{ijt}$, α_τ^g, and year τ in place of $\ln q_{js}$, β_τ^g, and election cycle τ.

For each coefficient β_τ^g, the wild cluster bootstrap with Rademacher weights proceeds as follows. In each of $B = 999$ iterations b:

1. Generate Rademacher weights $w_c^{(b)} \in \{-1, +1\}$ with equal probability for each cluster c
2. Construct bootstrap residuals: $\tilde{u}_{js}^{(b)} = w_{c(j)}^{(b)} \cdot \hat{u}_{js}$, where $c(j)$ is the cluster containing city j
3. Generate bootstrap response under $H_0 : \beta_\tau^g = 0$: $q_{js}^{*(b)} = \hat{q}_{js}^{H_0} + \tilde{u}_{js}^{(b)}$
4. Re-estimate the model and compute the t-statistic: $t^{(b)} = \hat{\beta}_\tau^{g,(b)} / SE(\hat{\beta}_\tau^{g,(b)})$

The bootstrap p-value is:

$$p = \frac{1}{B} \sum_{b=1}^{B} \mathbf{1}\left[|t^{(b)}| \geq |t^{obs}|\right]$$

B.2 Pairs Cluster Bootstrap SE for DDD Estimator (Vote Share)

For the DDD estimator of vote share $DDD_\tau = \beta_\tau^{Main} - \beta_\tau^{PlaceboA}$ where $\tau \in \{46, 47, 48, 50\}$ denotes the election cycle, standard errors are computed via pairs cluster bootstrap. I run $B = 999$ bootstrap iterations b within 6 clusters for Main and 4 clusters for PlaceboA, separately:

$$\begin{aligned} \mathcal{C}_{Main}^{(b)} &\sim \text{sample with replacement from } \{c_1^M, ..., c_8^M\} \\ \mathcal{C}_{PlaceboA}^{(b)} &\sim \text{sample with replacement from } \{c_1^P, ..., c_4^P\} \end{aligned}$$

For each bootstrap sample, I re-estimate the TWFE event study in Equation (2) for each group and compute the bootstrap DDD:

$$DDD_\tau^{(b)} = \hat{\beta}_\tau^{Main,(b)} - \hat{\beta}_\tau^{PlaceboA,(b)}$$

The bootstrap standard error is the standard deviation of the bootstrap distribution:

$$SE_{boot}(\widehat{DDD}_\tau) = \sqrt{\frac{1}{B-1} \sum_{b=1}^{B} \left(DDD_\tau^{(b)} - \overline{DDD}_\tau\right)^2}$$

The 95% confidence interval is $\widehat{DDD}_\tau \pm 1.96 \times SE_{boot}$.

B.3 Cluster of Region in Each Treatment Group

Table B.1: Cluster of Region in Each Treatment Group

Treatment Group	Prefectures in Each Cluster
MainAB	Aomori, Iwate
	Chiba
	Tokyo, Kanagawa, Saitama
	Shizuoka
	Hiroshima, Yamaguchi
	Nagasaki
PlaceboA	Hokkaido
	Aomori
	Saitama
	Tokyo, Kanagawa
	Kyoto
PlaceboB	Hokkaido
	Aomori, Iwate, Akita
	Miyagi, Yamagata, Fukushima
	Ibaraki, Tochigi, Gunma
	Tokyo, Saitama
	Nagano, Niigata, Yamanashi, Gifu
	Ishikawa
	Shiga, Kyoto, Hyogo, Tottori, Okayama, Hiroshima, Yamaguchi
	Fukuoka, Saga, Nagasaki, Kumamoto, Oita, Miyazaki, Kagoshima

Notes: Regional cluster definitions used for wild bootstrap standard errors. Clusters are based on geographic proximity of treatment cities. MainAB uses 6 clusters and PlaceboA uses 5 clusters because treatment cities are concentrated in specific regions. PlaceboB uses 9 clusters covering a wider geographic range due to more dispersed former US base locations. Okinawa is excluded from all treatment groups.

Appendix C Supplementary Materials

C.1 Media Articles

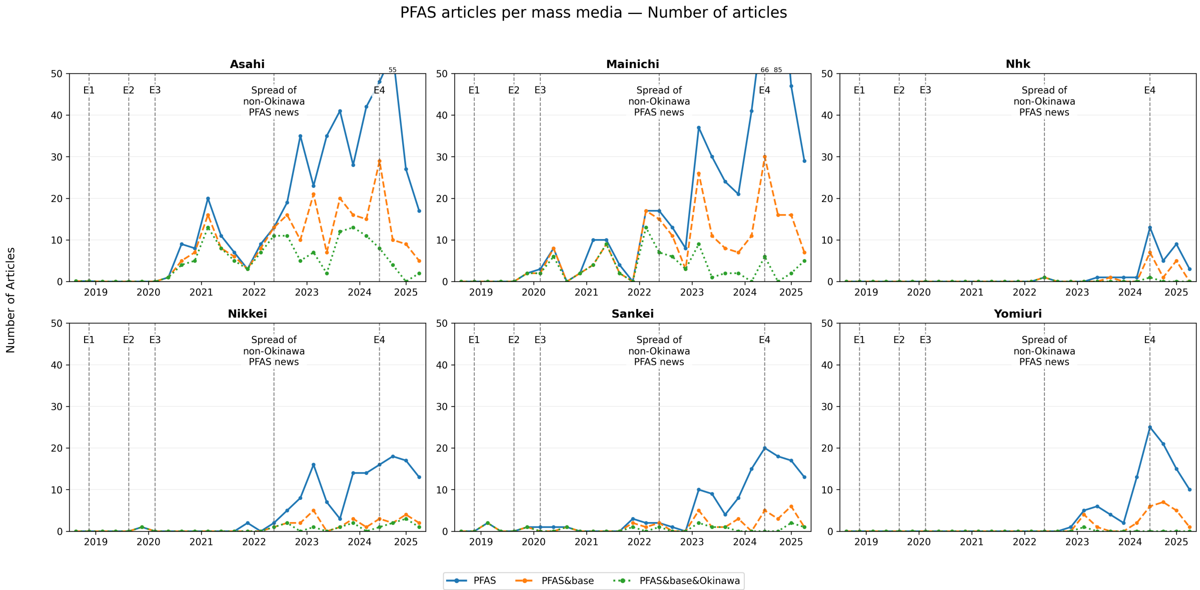


Figure B.1: PFAS Mass Media Articles by Individual Outlet

Notes: Quarterly count of PFAS-related articles for each of the 6 major mass media outlets. See Figure 1 for the aggregated view.

C.2 Google Trends

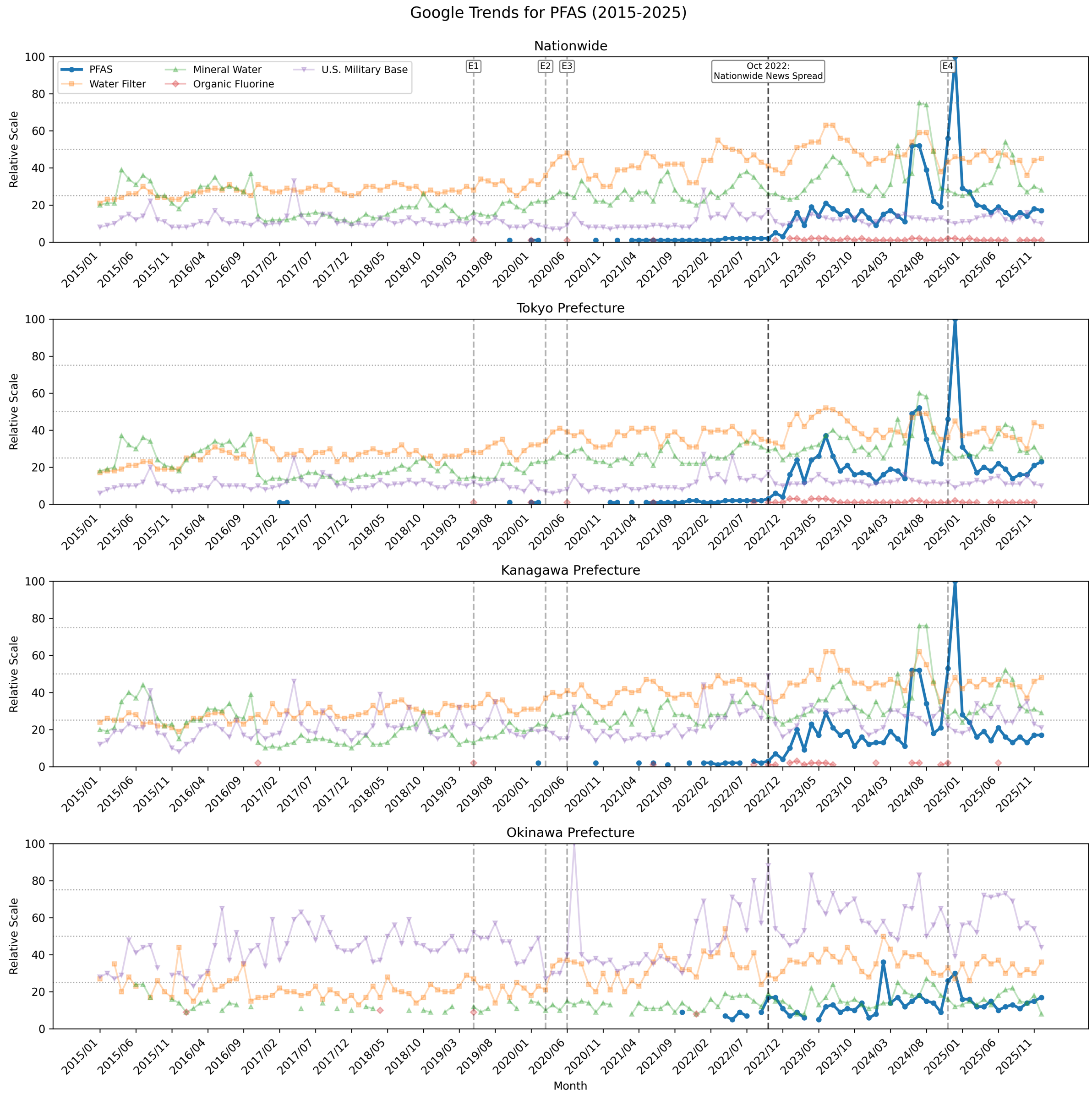


Figure B.2: Google Trends by Region

Notes: Regional Google Trends data for Japan (nationwide), Tokyo Prefecture, Kanagawa Prefecture, and Okinawa Prefecture. Keywords: "PFAS", "Water Filter", "Mineral Water", "Organic Fluorine", "US Base". Values normalized to max = 100.

