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Temporal Misalignment of Planning Horizons and the Relative Positioning of Demographic Assumptions in Japan's Ordinance-Designated Cities: Implications for Public Facility Management

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Abstract

This paper presents a descriptive and exploratory analysis of temporal mismatch between Comprehensive Management Plans for Public Facilities (PFMPs) and other municipal management plans, and of the positioning of population assumptions against a common external benchmark, focusing on Japan's 20 ordinance-designated cities. Using the PFMP as the reference plan, Mismatch Years and Mismatch Ratio are treated as risk indicators of potential coordination exposure, while DOG (annualised) is used as the primary indicator of demographic assumption positioning. Descriptive tabulations show that the average PFMP duration (20.80 years) exceeded those of the Basic Plan (10.00 years), Fiscal Vision (7.65 years), Administrative Management Policy (7.95 years), and Implementation Plan (4.30 years). Most cities projected population decline, although assumed levels varied considerably. Spearman correlations between DOG (annualised) and Mismatch Ratio were weakly negative for the Basic Plan, Fiscal Vision, and Administrative Management Policy, with no clear positive monotonic co-movement. These results suggest that temporal mismatch and demographic assumption positioning are analytically distinct governance dimensions. Policy implications include synchronising PFMP reviews with medium-term fiscal and administrative cycles, rechecking demographic assumptions against a common external benchmark, and stress-testing PFMP assumptions across multiple crisis scenarios.

Keywords: ordinance-designated cities; comprehensive management plan for public facilities; temporal mismatch; population assumptions; population vision; external benchmarks; urban management; shrinking cities; PDCA



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1. Introduction

1.1. Background: Infrastructure Maintenance and Planning Consistency Under Population Decline

In Japanese cities facing population decline and an ageing population, there is a growing need to rethink the renewal, reorganisation, and maintenance of roads, bridges, water and sewerage systems, and public buildings under premises fundamentally different from those of the previous expansion phase. In particular, ordinance-designated cities bear a disproportionate share of the nation's population, administrative functions, and infrastructure stock; consequently, challenges related to infrastructure sustainability tend

to manifest most acutely in these contexts. According to data compiled in this study, the PFMP in the 20 ordinance-designated cities function as long-term plans averaging 20.80 years, whilst basic plans (average 10.00 years), administrative management policies (7.95 years), fiscal visions (7.65 years), and implementation plans (4.30 years) are all limited to medium- or short-term cycles of approximately 4 to 10 years. This structural disparity in planning horizons is the central concern of this paper.

Local government management plans are grounded in demographic and fiscal frameworks. The more stringently underlying assumptions are specified, the narrower the room for new initiatives or maintenance of existing services becomes. This may create an incentive to adopt comparatively lenient projections of future population and fiscal capacity, thereby preserving adjustment room between long-term and medium-term plans. This phenomenon is not merely a formal difference in documentation but is deeply linked to the structure of decision-making in urban management.

PFMPs are formulated over long horizons to optimise the volume of facilities held, extend service lives, and address renewal needs. Basic plans, fiscal visions, administrative management policies, and implementation plans, by contrast, operate as medium- to short-term plans focused on policy management, budget formulation, organisational management, and project delivery. When these time horizons differ substantially, the linkage between the feasibility of long-term infrastructure plans and medium-term fiscal and administrative decisions may weaken.

1.2. Related Research and Institutional Context

Research on local government comprehensive plans has identified the hierarchical structure of basic concepts, basic plans, and implementation plans—alongside their strategic nature, effectiveness, and connection to evaluation—as key issues [1–3]. Research on public facility management has emphasised the optimisation of the total facility stock, renewal investment, the extension of service lives, consolidation and rationalisation, and the levelling of fiscal burdens. Under regional revitalisation policies, population visions serve as foundational documents presenting future population trends and policy directions.

Planning research has long noted that forecasts and demand projections are not presented neutrally but may incorporate wishful thinking or strategic distortion. Wachs [4] discussed the manipulability of figures in planning; Flyvbjerg [5] addressed optimism bias and strategic misrepresentation; and Siemiatycki [6] examined the manageability of optimism bias in large-scale infrastructure delivery. Concerning population forecasts, Tayman and Swanson [7] summarised their utility and limitations, whilst Nishimura [8] argued that delays in revising population and growth projections downward during a phase of demographic decline may heighten policy vulnerability. These discussions help position the relative standing of population assumptions vis-à-vis external benchmarks—the focus of this paper—not merely as a local-authority-specific phenomenon but as a general issue inherent in the relationship between forecasting and policy judgement. The indicators used here, however, do not treat the National Institute of Population and Social Security Research (IPSS) projections as the sole correct answer; rather, they serve as a common external benchmark for describing the relative position of locally adopted demographic assumptions.

In public administration and policy studies, time has been described as a ‘hidden dimension’ of policy formulation and implementation, and competition between short-, medium-, and long-term horizons within organisations is recognised as a contributor to institutional inconsistency [9–12]. This perspective provides a basis for understanding the discrepancy between long-term plans, such as PFMPs, and medium-term plans, such

as basic plans, fiscal visions, and administrative management policies, not merely as a difference in document format, but as temporal mismatch inherent in the policy process.

More recent discussions of polycrisis extend this temporal perspective by emphasising how slow-moving stresses and fast-moving shocks can become entangled across fiscal, environmental, health, and infrastructural systems [13]. For local infrastructure management, this implies that plan horizons are not merely technical attributes of documents but governance devices that distribute uncertainty, review responsibilities, and adjustment burdens across future decision cycles.