C.3 Summary Statistics

Table B.1: Summary Statistics of Main-AB US-base Cities and Ring Cities

	US Base Cities		Ring-1 Cities		Ring-2 Cities		Rest of Japan	
Variable	Pre	Post	Pre	Post	Pre	Post	Pre	Post
N (cities)	26	26	73	73	97	97	1658	1649
N (land points)	629	629	1,445	1,445	1,600	1,600	NA	NA
Land price	134,865	147,477	159,142	183,357	198,101	238,310	NA	NA
	(197,199)	(245,608)	(203,928)	(292,693)	(317,153)	(496,540)		
Electorate size	118,044	116,764	86,578	86,628	82,045	83,154	52,047	51,292
	(87,983)	(88,212)	(98,075)	(100,773)	(88,896)	(93,086)	(77,282)	(78,817)
Voter turnout	53.57	51.44	56.41	54.43	58.06	55.74	60.30	58.49
	(4.10)	(2.57)	(5.33)	(4.49)	(6.96)	(5.68)	(8.27)	(7.60)
Vote share (%)								
Incumbent gov	56.44	43.23	54.62	42.60	54.31	43.38	54.17	43.81
	(9.73)	(6.59)	(9.25)	(7.04)	(9.88)	(8.47)	(9.91)	(8.90)
LDP	41.30	31.17	40.02	31.07	39.97	31.70	39.07	31.76
	(10.02)	(7.44)	(7.70)	(6.35)	(7.74)	(7.24)	(8.30)	(7.73)
Komeito	15.15	12.06	14.59	11.54	14.34	11.68	15.10	12.05
	(3.41)	(2.77)	(3.77)	(2.80)	(4.20)	(3.06)	(5.39)	(4.17)
Leftist parties	19.28	26.54	20.45	29.60	20.47	29.55	20.51	28.88
	(9.32)	(3.80)	(9.65)	(3.74)	(9.71)	(4.31)	(9.73)	(6.91)
JCP	7.95	5.33	8.27	5.50	8.34	5.60	8.38	5.59
	(3.82)	(1.96)	(3.84)	(2.14)	(3.85)	(2.01)	(4.11)	(2.27)
SDP	1.98	1.70	2.29	1.90	2.24	1.87	2.51	1.77
	(0.82)	(0.55)	(1.16)	(0.56)	(1.22)	(0.77)	(2.14)	(1.09)
CDP	9.34	19.51	9.90	22.19	9.88	22.08	9.63	21.52
	(9.76)	(3.35)	(10.42)	(3.33)	(10.44)	(3.79)	(10.55)	(6.47)

Notes:
Standard deviations in parentheses below means.
Treatment: Oct 2022 nationwide media coverage.
Land price pre: 2007-2022; post: 2023-2025.
Vote share pre: Elections 46-49 (2012-2021); post: Election 50 (Oct 2024).

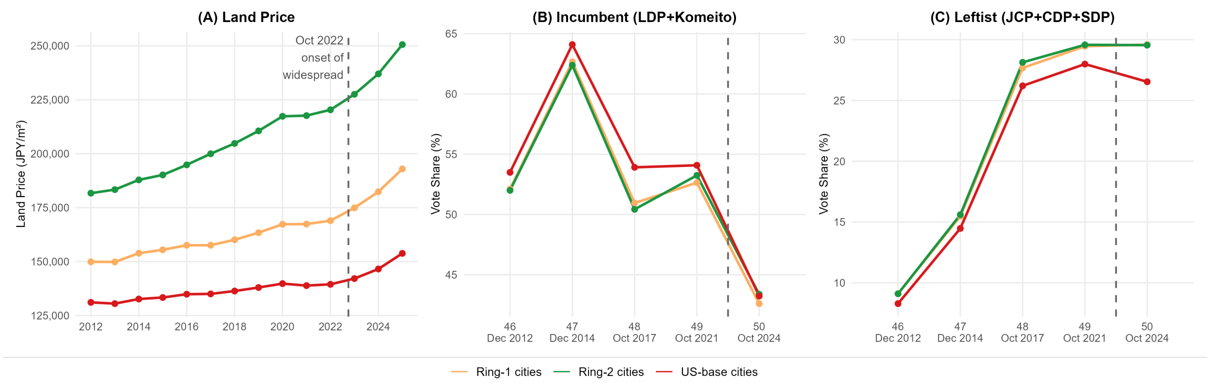


Figure B.3: Descriptive Trends by Treatment Group (Main)

Notes: (A) Average residential land prices (yen/m^2) by treatment/control group. (B) Average vote share of incumbent government (LDP+Komeito). (C) Average vote share of leftist parties (JCP+CDP+SDP).

C.3.1 Land Price Panel Balance

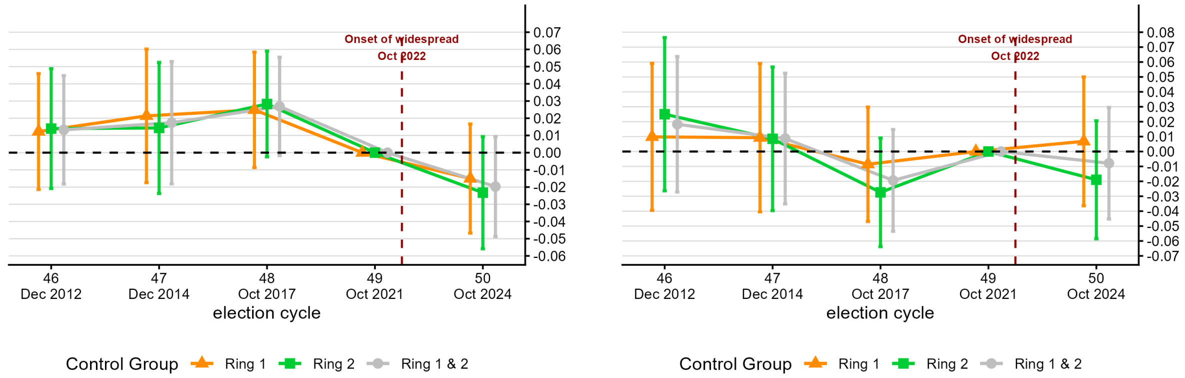
Table B.2: Land Price Panel Balance: Frequency by Years Observed (2012–2025)

Years Observed	Ring 1	Ring 2	US Base
1	17	24	10
2	29	42	13
3	0	0	0
4	1	6	0
5	0	1	0
6	0	0	0
7	1	0	0
8	0	3	0
9	5	5	4
10	10	9	2
11	40	52	25
12	79	107	33
13	47	55	29
14	**1,083**	**1,154**	**481**
Total	1,312	1,458	597
% Fully Balanced	82.5%	79.1%	80.6%

Notes:
Each cell shows the number of unique land price points observed for that many years.
Fully balanced points are those observed in all 14 years (2012–2025).
Land points identified by city code + local ID.

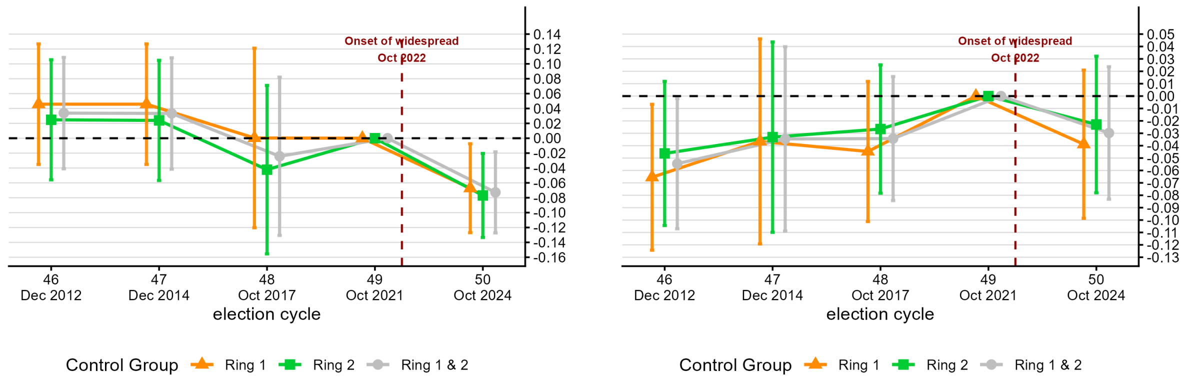
C.4 Event Study Figures

C.4.1 Main: Vote Share Decomposed



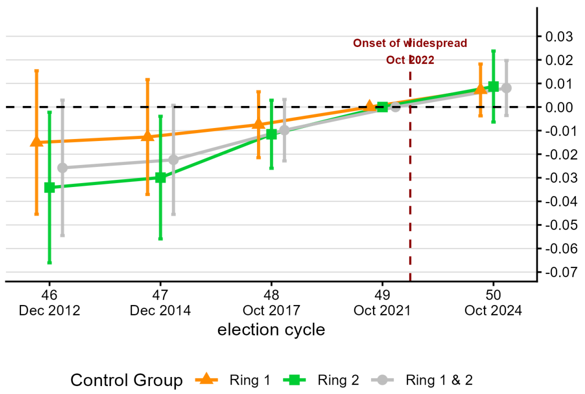
(a) LDP (b) Komeito

Figure B.4: Event Study: Vote Share - Incumbent Government Decomposed (Main)

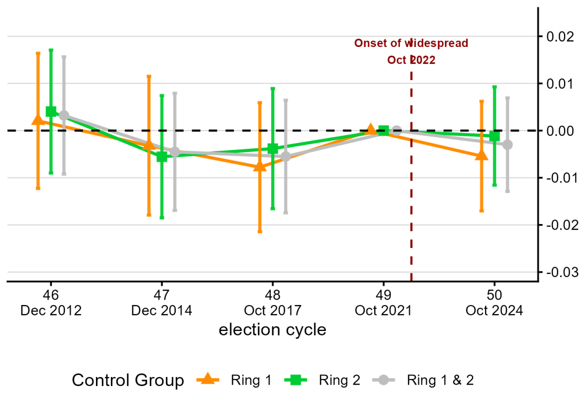


(a) CDP (b) JCP+SDP

Figure B.5: Event Study: Vote Share - Leftist Parties Decomposed (Main)



(a) Electorate Size



(b) Turnout Rate

Figure B.6: Event Study: Electorate Size and Turnout (Main)

C.4.2 PlaceboA

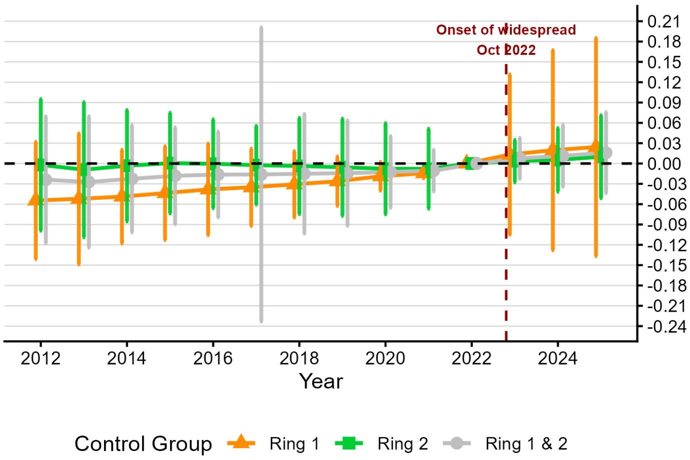
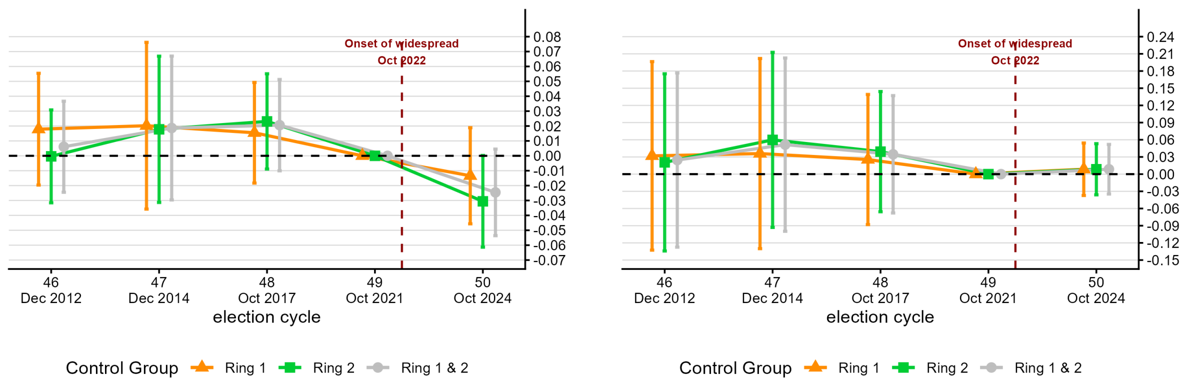


Figure B.7: Land Price Event Study: PlaceboA



(a) Incumbent Government

(b) Leftist Parties

Figure B.8: Event Study: PlaceboA - Vote Share

C.4.3 PlaceboB

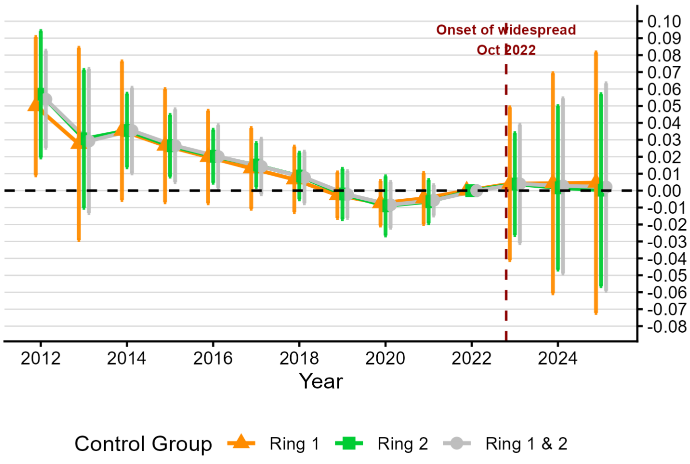
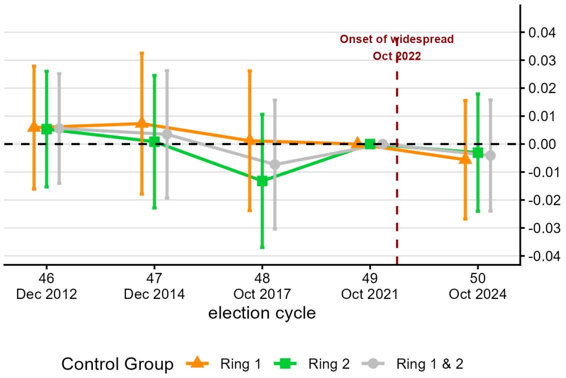
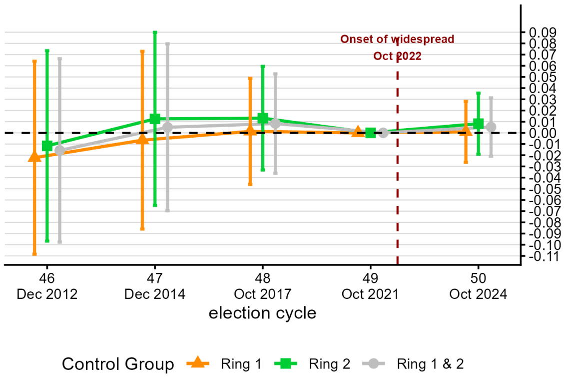


Figure B.9: Land Price Event Study: PlaceboB



(a) Incumbent Government



(b) Leftist Parties

Figure B.10: Event Study: PlaceboB - Vote Share

C.5 Placebo Maps

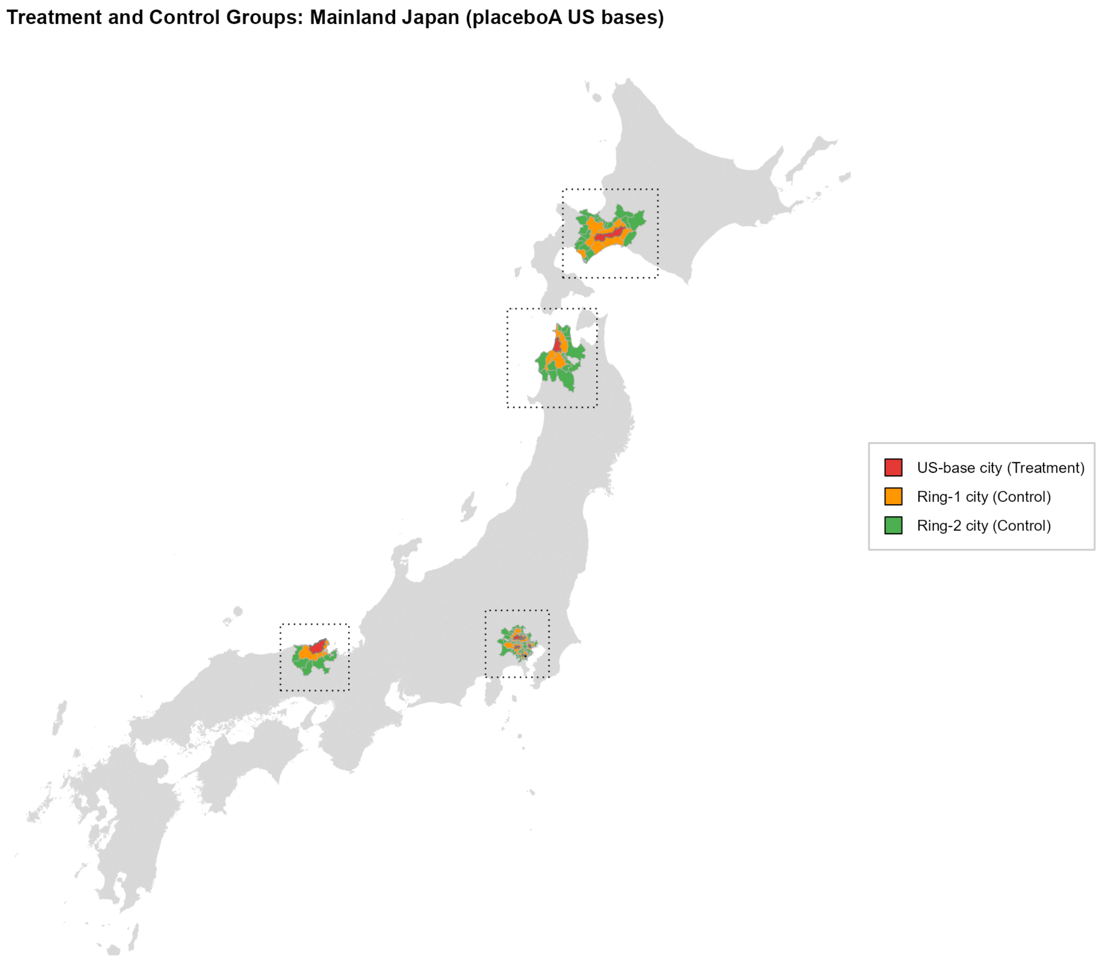


Figure B.11: Map of PlaceboA US Bases in Japan

Notes: Geographic distribution of PlaceboA US bases and surrounding ring cities.