Research on shrinking cities has increasingly viewed population decline not simply as decay but as a reorganisation of urban space, infrastructure, and service provision. Hollander and Németh's [14] theory of 'smart decline', international comparisons by Martinez-Fernandez et al. [15] and Wiechmann and Pallagst [16], the policy and design perspectives of Mallach [17] and Ryan [18], and Schatz's [19] concept of 'decline-oriented governance' systematise the logic of rationalisation and functional reallocation during periods of contraction. Recent work on shrinking-city planning also shows that even where shrinkage is acknowledged in planning documents, growth-oriented strategies may persist, underscoring the importance of examining how demographic premises are actually translated into plan assumptions [20]. For Japan specifically, Sorensen [21] charts the institutional formation of urban planning; Edgington [3], drawing on fieldwork in 19 ordinance-designated cities conducted between 2013 and 2016, documents the hierarchical structure of Japanese comprehensive planning—encompassing a long-term Concept Plan, a medium-term Basic Plan, and a short-term Implementation Plan—and traces its evolution from national-development-oriented public works towards a system increasingly responsive to fiscal austerity, demographic ageing, and the need for PDCA-based performance management. Buhnik [22], Matanle [23], Iwasaki [24], and Kudo et al. [25] document how population decline and ageing manifest in Japanese urban and regional policies ahead of other nations. The evaluation of spatial planning effectiveness in this context has long employed the concept of the 'implementation gap'—the discrepancy that arises when a planning vision fails to be translated into practice [26]. Within this broader concept, scholars have further distinguished a 'conformance gap', which specifically refers to the misalignment between the policy intentions expressed in a comprehensive plan and the legal regulatory instruments—such as zoning ordinances—that are meant to operationalise them [26]. These distinctions provide a useful theoretical lens for analysing the structural disparity in planning horizons examined in this study: temporal mismatch between the PFMP and medium-term plans is interpreted here not as direct evidence of an implementation gap, but as a risk indicator of institutional conditions under which implementation gaps may become more likely; similarly, divergence among demographic premises may indicate potential conformance risk rather than demonstrated regulatory misalignment.

However, much existing research focuses strongly on individual plan content, institutional history, or the policy processes of particular local authorities, without simultaneously comparing the temporal consistency of multiple plans and the coherence of their population assumptions. The issue is therefore not that previous studies have ignored time, forecasting, or shrinkage, but that these dimensions have rarely been operationalised together within a single cross-sectional comparison of comparable local governments. In particular, research examining the relationship between long-term plans such as PFMPs and medium-term plans such as basic plans, fiscal visions, and administrative management policies from both institutional and empirical perspectives remains limited.

1.3. Research Gaps

Building on this literature, this study addresses two more specific research gaps. First, although the relationships among the multiple plans constituting urban management have been discussed conceptually, fewer studies have translated plan start dates, end dates, and durations into comparable indicators of potential temporal coordination risk. Second, although population visions are often treated as documents embodying policy intent, comparative studies that position their relationship with a common external population benchmark as a relative positioning of planning assumptions within the same analytical universe remain limited.

The novelty of this study therefore lies less in observing that infrastructure plans are often longer than fiscal or administrative plans than in documenting, for the full set of ordinance-designated cities, how this expected horizon difference is recorded alongside demographic assumption positioning. Specifically, the study simultaneously: (a) describes population assumptions not as the presence or absence of “optimism” embedded in local government documents, but as a relative position vis-à-vis a common external benchmark; (b) quantifies inter-plan time lags as risk indicators of potential temporal mismatch; and (c) explores whether these two dimensions move together or remain analytically distinct within the same group of local authorities.

Accordingly, this paper designates the PFMP as the reference plan to identify temporal mismatches with the Basic Plan, Fiscal Vision, and Administrative Management Policy, whilst treating the divergence between projected population in the Population Vision and IPSS projections as an indicator of relative positioning against a common external benchmark. Through this framework, we examine whether discrepancies between long-term and medium-term infrastructure plans and differences in population assumptions coexist and interact—or remain separate—within the same urban cluster.

1.4. Research Questions and Contribution

This paper addresses three research questions. First, to what extent do temporal lags exist between PFMPs and other major plans in Japan’s 20 ordinance-designated cities? Second, how is the projected population in each city’s population vision positioned relative to the IPSS 2050 projections used as a common external benchmark? Third, how do these two phenomena coexist and interact—or remain separate—within the same urban cluster?

The contributions of this paper are threefold. It conducts a cross-sectional comparison of the planning systems of ordinance-designated cities centred on the PFMP, thereby visualising the connectivity issue between long-term infrastructure plans and medium-term plans. It introduces the dimension of population assumptions into the debate on planning consistency by organising population visions in terms of their positioning relative to external projections. It also shows descriptively that temporal mismatches and differences in population assumptions do not necessarily move together as a single phenomenon. The contribution should therefore be understood as diagnostic and framing-oriented: the analysis makes visible institutional conditions under which coordination problems may become more likely, rather than demonstrating actual policy failure or forecasting implementation outcomes. The remainder of the paper is structured as follows: Section 2 outlines the institutional background; Section 3 presents data and methodology; Section 4 presents the results; and Sections 5 and 6 discuss the implications.

2. Institutional Context of Japanese Local Planning

This section outlines the institutional background of the planning system within Japanese local authorities. The temporal mismatch examined here should be understood not as direct evidence of governance failure or as incidental variation between individual

municipalities, but as a form of structural exposure produced by multiple plans coexisting under different legal bases, formulation objectives, and time horizons.

2.1. Hierarchical Structure: Basic Concept, Basic Plan, and Implementation Plan

Comprehensive plans in Japanese local authorities have generally been understood as a three-tier structure: the Basic Concept, setting out a long-term urban vision and policy principles; the Basic Plan, translating this direction into medium-term sector-specific measures; and the Implementation Plan, specifying individual projects and priority initiatives. Although the obligation to formulate a Basic Concept was abolished by the 2011 amendment to the Local Autonomy Act, many local authorities continue to maintain its role as a long-term vision in practice [27]. The Basic Plan serves as the core medium-term plan mediating between the Basic Concept and individual projects, whilst the Implementation Plan concretises priority projects and annual initiatives, linking readily to budget formulation, administrative evaluation, and KPI-based progress management. The comprehensive planning framework thus already incorporates distinct long-, medium-, and short-term horizons within its structure.

2.2. Institutional Positioning of the Comprehensive Management Plan for Public Facilities

The PFMP is a long-term plan designed to comprehensively examine the renewal, consolidation, extension of service lives, maintenance, and levelling of fiscal burdens for public buildings and infrastructure assets owned by local authorities. Its institutional background lies in the 2013 ‘Basic Plan for Extending the Service Life of Infrastructure’ and the subsequent request from the Ministry of Internal Affairs and Communications (MIC) to formulate the plan [28–30]. A defining feature of the PFMP is that its planning horizon is substantially longer than those of other management plans—averaging 20.80 years across the 20 cities studied. This contrasts markedly with the three-tier structure documented by Edgington [3] for the broader *sōgō keikaku* system, in which the long-term Concept Plan (*kihon kōsō*, typically 25 years), the Basic Plan (*kihon keikaku*, 10–15 years), and the Implementation Plan (*jicchi keikaku*, 1–3 years) are designed to cascade from vision to execution; the PFMP sits alongside but structurally above this hierarchy, creating the temporal misalignment that this study seeks to quantify. Critically, however, the most important consideration is not the long-term nature of the plan itself, but how it is connected to medium-term policy, fiscal, and implementation plans. Facility restructuring and renewal investments are only operationally effective when consistent with financial projections and implementation frameworks.

2.3. Population Vision and Demographic Framework

The population vision, required under regional revitalisation policies, serves as a foundational document for local authorities to analyse current population trends and present future population outlooks and policy directions. Whilst the national long-term vision looks ahead to 2060 [31], local population visions set target years ranging from approximately 2040 to 2070 depending on regional circumstances. A population vision is not merely a demographic forecast: projections of population size and age structure influence future administrative demand, facility requirements, the tax revenue base, and the sustainability of service provision, thereby serving as prerequisites for PFMPs and fiscal visions. Where a population vision is set at a level substantially above external estimates, this may also affect the premises of long-term infrastructure planning. This study interprets such discrepancies as the relative positioning of population assumptions against external benchmarks.

3. Materials and Methods

3.1. Study Area

The study covers Japan's 20 ordinance-designated cities: Sapporo, Sendai, Saitama, Chiba, Yokohama, Kawasaki, Sagami-hara, Niigata, Shizuoka, Hamamatsu, Nagoya, Kyoto, Osaka, Sakai, Kobe, Okayama, Hiroshima, Kitakyushu, Fukuoka, and Kumamoto. These 20 cities differ in population size, spatial structure, and economic profile. Their comparability in this study lies not in socioeconomic homogeneity, but in their shared institutional status under Japan's local government system and in the availability of broadly comparable planning documents across all cities. The unit of analysis is the individual city; $N = 20$. Given this sample size, the cross-analysis described below focuses on descriptive and exploratory comparison rather than statistical inference, with analysis limited to identifying the presence and direction of correlations. It should be noted that the 20 cities constitute the full population of ordinance-designated cities in Japan rather than a sample; accordingly, the reported correlations are interpreted as population-level associations rather than inferential statistics. Figure 1 provides a visual overview of the geographical distribution of these cities, which extend from Sapporo in northern Japan to Kumamoto in Kyushu.

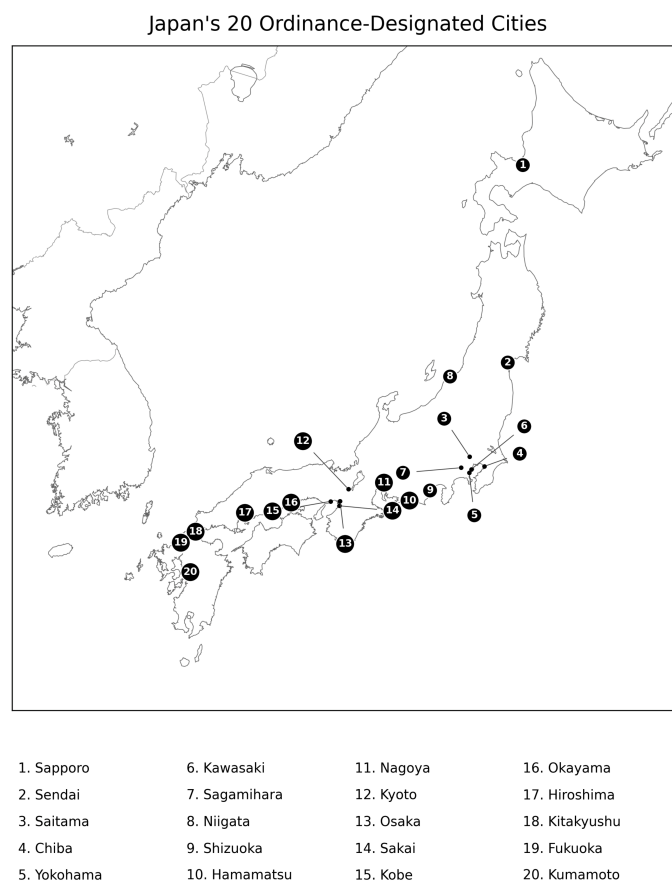


Figure 1. Geographical distribution of Japan's 20 ordinance-designated cities included in the study. Numbers correspond to the city list shown in the map legend. Source: Created by the authors using public geographic boundary data and city-location information.

Beyond data availability, ordinance-designated cities are substantively appropriate because they share a common legal and institutional status under Japan's local government system, including delegated administrative functions and comparable responsibilities for large-scale urban infrastructure. Together, these cities account for approximately 28% of Japan's population and concentrate major administrative, fiscal, and infrastructure man-

agement functions. The comparison is therefore not based on socioeconomic homogeneity; rather, the institutional commonality of the ordinance-designated city system provides the basis for comparing how diverse cities structure PFMPs and related medium-term plans within the same municipal category.