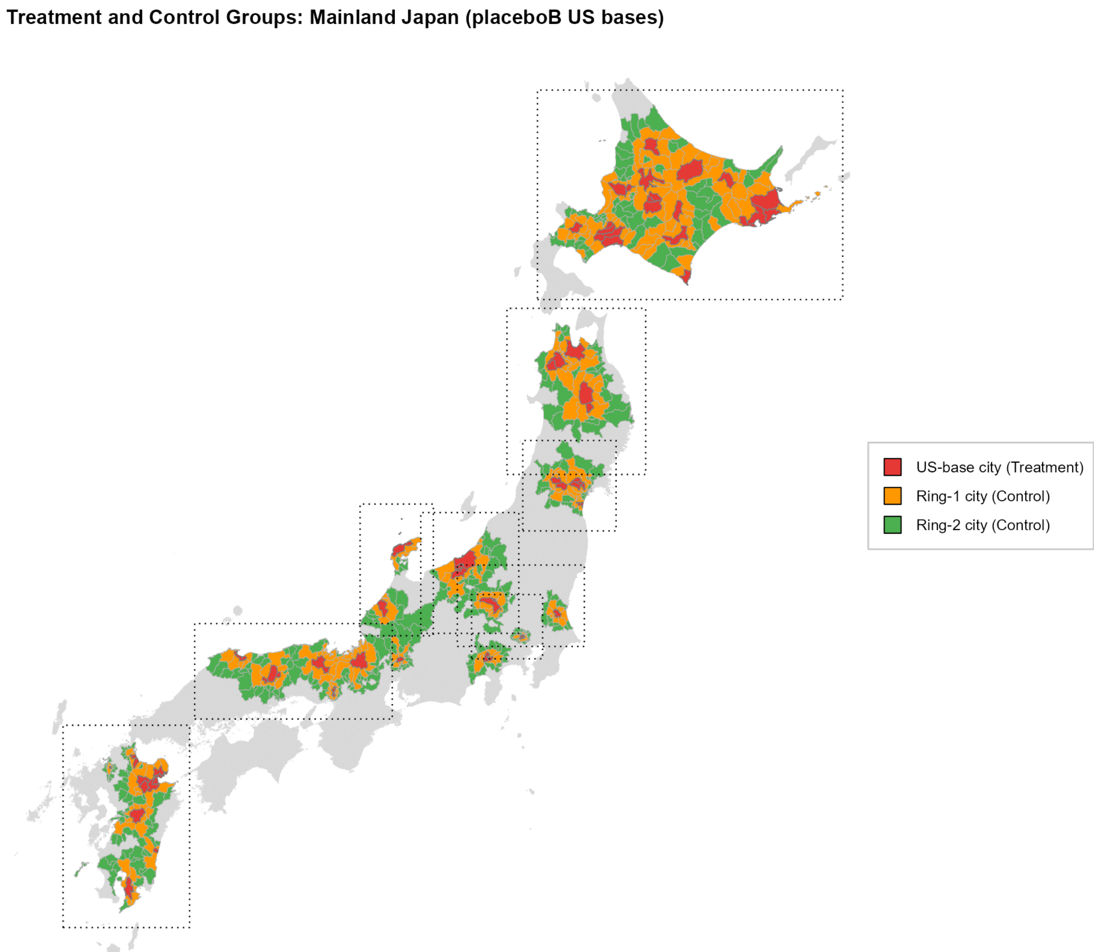


Figure B.12: Map of PlaceboB US Bases in Japan

Notes: Geographic distribution of PlaceboB sites and surrounding ring cities.

C.6 Parliamentary Question Data

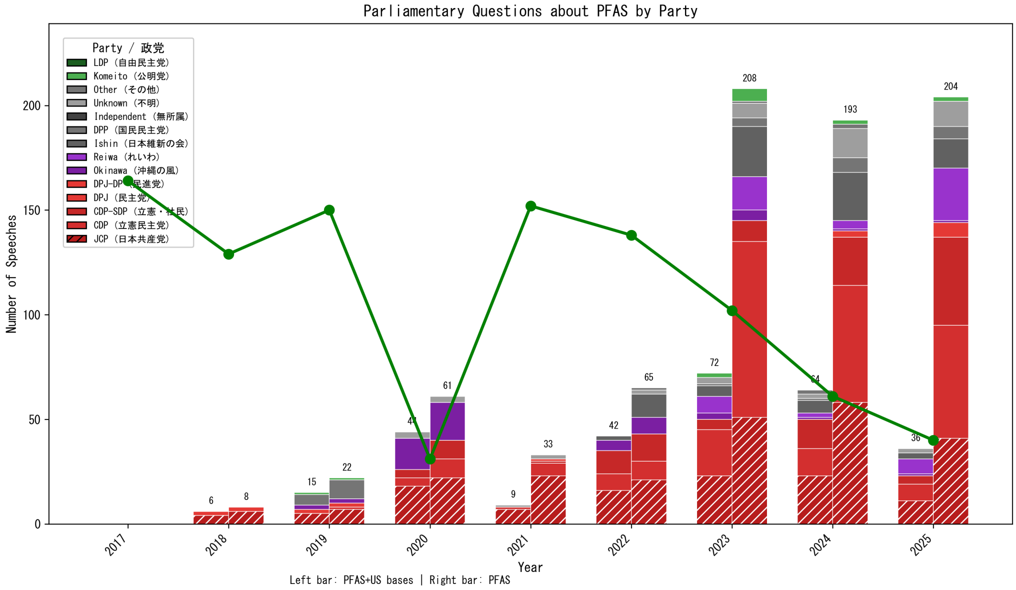


Figure B.13: Parliamentary Questions by Session Type, Party, and Year

Notes: Data Source: National Diet Library (2026).

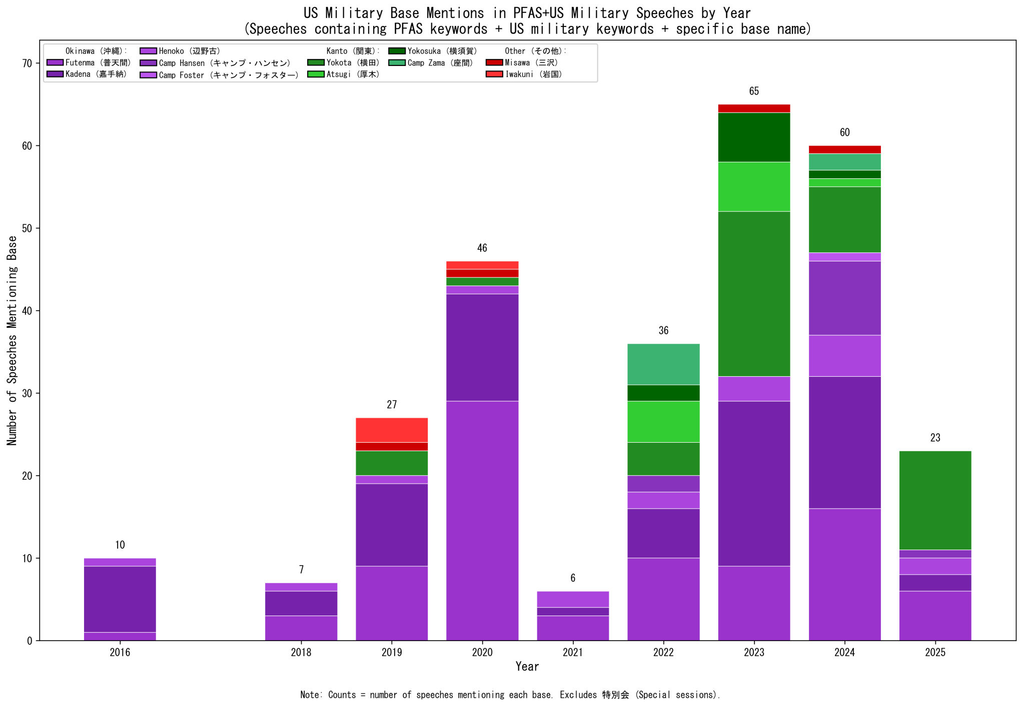


Figure B.14: US Base Mentions in Parliamentary Questions

Notes: Data Source: National Diet Library (2026).

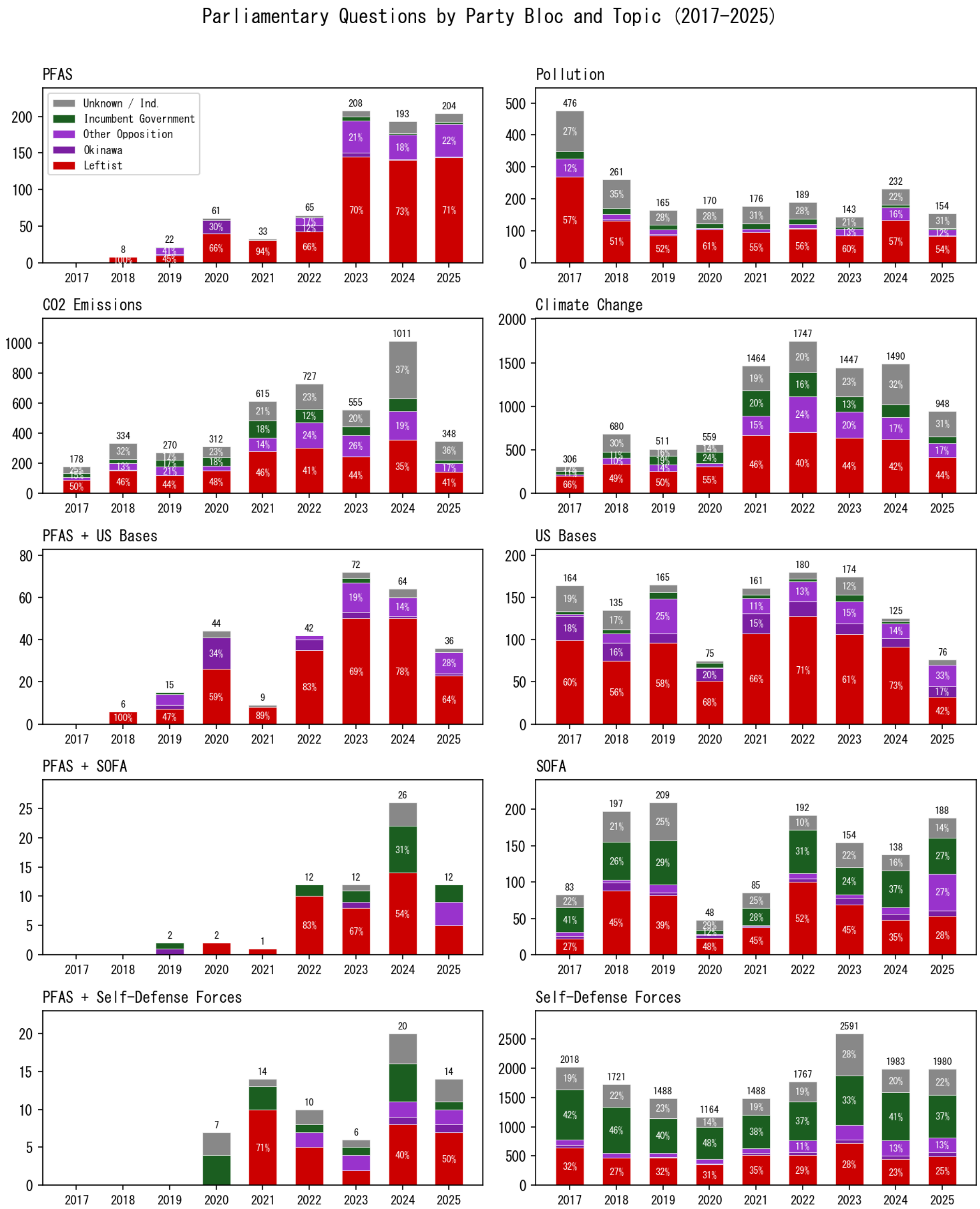


Figure B.15: Environmental Topics in Parliamentary Questions

Notes: Data Source: National Diet Library (2026).