3.2. Data Sources

Data were drawn from official documents published by each ordinance-designated city and from national public sources. Municipal documents include: PFMPs; basic plans within comprehensive plans; fiscal visions or equivalent fiscal management plans; administrative management policies or administrative reform programmes; and local population visions. External benchmark population data were drawn from the IPSS 2050 projections in the 'Future Population Projections by Region in Japan (Reiwa 5 Projections)' [32]. To facilitate comparison with population vision projections, 2022 population figures recorded in each local government's documents were also collated. Planning periods, average durations, integration status, and Type I–IV classifications were verified against existing published materials and accompanying data. Where fiscal visions or administrative management policies did not exist as independent plans but were integrated into the Basic Plan, this was recorded as an institutional characteristic. Documents were retrieved from each city's official municipal website between January and March 2026; where multiple versions were available, the most recently adopted version was used. Plan periods were coded using the start and end fiscal years stated on the cover page or introductory section of each document; where a plan had been partially amended mid-cycle, the originally stated end year was retained unless a formally revised terminal year was explicitly stated. Integrated plans were assigned the duration of the host plan for comparability. Data fields were extracted by the first author and cross-checked against source documents by the second author; discrepancies were resolved by consensus.

For document selection and coding, formally adopted plans and the most recent revised versions were prioritised over drafts, archived versions, or explanatory webpages. Where a revised terminal year was explicitly stated, that revised end year was adopted; where only partial amendments were issued without a new terminal year, the originally stated end year was retained. When a fiscal vision or administrative management policy was embedded within the Basic Plan, the period of the host plan was used for duration coding, while the case was recorded as an integrated-plan case rather than treated as automatically equivalent to an independent plan. Explicit cross-references among the PFMP, Basic Plan, Fiscal Vision, Administrative Management Policy, and Population Vision were noted during document review; however, a complete binary coding table of all inter-plan cross-references was not constructed for the present revision and is therefore identified as a future task in the limitations.

3.3. Variable Construction

The PFMP is designated as the reference plan. For each plan, start and end years were identified, and the planning period was calculated as end year – start year + 1. Temporal discrepancy between the PFMP and comparison plan X is measured using two primary indicators. Mismatch Years is the absolute difference between the PFMP end year and plan X end year. Mismatch Ratio is the PFMP duration divided by the duration of plan X. These indicators are interpreted as descriptive risk indicators of structural institutional exposure to potential coordination problems, not as direct evidence of governance inconsistency or policy failure. In other words, a larger mismatch indicates that coordination between long-term infrastructure planning and medium-term fiscal or administrative planning may require closer institutional attention.

To measure the relative positioning of population assumptions, three data points are used: reference population A (2022 population estimate); projected population B from the Regional Population Vision; and IPSS 2050 projected population C. Because target years in local population visions differ across local authorities, DOG (annualised) is used as the primary indicator in this study. It is defined as $(B/A)^{1/(target - 2022)} - (C/A)^{1/(2050 - 2022)}$, where B denotes the projected population in the local population vision and C denotes the IPSS 2050 benchmark. A positive value indicates that the implied annual rate of change in the local population vision is higher than the annual rate implied by the IPSS 2050 benchmark. DOG (simple), defined as $(B - C)/C$, is retained as a supplementary reference measure because it compares population levels directly but may compare different target years. These indicators are used to describe the relative positioning of locally adopted demographic assumptions against a common external benchmark; they are not measures of forecast error (Table 1). The resulting Type I–IV classification is summarised in Table 2.

Table 1. Definitions of temporal lag and population assumption indicators.

Indicator	Role	Definition	Interpretation
Mismatch Years	Primary	$ end_PFMP - end_X $	Absolute time lag (years); risk indicator of potential coordination gap
Mismatch Ratio	Primary	$duration_PFMP / duration_X$	>1 indicates PFMP is longer; risk indicator of potential coordination gap when not linked to medium-term review cycles
DOG (annualised)	Primary	$(B/A)^{1/(target - 2022)} - (C/A)^{1/(2050 - 2022)}$	Adjusts for target-year difference; primary indicator of demographic assumption positioning
DOG (simple)	Supplementary	$(B - C)/C$	Positive: vision exceeds IPSS estimate in population level; supplementary reference measure

Note: A = 2022 population estimate; B = projected population in the Regional Population Vision; C = IPSS 2050 projected population. Horizon Gap (=target_year_PFMP – target_year_X) is conceptually close to Mismatch Years and is not used as a primary indicator in this study.

Table 2. Type classification and corresponding cities.

Type	Definition	Cities
I	$A < B$ and $A < C$	Kawasaki, Fukuoka (n = 2)
II	$A < B$ and $A > C$	Nagoya, Osaka (n = 2)
III	$A > B$ and $C > B$	Sendai, Saitama, Chiba, Sagami-hara, Kyoto, Sakai, Kobe, Kitakyushu, Kumamoto (n = 9)
IV	$A > B$ and $C < B$	Sapporo, Yokohama, Niigata, Shizuoka, Hamamatsu, Okayama, Hiroshima (n = 7)

Note: The type classification serves as a supplementary interpretive tool; primary analyses employ the continuous variables Mismatch Years, Mismatch Ratio, and DOG (annualised), while DOG (simple) is retained as a supplementary reference measure.

3.4. Analytical Procedure

The analysis proceeds in four stages. First, planning documents for all 20 cities are collected, and start year, end year, planning period, target year, and integration status are extracted for the PFMP, Basic Plan, Fiscal Vision, Administrative Management Policy, and Population Vision. Second, the duration distribution of each plan type is described using mean, median, minimum, and maximum values. Third, using the PFMP as the reference, temporal mismatch in each city is assessed via Mismatch Years and Mismatch Ratio. Fourth, the difference between the population vision and IPSS projections is used to evaluate the relative positioning of population assumptions against external benchmarks, and the relationship between the two dimensions is explored.

Specifically, scatter plots of DOG (annualised) and Mismatch Ratio, together with Spearman's rank correlation coefficients, are employed. Average DOG (annualised) and

average Mismatch Ratio are compared across Types I–IV. DOG (simple) is reported as a supplementary level-difference measure, and for the five cities where the signs of DOG (simple) and DOG (annualised) did not align, a brief qualitative interpretation is provided, focusing on the structural difference between level-difference and annual-rate-difference indicators. Given that $N = 20$ and that planning document formats vary across local authorities, this study aims to identify institutional correlations and patterns rather than to infer causal relationships.

Data tabulation and descriptive calculations were organised using Microsoft Excel for Microsoft 365 (Microsoft Corporation, Redmond, WA, USA). Statistical calculations, figure preparation, and consistency checks were performed using Python 3.13.5 (Python Software Foundation, Wilmington, DE, USA), with pandas 2.2.3, NumPy 2.3.5, SciPy 1.17.0, Matplotlib 3.10.8, and GeoPandas 1.1.2. The study area map was prepared using public geographic boundary data and city coordinate information compiled by the authors.

4. Results

4.1. Distribution of Planning Periods by Plan Type

Comparison of planning period distributions reveals that the PFMP is substantially longer than all other plan types (Table 3). The average PFMP duration was 20.80 years, with a range of 4 to 47 years. In contrast, average durations were 10.00 years for the Basic Plan, 7.95 years for Administrative Management Policies, 7.65 years for Fiscal Visions, 7.40 years for the Regional Revitalisation Comprehensive Strategy, 4.38 years for the SDGs Future City Plan, and 4.30 years for Implementation Plans. The minimum values reflect short-horizon outliers: Fukuoka City's PFMP covers four years, and Sakai City's Fiscal Vision covers one year; these cases are retained in the descriptive statistics because they represent formally stated planning periods.

Table 3. Distribution of plan durations by plan type across 20 ordinance-designated cities.

Plan Type	Mean (Years)	Min/Max (Years)	Remarks
Comprehensive Management Plan for Public Facilities (PFMP)	20.80	4/47	Five cities have PFMP horizons of 40 years or more; Fukuoka PFMP = 4 years is a short-horizon outlier
Basic Plan	10.00	5/17	10-year plans predominate
Administrative Management Policy	7.95	4/43	Integrated into Basic Plan: 7 cities
Fiscal Vision	7.65	1/46	Integrated into Basic Plan: 5 cities; Sakai Fiscal Vision = 1 year is a short-horizon outlier
Regional Revitalisation Comprehensive Strategy	7.40	3/22	Aligned with national guidelines
SDGs Future City Plan	4.38	3/13	Three-year rolling revision cycle
Implementation Plan	4.30	1/5	Shortest

Source: Author's compilation based on publicly available data from each ordinance-designated city.

Differences were also observed in plan existence and form. Fiscal visions were integrated into the Basic Plan in five municipalities; administrative management policies were integrated in seven. The planning framework of ordinance-designated cities is therefore not organised along a single timeline; rather, different timeframes for each plan type are layered within each city's governance structure.

4.2. Temporal Mismatch

Mismatch Years and Mismatch Ratio serve as the primary indicators of temporal mismatch and potential structural exposure to coordination risks; average duration differences

are presented as supplementary reference values. Averaged across the 20 cities, Mismatch Years between the PFMP and the Basic Plan was 10.70 years; between the PFMP and the Fiscal Vision, 9.70 years; and between the PFMP and the Administrative Management Policy, 10.60 years (Table 4). Corresponding mean Mismatch Ratios were 2.22 (Basic Plan), 4.46 (Fiscal Vision), and 3.67 (Administrative Management Policy), indicating that the PFMP is generally longer than comparison plans. Median Mismatch Ratios were 1.63 (Basic Plan), 2.25 (Fiscal Vision), and 2.25 (Administrative Management Policy), with IQRs of [0.98, 3.75], [2.00, 3.99], and [1.86, 4.31], respectively (see Supplementary Table S4).

Table 4. Temporal mismatch between the PFMP and other plans (20-city means).

Comparison Plan X	Mean Mismatch Years	Mean Mismatch Ratio	Mean Duration Difference (Reference, Years)
Basic Plan	10.70	2.22	≈10.80
Fiscal Vision	9.70	4.46	≈13.15
Administrative Management Policy	10.60	3.67	≈12.85
Implementation Plan (reference only)	—	—	≈16.50

Note: Mismatch Years = $|\text{end_PFMP} - \text{end_X}|$. Mismatch Ratio = $\text{duration_PFMP} / \text{duration_X}$. Duration difference (reference) = PFMP mean duration – plan X mean duration. N = 20.

Whilst these supplementary figures differ from Mismatch Years and Mismatch Ratio, they reinforce the finding of a substantial temporal gap between long-term infrastructure plans and medium-term fiscal and administrative plans. At the individual city level, the longest Fiscal Vision spans 46 years and the longest Administrative Management Policy spans 43 years, indicating that some cities do adopt long-horizon fiscal and administrative policies. The core issue is therefore not a uniform short-termism but rather the variation in planning horizons and the different mechanisms—or absence thereof—for connecting them across cities.

4.3. Relative Positioning of Demographic Assumptions

Re-examination of population visions revealed clear inter-municipal differences. Regarding target year, four municipalities set a target year before 2050, one municipality set 2050, and fifteen municipalities set a target year after 2050; 2060 was the modal target year. In terms of the relationship between 2022 population A and projected population B: four cities assumed $A < B$ (future growth), whilst 16 assumed $A > B$ (future decline). Of the four cities where $A < B$, Kawasaki and Fukuoka fall under Type I ($A < B$ and $A < C$), where IPSS projections also indicate populations exceeding current levels by 2050. Nagoya and Osaka, classified as Type II ($A < B$ and $A > C$), projected growth in their population visions despite IPSS estimates indicating populations below current levels. The first observation is therefore that the number of cities assuming growth is small and, even among them, the relationship with the external benchmark is not uniform.