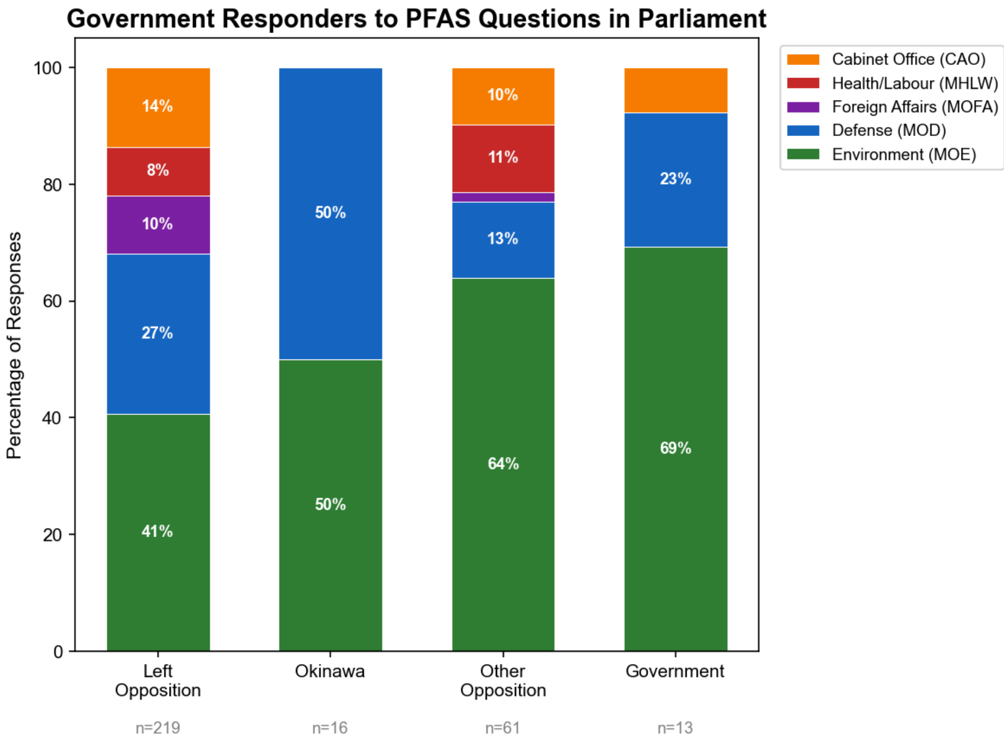


Figure B.16: PFAS-Related Parliamentary Questions by Responders

Notes: Data Source: National Diet Library (2026).

C.7 US Base List

C.7.1 List of All US Bases in Mainland Japan

Table B.3: U.S. military bases in mainland Japan

No.	Base Name	Use	Size (Total)	Size (JP)	Pref.	Base Type
1	Chitose	Telecom	4,274	4,274	Hokkaido	pA
2	Kamifurano	Training	34,688	0	Hokkaido	pB
3	Kutchan	Training	928	0	Hokkaido	pB
4	Betsukai	Training	168,178	0	Hokkaido	pB
5	Chitose	Training	92,288	0	Hokkaido	pB
6	Chitose	Airfield	2,584	0	Hokkaido	pB
7	Nayoro	Training	1,734	0	Hokkaido	pB
8	Obihiro	Training	757	0	Hokkaido	pB
9	Asahikawa	Training	1,416	0	Hokkaido	pB
10	Higashi-Chitose	Training	81	0	Hokkaido	pB
11	Takikawa	Training	1,367	0	Hokkaido	pB
12	Bihoro	Training	2,269	0	Hokkaido	pB
13	Engaru	Training	1,082	0	Hokkaido	pB
14	Kushiro	Barracks	26	0	Hokkaido	pB
15	Shikaoi	Training	32,832	0	Hokkaido	pB
16	Shikaoi	Training	59	0	Hokkaido	pB
17	Misawa	Training	7,656	7,656	Aomori	mA&mB
18	Misawa	Airfield	15,968	15,780	Aomori	mA&mB
19	Hachinohe	Depot	173	173	Aomori	mB
20	Hachinohe	Barracks	53	0	Aomori	-
21	Hirosaki	Training	4,904	0	Aomori	pB
22	Shariki	Telecom	135	135	Aomori	pA
23	Aomori	Training	3,183	0	Aomori	pB
24	Iwate	Training	23,264	0	Iwate	pB
25	Sendai	Training	51	0	Miyagi	pB
26	Yamato-Ojo	Training	45,377	0	Miyagi	pB
27	Kasuminome	Airfield	260	0	Miyagi	pB
28	Jinmachi	Training	1,308	0	Yamagata	pB
29	Hyakuri	Airfield	1,089	0	Ibaraki	pB
30	Somagahara	Training	5,796	0	Gunma	pB
31	Asaka	Telecom	118	118	Saitama	pA
32	Owada	Telecom	1,199	1,199	Saitama	pA
33	Tokorozawa	Telecom	966	966	Saitama	pA
34	Asaka	Training	17	0	Saitama	pB
35	Kisarazu	Airfield	2,095	2,095	Chiba	mA&mB
36	Tama	Other	1,948	1,948	Tokyo	pA
37	Yokota	Airfield	7,139	7,136	Tokyo	mA&mB
38	Akasaka	Office	27	27	Tokyo	pA
39	Zama	Office	2,292	2,292	Kanagawa	mB

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No.	Base Name	Use	Size (Total)	Size (JP)	Pref.	Base Type
40	Atsugi	Airfield	5,056	2,497	Kanagawa	mA&mB
41	Azuma	Depot	802	802	Kanagawa	mB
42	Negishi	Housing	429	429	Kanagawa	-
43	Yokohama	Port	523	523	Kanagawa	pA
44	Yokosuka	Port	2,363	2,363	Kanagawa	-
45	Ikego	Housing	2,882	2,882	Kanagawa	-
46	Urago	Depot	194	194	Kanagawa	mB
47	Sagamihara	Housing	593	593	Kanagawa	-
48	Sagami	Factory	1,967	1,967	Kanagawa	mB
49	Nagasaka	Training	97	0	Kanagawa	-
50	Tsurumi	Depot	184	184	Kanagawa	mB
51	Takada-Sekiyama	Training	14,080	0	Niigata	pB
52	Komatsu	Airfield	1,606	0	Ishikawa	pB
53	Fuji	Training	133,925	0	Yamanashi	pB
54	Gifu	Other	1,626	0	Gifu	pB
55	Fuji	Barracks	1,177	1,177	Shizuoka	-
56	Numazu	Training	28	28	Shizuoka	mA
57	Imazu-Aibano	Training	24,085	0	Shiga	pB
58	Fukuchiyama	Training	55	0	Kyoto	pB
59	Kyogamisaki	Telecom	36	36	Kyoto	pA
60	Itami	Training	20	0	Hyogo	pB
61	Miho	Airfield	1,020	0	Tottori	pB
62	Nihonbara	Training	18,844	0	Okayama	pB
63	Haramura	Training	1,687	0	Hiroshima	-
64	Kure	Port	12	12	Hiroshima	-
65	Kawakami	Depot	2,604	2,604	Hiroshima	mB
66	Hiro	Depot	359	359	Hiroshima	mB
67	Akizuki	Depot	559	559	Hiroshima	mB
68	Iwakuni	Airfield	8,648	8,648	Yamaguchi	mA&mB
69	Soo	Telecom	24	24	Yamaguchi	-
70	Itazuke	Airfield	515	23	Fukuoka	pB
71	Tsuiki	Airfield	906	0	Fukuoka	pB
72	Sasebo	Port	83	41	Nagasaki	-
73	Sasebo	Depot	582	582	Nagasaki	mB
74	Sasebo	Port	496	488	Nagasaki	-
75	Iorizaki	Depot	227	227	Nagasaki	mB
76	Yokose	Depot	679	679	Nagasaki	mB
77	Tategami	Port	135	135	Nagasaki	-
78	Akasaki	Depot	754	754	Nagasaki	mB
79	Hariojima	Housing	354	354	Nagasaki	-
80	Hariojima	Depot	1,297	1,297	Nagasaki	mB
81	Kengun	Training	39	0	Kumamoto	pB
82	Kita-Kumamoto	Training	21	0	Kumamoto	pB

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No.	Base Name	Use	Size (Total)	Size (JP)	Pref.	Base Type
83	Oyanohara-Kirishima	Training	26,965	0	Kumamoto	pB
84	Hijudai	Training	56,317	0	Oita	pB
85	Nyutabaru	Airfield	1,833	0	Miyazaki	pB
86	Kanoya	Airfield	490	0	Kagoshima	pB

Notes: Sorted from north to south by prefecture. Size in 1,000 m^2. Size (Total) = total facility area; Size (JP) = area returned to Japan (0 = still fully US-occupied). Base Type: mA = airfields/training grounds (PFAS-likely); mB = large bases (>100k m^2); mA&mB = both criteria; pA = non-PFAS placebo (ports, telecom, offices); pB = other/unclassified.

C.7.2 US-Base Cities in Each Treatment Group

Table B.4: List of US Bases and Cities by Category (excluding Okinawa)

ID	Name	Prefecture	Use	Cities	Cluster
Panel A: MainAB					
17	Misawa	Aomori	Training	三沢市, 六ヶ所村	Upper Tohoku
18	Misawa	Aomori	Airfield	三沢市, 東北町	Upper Tohoku
19	Hachinohe	Aomori	Depot	八戸市, 三沢市, おいらせ町	Upper Tohoku
35	Kisarazu	Chiba	Airfield	木更津市	Tokyo Metro
37	Yokota	Tokyo	Airfield	福生市, 瑞穂町, 武蔵村山市, 羽村市, 立川市, 昭島市	Tokyo Metro
39	Zama	Kanagawa	Office	南区, 座間市	Tokyo Metro
40	Atsugi	Kanagawa	Airfield	綾瀬市, 大和市	Tokyo Metro
41	Azuma	Kanagawa	Depot	横須賀市	Tokyo Metro
46	Urago	Kanagawa	Depot	横須賀市	Tokyo Metro
48	Sagami	Kanagawa	Factory	中央区	Tokyo Metro
50	Tsurumi	Kanagawa	Depot	鶴見区	Tokyo Metro
56	Numazu	Shizuoka	Training	沼津市	Tokai
65	Kawakami	Hiroshima	Depot	東広島市	Chugoku
66	Hiro	Hiroshima	Depot	呉市	Chugoku
67	Akizuki	Hiroshima	Depot	江田島市	Chugoku
68	Iwakuni	Yamaguchi	Airfield	岩国市	Chugoku
73	Sasebo	Nagasaki	Depot	佐世保市	North Kyushu
75	Iorizaki	Nagasaki	Depot	佐世保市	North Kyushu
76	Yokose	Nagasaki	Depot	西海市	North Kyushu
78	Akasaki	Nagasaki	Depot	佐世保市	North Kyushu
80	Hariojima	Nagasaki	Depot	佐世保市	North Kyushu
Panel B: PlaceboA					
1	Chitose	Hokkaido	Telecom	千歳市	Hokkaido
22	Shariki	Aomori	Telecom	つがる市	Upper Tohoku
31	Asaka	Saitama	Telecom	和光市	Saitama
32	Owada	Saitama	Telecom	新座市, 清瀬市	Saitama
33	Tokorozawa	Saitama	Telecom	所沢市	Saitama
36	Tama	Tokyo	Other	稲城市, 多摩市	Tokyo Metro
38	Akasaka	Tokyo	Office	港区	Tokyo Metro
43	Yokohama	Kanagawa	Port	神奈川区	Tokyo Metro
59	Kyogamisaki	Kyoto	Telecom	京丹後市	Kinki
Panel C: PlaceboB					
2	Kamifurano	Hokkaido	Training	上富良野町, 中富良野町, 富良野市	Hokkaido
3	Kutchan	Hokkaido	Training	倶知安町	Hokkaido
4	Betsukai	Hokkaido	Training	別海町, 厚岸町, 浜中町	Hokkaido
5	Chitose	Hokkaido	Training	恵庭市, 千歳市, 札幌市, 北広島市	Hokkaido
6	Chitose	Hokkaido	Airfield	千歳市, 苫小牧市, えりも町	Hokkaido
7	Nayoro	Hokkaido	Training	名寄市	Hokkaido
8	Obihiro	Hokkaido	Training	帯広市	Hokkaido
9	Asahikawa	Hokkaido	Training	旭川市	Hokkaido
10	Higashi-Chitose	Hokkaido	Training	千歳市	Hokkaido
11	Takikawa	Hokkaido	Training	滝川市, 新十津川町	Hokkaido
12	Bihoro	Hokkaido	Training	美幌町	Hokkaido
13	Engaru	Hokkaido	Training	遠軽町	Hokkaido
14	Kushiro	Hokkaido	Barracks	釧路町	Hokkaido
15	Shikaoi	Hokkaido	Training	鹿追町	Hokkaido
16	Shikaoi	Hokkaido	Training	鹿追町	Hokkaido
21	Hirosaki	Aomori	Training	西目屋村, 弘前市	Upper Tohoku
23	Aomori	Aomori	Training	青森市	Upper Tohoku
24	Iwate	Iwate	Training	滝沢市, 八幡平市	Upper Tohoku
25	Sendai	Miyagi	Training	仙台市	Lower Tohoku
26	Yamato-Ojo	Miyagi	Training	色麻町, 大和町, 大衡村	Lower Tohoku
27	Kasuminome	Miyagi	Airfield	仙台市, 岩沼市	Lower Tohoku
28	Jinmachi	Yamagata	Training	村山市, 東根市	Lower Tohoku
29	Hyakuri	Ibaraki	Airfield	小美玉市	Ibaraki
30	Somagahara	Gunma	Training	高崎市, 榛東村	Gunma
34	Asaka	Saitama	Training	朝霞市, 和光市, 新座市	Saitama
51	Takada-Sekiyama	Niigata	Training	妙高市, 上越市	Niigata

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ID	Name	Prefecture	Use	Cities	Cluster
52	Komatsu	Ishikawa	Airfield	小松市, 輪島市	Noto
53	Fuji	Yamanashi	Training	富士吉田市, 山中湖村, 御殿場市, 小山町, 裾野市	Tokai
54	Gifu	Gifu	Other	各務原市	Chubu
57	Imazu-Aibano	Shiga	Training	高島市	Kinki
58	Fukuchiyama	Kyoto	Training	福知山市	Kinki
60	Itami	Hyogo	Training	川西市, 伊丹市	Kinki
61	Miho	Tottori	Airfield	境港市, 米子市	Chugoku
62	Nihonbara	Okayama	Training	奈義町, 津山市	Chugoku
70	Itazuke	Fukuoka	Airfield	福岡市	North Kyushu
71	Tsuiki	Fukuoka	Airfield	行橋市, 築上町, 春日市	North Kyushu
81	Kengun	Kumamoto	Training	熊本市	South Kyushu
82	Kita-Kumamoto	Kumamoto	Training	熊本市	South Kyushu
83	Oyanohara-Kirishima	Kumamoto	Training	山都町, えびの市, 湧水町	South Kyushu
84	Hijudai	Oita	Training	玖珠町, 九重町, 由布市, 別府市, 日出町, 杵築市	North Kyushu
85	Nyutabaru	Miyazaki	Airfield	新富町	South Kyushu
86	Kanoya	Kagoshima	Airfield	鹿屋市	South Kyushu

Notes: Panel A (MainAB) includes airfields, training grounds, or large bases (>100k m^2). Panel B (PlaceboA) includes ports, telecom, and office facilities; cities overlapping with MainAB are excluded. Panel C (PlaceboB) includes former US bases returned to Japan; cities overlapping with MainAB are excluded.

C.8 PFAS Data Tables

C.8.1 PFAS in Environmental Water and Tap Water for Main Cities

Table B.5: PFAS in Natural Water Sources and Tap Water near MainAB US Bases (ng/L)

				Natural Water Sources					Tap Water Supply				
No.	Base	City	T	’20	’21	’22	’23	’24	’20	’21	’22	’23	’24
17	Misawa	Misawa	B	–	–	–	–	760	0	0	0	0	0
		Rokkasho	B	–	–	–	–	–	–	–	–	–	–
		Higashidori	1	–	–	–	–	–	–	–	–	–	–
		Noheji	1	–	–	–	–	–	–	–	–	–	–
		Rokunohe	1	–	–	–	–	–	–	–	–	–	–
		Yokohama	1	–	–	–	–	–	–	–	–	–	–
		Mutsu	2	–	–	–	–	–	0	0	0	0	0
18	Misawa	Misawa	B	–	–	–	–	760	0	0	0	0	0
		Tohoku	B	–	–	–	–	–	–	–	–	–	–
		Hiranai	1	–	–	–	–	–	–	–	–	–	–
		Shichinohe	1	–	–	–	–	–	–	–	–	–	–
		Towada	1	–	–	–	–	–	0	0	0	0	0
		Aomori	2	–	–	–	–	–	0	0	0	0	0
		Hirakawa	2	–	–	–	–	–	–	–	–	–	–
		Kazuno	2	–	–	–	–	–	–	–	–	–	–
		Kosaka	2	–	–	–	–	–	–	–	–	–	–
		Shingo	2	–	–	–	–	–	–	–	–	–	–
19	Hachinohe	Hachinohe	B	–	–	–	–	–	0	0	0	0	0
		Misawa	B	–	–	–	–	760	0	0	0	0	0
		Oirase	B	–	–	–	–	–	–	–	–	–	–
		Gonohe	1	–	–	–	–	–	–	–	–	–	–
		Hashikami	1	–	–	–	–	–	–	–	–	–	–
		Karumai	1	–	–	–	–	–	–	–	–	–	–
		Nanbu	1	–	–	–	–	–	–	–	–	–	–
		Hirono	2	–	–	–	–	–	–	–	–	–	–
		Kuji	2	–	–	–	–	–	0	0	0	0	0
		Kunohe	2	–	–	–	–	–	–	–	–	–	–
		Ninohe	2	–	–	–	–	–	0	0	0	0	0
		Sannohe	2	–	–	–	–	–	–	–	–	–	–
35	Kisarazu	Kisarazu	B	–	–	38	–	38	0	0	0	0	0
		Ichihara	1	–	–	129	–	129	0	0	0	0	0
		Kimitsu	1	–	–	–	–	–	0	0	0	0	0
		Sodegaura	1	–	–	36	–	36	0	0	0	0	0
		C-Chuo	2	–	–	–	–	37	0	0	0	0	0
		C-Midori	2	–	–	–	–	37	0	0	0	0	0
		Chonan	2	–	–	–	–	–	–	–	–	–	–
		Futtsu	2	–	–	–	–	–	0	0	0	0	0
		Kamogawa	2	–	–	10	–	10	0	0	0	0	0
		Mobara	2	–	–	–	–	–	0	0	0	0	0
		Nagara	2	–	–	–	–	–	–	–	–	–	–
		Otaki	2	–	–	6	–	6	–	–	–	–	–
37	Yokota	Akishima	B	–	–	–	–	18	5.6	6.2	6.8	7.2	7.6