Among the 16 cities where $A > B$, nine are classified as Type III ($A > B$ and $C > B$), meaning their population visions project a level even below the IPSS 2050 estimate, whilst seven are classified as Type IV ($A > B$ and $C < B$), meaning they assume population decline yet project levels above the IPSS 2050 estimate. In sum, most cities assume population decline, but the level relative to the external benchmark differs substantially.

DOG (annualised), the primary indicator, had a mean of +0.00112, median of +0.00122, SD of 0.00231, IQR of $[-0.00042, +0.00275]$, and range of $[-0.00360, +0.00487]$. As a supplementary level-difference measure, DOG (simple) had a mean of +0.0056, median

of +0.0279, SD of 0.0980, IQR of [−0.0416, +0.0797], and range of [−0.1787, +0.1439]. City-level DOG values are reported in Table 5.

Table 5. DOG (annualised) and DOG (simple) for 20 ordinance-designated cities.

City	Target	DOG (Annualised)	DOG (Simple)	Sign Agree	Type
Sapporo	2060	+0.001954	+0.0312	○	IV
Sendai	2070	−0.000253	−0.0759	○	III
Saitama	2060	−0.000916	−0.0302	○	III
Chiba	2070	−0.002429	−0.1618	○	III
Yokohama	2045	+0.001006	+0.0355	○	IV
Kawasaki	2060	+0.001551	+0.0769	○	I
Sagamihara	2065	+0.001079	−0.0141	×	III
Niigata	2045	−0.000858	+0.0245	×	IV
Shizuoka	2040	−0.000045	+0.0881	×	IV
Hamamatsu	2060	+0.002668	+0.0364	○	IV
Nagoya	2060	+0.004116	+0.1308	○	II
Kyoto	2060	−0.003600	−0.1787	○	III
Osaka	2045	+0.004871	+0.1439	○	II
Sakai	2065	+0.002987	−0.0154	×	III
Kobe	2060	−0.000772	−0.1000	○	III
Okayama	2060	+0.004108	+0.1207	○	IV
Hiroshima	2060	+0.004438	+0.1277	○	IV
Kitakyushu	2065	−0.000306	−0.1384	○	III
Fukuoka	2050	+0.001392	+0.0397	○	I
Kumamoto	2070	+0.001350	−0.0281	×	III

Note: $DOG (annualised) = (B/A)^{1/(target - 2022)} - (C/A)^{1/(2050 - 2022)}$. $DOG (simple) = (B - C)/C$. A = 2022 population; B = population vision projected population; C = IPSS 2050 projected population. DOG (annualised) is the primary indicator; DOG (simple) is retained as a supplementary reference measure. Spearman ρ between the two indicators = +0.823. ○ = sign agreement; × = sign disagreement. Source: Authors' calculations based on published materials from each ordinance-designated city and IPSS publicly available projections.

Five cities (Sagamihara, Niigata, Shizuoka, Sakai, and Kumamoto) showed sign disagreement between DOG (simple) and DOG (annualised). This cannot be attributed solely to the target year's distance from 2050: Sendai and Chiba (target year 2070) and Kitakyushu (target year 2065) showed sign agreement. The key distinction is that DOG (simple) measures the difference in population levels, whilst DOG (annualised) measures the difference in the rate of population change from base year to target year. In Niigata and Shizuoka, DOG (simple) is positive ($B > C$ in level) but DOG (annualised) is negative, because reaching B from A by 2040–2045 requires a more rapid annual change than reaching C from A by 2050. In Sagamihara, Sakai, and Kumamoto, DOG (simple) is negative ($B < C$ in level) but DOG (annualised) is positive, because the longer target years of 2065–2070 produce a more gradual implied annual rate of change from A to B than from A to C (2050). The sign disagreement in these five cities thus reflects the structural difference between level and rate indicators rather than target-year distance alone.

4.4. Cross-Analysis of Temporal Mismatch and Demographic Assumptions

This section descriptively examines whether the temporal mismatches identified in Section 4.2 and the relative positioning of population assumptions identified in Section 4.3 move in the same direction within the same group of cities. The structure whereby the PFMP is longer than other major plans is a shared characteristic of most ordinance-designated cities. Population assumption positioning, however, varies: within the same sample, cities anticipating growth coexist with cities assuming decline yet setting levels above the external benchmark, and with cities setting levels below the benchmark.

The Spearman correlation between DOG (annualised) and Mismatch Ratio was $\rho = -0.382$ (Basic Plan), $\rho = -0.192$ (Fiscal Vision), and $\rho = -0.071$ (Administrative Management Policy)—all weakly negative or close to zero (Figure 2). Exploratory p -values based on a two-sided t approximation are not reported in the main text because the analysis covers the full population of ordinance-designated cities; they are provided only as supplementary diagnostics under a hypothetical superpopulation framework in Supplementary Table S5. In descriptive terms, no positive monotonic co-movement was observed, whereby cities with greater temporal mismatch also set population assumptions at relatively higher levels. Using the Type I–IV classifications, population assumption types also span multiple city groups with no concentration in a specific subtype. Table 6 summarises the average DOG (annualised) and Mismatch Ratio by type.