Table B.5 – continued

No.	Base	City	T	Natural Water Sources '20	'21	'22	'23	'24	Tap Water Supply '20	'21	'22	'23	'24
		Fussa	B	–	–	–	–	19	0	0	0	0	0
		Hamura	B	–	–	–	–	19	0	0	0	0	0
		Mizuho	B	–	–	–	–	15	0	0	0	0	0
		Musashimurayama	B	–	–	–	–	65	0	0	0	0	0
		Tachikawa	B	–	–	–	–	620	0	0	0	0	0
		Akiruno	1	–	–	–	–	1.9	0	0	0	0	0
		Hachioji	1	–	–	–	–	99	0	0	0	0	0
		Higashiyamato	1	–	–	–	–	48	0	0	0	0	0
		Hino	1	–	–	–	–	140	0	0	0	0	0
		Iruma	1	–	–	–	–	44	0	0	0	0	0
		Kodaira	1	–	–	–	–	85	0	0	0	0	0
		Kokubunji	1	–	–	–	–	140	0	0	0	0	0
		Kunitachi	1	–	–	–	–	190	0	0	0	0	0
		Ome	1	–	–	–	–	280	0	0	0	0	0
		Tokorozawa	1	–	–	–	–	160	0	0	0	0	0
		Fuchu	2	–	–	–	–	410	0	0	0	0	0
		Hanno	2	–	–	–	–	6.6	0	0	0	0	0
		Higashikurume	2	–	–	–	–	22	0	0	0	0	0
		Higashimurayama	2	–	–	–	–	0.8	0	0	0	0	0
		Hinode	2	–	–	–	–	10	–	–	–	–	–
		Hinohara	2	–	–	–	–	1.2	–	–	–	–	–
		Kawagoe	2	–	–	110	–	110	0	0	0	0	0
		Kiyose	2	–	–	–	–	22	0	0	0	0	0
		Koganei	2	–	–	–	–	48	0	0	0	0	0
		Miyoshi	2	–	–	–	–	–	–	–	–	–	–
		Niiza	2	–	–	–	–	65	0	0	0	0	0
		Nishi-Tokyo	2	–	–	–	–	80	0	0	0	0	0
		Okutama	2	–	–	–	–	1.6	–	–	–	–	–
		Sayama	2	–	–	–	–	390	0	0	0	0	0
39	Zama	S-Minami	B	–	–	–	–	870	0	0	0	0	0
		Zama	B	–	–	46	–	46	0	0	0	0	0
		Atsugi	1	–	–	–	–	6.1	0	0	0	0	0
		Hadano	2	–	–	200	–	200	0	0	0	0	0
		Hiratsuka	2	–	–	–	–	–	0	0	0	0	0
		Isehara	2	–	–	21	–	21	0	0	0	0	0
		Kiyokawa	2	–	–	–	–	5	–	–	–	–	–
40	Atsugi	Ayase	B	–	–	1300	–	1300	0	0	0	0	0
		Yamato	B	–	–	248	–	248	0	0	0	0	0
		Ebina	1	–	–	34	–	34	0	0	0	0	0
		Fujisawa	1	–	–	127	–	127	0	0	0	0	0
		Machida	1	–	–	–	–	32	0	0	0	0	0
		Y-Izumi	1	–	–	9.4	–	9.4	–	0	0	0	0
		Y-Seya	1	–	–	9.4	–	9.4	–	0	0	0	0
		Chigasaki	2	–	–	43	–	43	0	0	0	0	0
		K-Asao	2	–	–	–	–	35	0	0	0	0	0
		Kamakura	2	–	–	–	–	30	0	0	0	0	0

Table B.5 – continued

No.	Base	City	T	Natural Water Sources '20	'21	'22	'23	'24	Tap Water Supply '20	'21	'22	'23	'24
		Samukawa	2	–	–	29	–	29	0	0	0	0	0
		Tama	2	–	–	–	–	5.7	0	0	0	0	0
		Y-Aoba	2	–	–	9.4	–	9.4	–	0	0	0	0
		Y-Asahi	2	–	–	9.4	–	9.4	–	0	0	0	0
		Y-Totsuka	2	–	–	9.4	–	9.4	–	0	0	0	0
41	Azuma	Yokosuka	B	–	–	8592	–	8592	0	0	0	0	0
		Hayama	1	–	–	–	–	5	0	0	0	0	0
		Miura	1	–	–	–	–	41	0	0	0	0	0
		Y-Kanazawa	1	–	–	–	–	2	–	0	0	0	0
		Zushi	1	–	–	13	–	13	0	0	0	0	0
		Y-Isogo	2	–	–	–	–	–	–	0	0	0	0
		Y-Sakae	2	–	–	–	–	16	–	0	0	0	0
46	Urago	Yokosuka	B	–	–	8592	–	8592	0	0	0	0	0
48	Sagami	C-Chuo	B	–	–	–	–	37	0	0	0	0	0
		Aikawa	1	–	–	–	–	14	0	0	0	0	0
		C-Midori	1	–	–	–	–	37	0	0	0	0	0
		Doshi	2	–	–	–	–	–	–	–	–	–	–
		Uenohara	2	–	–	–	–	–	–	–	–	–	–
		Yamakita	2	–	–	12	–	12	0	0	0	0	0
50	Tsurumi	Y-Tsurumi	B	–	–	–	–	19	–	0	0	0	0
		K-Kawasaki	1	–	–	–	–	5	0	0	0	0	0
		K-Saiwai	1	–	–	–	–	48	0	0	0	0	0
		Y-Kanagawa	1	–	–	–	–	2	–	0	0	0	0
		Y-Kohoku	1	–	–	–	–	–	–	0	0	0	0
		C-Midori	2	–	–	–	–	37	0	0	0	0	0
		K-Nakahara	2	–	–	–	–	–	0	0	0	0	0
		K-Takatsu	2	–	–	–	–	140	0	0	0	0	0
		Ota	2	–	–	135	–	135	0	0	0	0	0
		Y-Hodogaya	2	–	–	–	–	2	–	0	0	0	0
		Y-Nishi	2	–	–	–	–	–	–	0	0	0	0
		Y-Tsuzuki	2	–	–	–	–	2	–	0	0	0	0
56	Numazu	Numazu	B	–	–	–	–	–	0	0	0	0	0
		Fuji	1	–	–	–	–	–	0	0	0	0	0
		Izu	1	–	–	–	–	–	–	–	–	–	–
		Izunokuni	1	–	–	–	–	–	–	–	–	–	–
		Kannami	1	–	–	–	–	–	–	–	–	–	–
		Mishima	1	–	–	2	–	2	0	0	0	0	0
		Nagaizumi	1	–	–	2	–	2	–	–	–	–	–
		Shimizu	1	–	–	–	–	–	–	–	–	–	–
		Atami	2	–	–	–	–	–	0	0	0	0	0
		Fujinomiya	2	–	–	–	–	–	0	0	0	0	0
		Gotemba	2	–	–	–	–	–	–	–	–	–	–
		Hakone	2	–	–	–	–	14	0	0	0	0	0
		Higashiizu	2	–	–	–	–	–	–	–	–	–	–
		Ito	2	–	–	–	–	–	0	0	0	0	0
		Kawazu	2	–	–	–	–	–	–	–	–	–	–

Table B.5 – continued

No.	Base	City	T	Natural Water Sources '20	'21	'22	'23	'24	Tap Water Supply '20	'21	'22	'23	'24
		Nishiizu	2	–	–	–	–	–	–	–	–	–	–
		Shimizu	2	–	–	–	–	–	0	0	0	0	0
		Susono	2	–	–	2	–	2	–	–	–	–	–
		Yugawara	2	–	–	5	–	5	0	0	0	0	0
65	Kawakami	Higashihiroshima	B	–	–	–	–	15000	–	–	10	10	10
		Akitakata	1	–	–	–	–	–	–	–	10	10	10
		H-Aki	1	–	–	–	–	–	0	0	0	0	0
		H-Asakita	1	–	–	–	–	–	0	0	0	0	0
		Kumano	1	–	–	–	–	–	–	–	–	–	–
		Mihara	1	–	–	2.5	–	2.5	–	–	10	10	10
		Miyoshi	1	–	–	–	–	–	0	0	0	0	0
		Sera	1	–	–	–	–	–	–	–	–	–	–
		Takehara	1	–	–	–	–	–	–	–	10	10	10
		Fuchu	2	–	–	–	–	410	0	0	0	0	0
		Fuchu	2	–	–	–	–	–	–	–	–	–	–
		H-Asaminami	2	–	–	–	–	–	0	0	0	0	0
		H-Higashi	2	–	–	–	–	–	0	0	0	0	0
		Iinan	2	–	–	–	–	–	–	–	–	–	–
		Kaita	2	–	–	–	–	–	–	–	–	–	–
		Misato	2	–	–	–	–	–	–	–	–	–	–
		Ohnan	2	–	–	–	–	–	–	–	–	–	–
		Onomichi	2	–	–	–	–	–	0	0	0	0	0
		S-Minami	2	–	–	–	–	870	0	0	0	0	0
		Shobara	2	–	–	–	–	–	0	0	0	0	0
66	Hiro	Kure	B	–	–	–	–	50	0	0	0	0	0
		Saka	1	–	–	–	–	–	–	–	–	–	–
67	Akizuki	Etajima	B	–	–	–	–	8	0	0	0	0	0
68	Iwakuni	Iwakuni	B	–	–	–	–	176	0	0	0	0	0
		Hatsukaichi	1	–	–	–	–	–	–	–	10	10	10
		Hikari	1	–	–	0.7	–	0.7	0	0	0	0	0
		Masuda	1	–	–	–	–	–	–	–	–	–	–
		Otake	1	–	–	–	–	–	0	0	0	0	0
		Shunan	1	–	–	–	–	–	0	0	0	0	0
		Tabuse	1	–	–	–	–	–	–	–	–	–	–
		Waki	1	–	–	–	–	–	–	–	–	–	–
		Yanai	1	–	–	–	–	–	0	0	0	0	0
		Yoshika	1	–	–	–	–	–	–	–	–	–	–
		Akiota	2	–	–	–	–	–	–	–	–	–	–
		H-Saeki	2	–	–	–	–	–	0	0	0	0	0
		Hagi	2	–	–	–	–	–	–	–	–	–	–
		Hamada	2	–	–	1.6	–	1.6	–	–	–	–	–
		Hirao	2	–	–	–	–	–	–	–	–	–	–
		Hofu	2	–	–	9	–	9	0	0	0	0	0
		Kaminoseki	2	–	–	–	–	–	–	–	–	–	–
		Kitahiroshima	2	–	–	–	–	–	–	–	–	–	–
		Kudamatsu	2	–	–	4.5	–	4.5	0	0	0	0	0