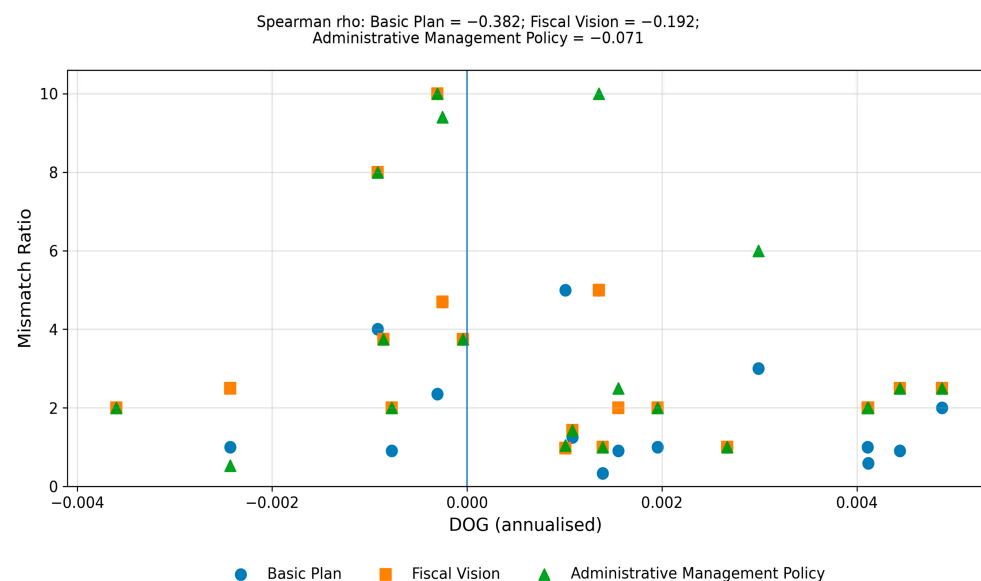


Figure 2. Relationship between DOG (annualised) and Mismatch Ratio across Japan’s 20 ordinance-designated cities. DOG (annualised) compares the implied annual population change rate in each local population vision with the annual rate implied by the IPSS 2050 benchmark; positive values indicate that the local population vision implies a higher annual rate than the external benchmark. Mismatch Ratio = duration(PFMP)/duration(X), where X denotes the Basic Plan (○), Fiscal Vision (□), or Administrative Management Policy (△). Spearman ρ : Basic Plan = -0.382 ; Fiscal Vision = -0.192 ; Administrative Management Policy = -0.071 . Exploratory p values are reported only in Supplementary Table S5. $N = 20$. Note: Sakai City’s Fiscal Vision Mismatch Ratio ($=30.0$) falls outside the displayed range and is excluded from the plot; Fukuoka City’s PFMP duration (4 years) is notably shorter than the sample mean (20.80 years).

Table 6. Average DOG (annualised) and average Mismatch Ratio by Type I–IV.

Type	n	Mean DOG (Annualised)	Mean Mismatch Ratio (Basic Plan)	Mean Mismatch Ratio (Fiscal Vision)	Mean Mismatch Ratio (Admin. Policy)
I	2	+0.00147	0.62	1.50	1.75
II	2	+0.00449	1.29	2.25	2.25
III	9	−0.00032	2.69	7.29	5.48
IV	7	+0.00190	2.34	2.28	2.29

Note: $DOG (annualised) = (B/A)^{1/(target - 2022)} - (C/A)^{1/(2050 - 2022)}$. A = 2022 population; B = population vision projected population; C = IPSS 2050 projected population. DOG (annualised) is the primary indicator. Source: Authors' calculations based on published materials from each ordinance-designated city and IPSS publicly available projections.

5. Discussion

5.1. Why Temporal Mismatch Emerges

Compared with prior studies that discuss comprehensive planning, public facility management, shrinking-city policy, or time in public administration separately, the distinctive contribution of this study is to document two dimensions in the same institutional population: temporal exposure among interrelated planning documents and demographic assumption positioning against a common external benchmark. The empirical value of this design is not that it proves actual implementation failure, but that it makes visible a structural condition under which different planning horizons and different demographic premises may coexist without being deliberately coordinated. In theoretical terms, this shifts the discussion from whether individual plans are internally well written to how the temporal architecture of a local planning system may generate coordination risks across otherwise legitimate documents [10–13,27].

The results suggest that mismatches in planning horizons within ordinance-designated cities may arise as a structural feature inherent in the institutional design rather than as incidental errors by individual municipalities. Such mismatches should be read as risk indicators of potential coordination problems, not as direct evidence of governance inconsistency or policy failure. PFMPs are designed to provide long-term projections of facility renewal, consolidation, service life extension, and fiscal allocation, for which a planning period exceeding ten years is appropriate. Basic plans, fiscal visions, administrative management policies, and implementation plans, by contrast, are linked to political schedules, budget formulation, organisational management, and policy evaluation, and are accordingly revised on shorter cycles. The primary source of temporal mismatch is therefore that long-term infrastructure management and medium-term policy and fiscal operations are designed with fundamentally different institutional objectives and revision cycles.

The problem lies not in differing time horizons per se, but in the fact that if mechanisms for interconnection and review among plans with different horizons are insufficiently designed, long-term infrastructure plans may become detached from medium-term fiscal and administrative decisions, creating documentary and institutional conditions under which an ‘implementation gap’—in the sense used by Ryan and Gao [26]—may become more likely. This study does not demonstrate actual implementation failure, fiscal deferral, or delayed facility restructuring; rather, it identifies the structural conditions under which such risks may arise if plan–review cycles are not explicitly cross-checked.

This interpretation also helps explain why temporal mismatch should not be treated as a simple administrative defect. Long horizons are rational for infrastructure assets because renewal, consolidation, and service life extension unfold over several decades; short and medium horizons are equally rational for budgeting, elections, administrative

reform, and project management. The governance issue arises at the interface between these rationalities. A large Mismatch Years value or Mismatch Ratio therefore indicates that coordination requires additional institutional devices, such as rolling review, cross-referencing, or explicit translation of long-term facility assumptions into medium-term fiscal and administrative cycles.