Table B.5 – continued

No.	Base	City	T	Natural Water Sources '20	'21	'22	'23	'24	Tap Water Supply '20	'21	'22	'23	'24
		Tsuwano	2	–	–	–	–	–	–	–	–	–	–
		Yamaguchi	2	–	–	–	–	–	–	–	–	–	–
73	Sasebo	Sasebo	B	–	–	2.3	–	2.3	–	–	5	5	5
75	Iorizaki	Sasebo	B	–	–	2.3	–	2.3	–	–	5	5	5
76	Yokose	Saikai	B	–	–	–	–	0	0	0	0	0	0
		Nagasaki	1	–	–	–	–	–	0	0	0	0	0
		Isahaya	2	–	–	49	–	49	0	0	0	0	0
		Nagayo	2	–	–	–	–	–	–	–	–	–	–
		Togitsu	2	–	–	–	–	–	–	–	–	–	–
78	Akasaki	Sasebo	B	–	–	2.3	–	2.3	–	–	5	5	5
		Arita	1	–	–	–	–	–	–	–	–	–	–
		Hasami	1	–	–	–	–	–	–	–	–	–	–
		Hirado	1	–	–	–	–	–	–	–	–	–	–
		Imari	1	–	–	–	–	–	–	–	–	–	–
		Kawatana	1	–	–	–	–	–	–	–	–	–	–
		Matsuura	1	–	–	–	–	–	–	–	–	–	–
		Saza	1	–	–	–	–	–	–	–	–	–	–
		Higashisonogi	2	–	–	–	–	–	–	–	–	–	–
		Karatsu	2	–	–	7.7	–	7.7	–	–	–	–	–
		Takeo	2	–	–	–	–	–	–	–	–	–	–
		Ureshino	2	–	–	–	–	–	–	–	–	–	–
80	Hariojima	Sasebo	B	–	–	2.3	–	2.3	–	–	5	5	5

Notes. No. = base number from Table B.3. PFAS = PFOS + PFOA. Natural Water Sources = rivers, groundwater, lakes. Tap Water = municipal water supply. T = city type (B=base, 1=ring1, 2=ring2). 0 = Not Detected (¡5 ng/L). – = no data available. Dark ≥50 ng/L; Light = 40–49 ng/L.

Japan's provisional target: 50 ng/L (mandatory from April 2026). All tap water values below guideline.

C.8.2 PFAS in Environmental Water and Tap Water for Okinawa Cities

Table B.6: PFAS in Natural Water Sources and Tap Water near Okinawa US Bases (ng/L)

			Natural Water Sources					Tap Water Supply				
Base	City	T	’20	’21	’22	’23	’24	’20	’21	’22	’23	’24
Kadena	Kadena	B	380	420	450	480	520	1	0.8	0.7	0.6	0.5
	Chatan	1	320	350	380	410	450	1	0.8	0.7	0.6	0.5
	Okinawa	1	145	165	180	195	210	0.9	0.7	0.6	0.5	0.5
	Yomitan	1	52	58	63	68	72	0.8	0.6	0.5	0.4	0.4
Futenma	Ginowan	B	210	240	260	280	300	1	0.9	0.8	0.7	0.6
	Nakagusuku	1	30	34	38	42	45	0.7	0.6	0.5	0.5	0.4
	Nishihara	1	18	21	24	27	30	0.6	0.5	0.5	0.4	0.4
	Urasoe	1	42	48	52	56	60	0.8	0.7	0.6	0.5	0.5
Hansen	Kin	B	95	108	120	132	145	0.9	0.8	0.7	0.6	0.5
	Ginoza	1	32	36	40	44	48	0.8	0.7	0.6	0.5	0.5
	Onna	1	14	16	18	20	22	0.5	0.4	0.4	0.3	0.3
Schwab	Nago	B	52	60	68	76	85	0.7	0.6	0.5	0.5	0.4
Zukeran	Kitanakagusuku	B	75	85	95	105	115	0.8	0.7	0.6	0.5	0.5
	Nakagusuku	1	30	34	38	42	45	0.7	0.6	0.5	0.5	0.4
Courtney	Uruma	B	48	55	62	70	78	0.8	0.7	0.6	0.5	0.5
White Beach	Uruma	B	48	55	62	70	78	0.8	0.7	0.6	0.5	0.5
Makiminato	Urasoe	B	42	48	52	56	60	0.8	0.7	0.6	0.5	0.5
Naha	Naha	B	22	26	30	34	38	0.6	0.5	0.4	0.4	0.3

Notes. PFAS = PFOS + PFOA. Natural Water Sources = rivers, groundwater, springs. Tap Water = municipal water supply (treated). T = city type (B=base, 1=ring1). 0 = Not Detected (¡5 ng/L). – = no data available. Dark $\geq$50 ng/L; Light = 40–49 ng/L.

Japan’s provisional target: 50 ng/L (mandatory from April 2026). Note: Okinawa tap water is treated with activated carbon filtration, reducing PFAS levels significantly.

References

Asahi Shimbun. 朝日新聞. https://www.asahi.com/, 2026. Accessed: 2025-10-1.

Julia Bredtmann. Immigration and electoral outcomes: Evidence from the 2015 refugee inflow to germany. *Regional science and urban economics*, 96(103807):103807, September 2022.

Peter Christensen, David A Keiser, and Gabriel E Lade. Economic effects of environmental crises: Evidence from flint, michigan. *American Economic Journal. Economic Policy*, 15(1):196–232, February 2023.

Michael Greenstone and Justin Gallagher. Does hazardous waste matter? evidence from the housing market and the superfund program. *The Quarterly Journal of Economics*, 2008.

Kanagawa Prefectural Government. 県営水道における有機フッ素化合物（pfos及びpfoa）の検査結果. https://www.pref.kanagawa.jp/docs/w6a/wqa/pfas.html, 2025. Accessed: 2025-12-31.

Mainichi Shimbun. 毎日新聞. https://mainichi.jp/, 2026. Accessed: 2025-10-1.

Michelle Marcus and Rosie Mueller. Unregulated contaminants in drinking water: Evidence from PFAS and housing prices. *Journal of environmental economics and management*, 125(102987):102987, May 2024.

Adrian Mehic. The electoral consequences of environmental accidents: Evidence from chernobyl. *Journal of public economics*, 225(104964):104964, September 2023.

MHLW. 「水質基準に関する省令の一部改正等について」の留意事項について. https://www.mhlw.go.jp/content/10900000/000615829.pdf, 2020. Accessed: 2026-1-1.

Ministry of Foreign Affairs of Japan. Agreement regarding the status of united states armed forces in japan. https://www.mofa.go.jp/region/n-america/us/q&a/ref/2.html, 1960. Accessed: 2026-1-1.

Mizusaki and Mori. JED-M(水崎・森)衆議院議員総選挙データ. https://ci.nii.ac.jp/ncid/BD00799741, 2021. Accessed: 2025-8-1.

MLIT. 行政区域データ. https://nlftp.mlit.go.jp/ksj/gml/datalist/KsjTmplt-N03-v3_1.html, 2023. Accessed: 2025-5-1.

MLIT. 地価公示データ. https://nlftp.mlit.go.jp/ksj/gml/datalist/KsjTmplt-L01-v3_1.html, 2025. Accessed: 2025-5-1.

MOE. 令和元年度pfos及びpfoa全国存在状況把握調査の結果について. https://www.env.go.jp/press/108091.html, 2020. Accessed: 2026-1-1.

MOE. 水道におけるpfos及びpfoaに関する調査の結果について（水道事業及び水道用水供給事業分）. https://www.env.go.jp/press/press_04025.html, 2024. Accessed: 2026-1-3.

MOE. 「水質基準に関する省令の一部を改正する省令」及び「水道法施行規則の一部を改正する省令」の公布等について. https://www.env.go.jp/press/press_00075.html, 2025. Accessed: 2026-1-1.

National Diet Library. 国会会議録検索システム. https://kokkai.ndl.go.jp, 2026. Accessed: 2025-12-1.

NHK. NHK ONE. https://news.web.nhk/newsweb, 2026. Accessed: 2025-10-1.

Nikkei Shimbun. 日本経済新聞. https://www.nikkei.com/, 2026. Accessed: 2025-10-1.

Okinawa Prefectural Enterprise Bureau. 有機フッ素化合物（pfos・pfoa）. https://www.eb.pref.okinawa.jp/sp/water/82/3017, 2024. Accessed: 2025-12-31.

David Roodman, Morten Ørregaard Nielsen, James G MacKinnon, and Matthew D Webb. Fast and wild: Bootstrap inference in stata using boottest. *The Stata Journal*, 19(1):4–60, March 2019.

Stockholm Convention. The new POPs under the stockholm convention. https://www.pops.int/TheConvention/ThePOPs/TheNewPOPs/tabid/2511/Default.aspx, 2023. Accessed: 2026-1-1.

The Portal Site of Official Statistics of Japan. 在日米軍施設・区域の状況. https://www.e-stat.go.jp/stat-search/files?page=1&toukei=00700011&kikan=00700&tstat=000001149526, 2022. Accessed: 2025-5-1.

THE SANKEI SHIMBUN. THE SANKEI SHIMBUN. https://www.sankei.com/, 2026. Accessed: 2025-10-1.

Tokyo Metropolitan Government. 有機フッ素化合物（pfos・pfoa）に関する東京都の取組. https://www.kankyo.metro.tokyo.lg.jp/water/groundwater/sonota, 2025. Accessed: 2025-12-31.

Yomiuri Shimbun. 読売新聞オンライン. https://www.yomiuri.co.jp/, 2026. Accessed: 2025-10-1.