The relative positioning of population assumptions, by contrast, arises from a distinct pathway related to the construction of future scenarios and policy framing. DOG (annualised), used here as the primary indicator, and DOG (simple), retained as a supplementary level-difference measure, showed $\rho = +0.823$ with sign agreement in 15 of 20 cities, indicating overall consistency; however, sign disagreement in five cities cannot be attributed solely to target-year distance from 2050. Given that DOG (annualised) represents differences in the implied annual rate of population change, while DOG (simple) represents population-level differences, the evaluation of population assumptions is sensitive to both the setting of the target year and the structure of the indicator. The issue of population assumptions therefore cannot be explained through the same institutional channels as temporal mismatch; it must be understood as a separate governance issue concerning the criteria against which the future population is set and the degree of conservatism or leniency applied.

The treatment of integrated plans adds a further institutional nuance. Where a Fiscal Vision or Administrative Management Policy is embedded within the Basic Plan rather than issued as an independent document, integration may mitigate temporal mismatch if the embedded fiscal or administrative component is reviewed whenever the Basic Plan is revised. In such cases, the Basic Plan can provide an intermediate review opportunity through which PFMP assumptions, medium-term policy priorities, and fiscal or administrative constraints may be reconnected more regularly than would be the case if each document were revised in isolation.

At the same time, integration may also obscure rather than resolve temporal mismatch. If fiscal constraints, administrative reform priorities, or long-term renewal costs are absorbed into a broad Basic Plan without explicit cross-references to the PFMP, their visibility, procedural force, and budgetary salience may be reduced. Whether integration mitigates or exacerbates temporal mismatch therefore depends not on integration itself, but on the design of the review mechanism, the presence of explicit PFMP cross-references, budgetary linkage, and the extent to which facility renewal costs remain visible when the Basic Plan is revised.

The cross-analysis reported in Section 4.4 therefore adds an interpretive point for discussion: the observed associations do not suggest a positive monotonic relationship between temporal mismatch and demographic assumption positioning. Rather than treating one dimension as a proxy for the other, the two should be examined as analytically distinct governance dimensions that may arise through different institutional mechanisms.

The two most visible outliers reinforce this interpretation. Sakai's one-year Fiscal Vision produces an exceptionally high Fiscal Vision Mismatch Ratio, suggesting not a simple statistical anomaly but a potential governance problem: if fiscal assumptions are renewed only on a very short horizon, the link between long-term facility restructuring and fiscal discipline may depend heavily on informal or annual budgetary coordination. Fukuoka, by contrast, has an unusually short PFMP duration of four years. As a growing Type I city, this case may reflect a more short-cycle, adaptive planning posture rather than the standard long-horizon facility management model. These outliers should therefore be read as policy-relevant institutional configurations, not merely as observations to be excluded from the analysis.

5.2. Implications for Fiscal Sustainability and Infrastructure Governance

The discrepancy between long-term infrastructure plans and medium-term fiscal and administrative plans carries significant implications for fiscal sustainability. Whilst the PFMP presents long-term projections for renewal investment and maintenance costs, it is the budget, fiscal vision, and administrative policies—revised at shorter intervals—that link these to actual fiscal management. When the time horizons of the two diverge substantially, long-term plans may be maintained as policy principles yet lose relative priority at the implementation stage, generating conditions conducive to consistent deferral.

From this perspective, fiscal sustainability depends not only on the scale of future investment but also on how urban functions and total facility stock are optimised in the context of population decline. Research on shrinking cities has proposed concepts such as ‘smart decline’ and ‘decline-oriented governance’, which involve readjusting space, infrastructure, and service provision in response to shrinking demand rather than simple withdrawal [14,17,19]. Comparative European and North American studies show that local strategies during contraction manifest as combinations of fiscal constraint, spatial reorganisation, and infrastructure maintenance [14,15,17]. This paper’s findings add to these discussions by highlighting that, beyond the necessity of facility reorganisation itself, the design of the interface between long-term and medium-term plans constitutes an independent governance challenge.

Seen through the managed-decline and rightsizing literature, the central policy question is not whether cities should simply reduce facilities, but how they can redesign service provision, fiscal responsibility, and spatial allocation while maintaining legitimacy. Smart decline and decline-oriented governance emphasise selective reinvestment, functional reallocation, and the avoidance of unmanaged abandonment [15,18,20,21]. The present findings add a planning-system dimension to that debate: even where the substantive need for rightsizing is recognised, the implementation of such strategies may be weakened if PFMP assumptions are not translated into the fiscal and administrative plans that actually govern medium-term decisions.

The Type I–IV classification clarifies how different combinations of current population, local population vision, and external benchmark coexist within the same institutional category. Type III cities set local population visions below the IPSS 2050 benchmark, suggesting relatively conservative demographic premises. Type IV cities acknowledge future population decline but still set projected levels above the external benchmark; both groups assume decline, yet they imply different degrees of adjustment pressure for facility restructuring, service demand estimation, and fiscal planning. Conversely, the relative positioning of population assumptions against external benchmarks may influence fiscal sustainability through a different channel. Assuming a stable or gradually declining population may raise expectations regarding tax revenue, service demand, and facility utilisation, potentially creating conditions conducive to delays in restructuring decisions. However, the descriptive correlations reported in Section 4.4 do not show a positive monotonic pattern in which greater temporal mismatch is accompanied by relatively higher demographic assumptions.

A further implication is that public facility management under demographic decline should be understood as part of a broader polycrisis context rather than as a demographic problem alone. Population ageing, fiscal stress, climate-related disaster exposure, public health shocks, energy price instability, digitalisation demands, and infrastructure supply chain constraints may interact and intensify one another [14]. In this context, temporal mismatch is important because assumptions embedded in long-term PFMPs may be overtaken not only by population change but also by overlapping fiscal, environmental, and service delivery shocks. This strengthens the case for treating PFMPs as documents requiring

periodic stress-testing against multiple crisis scenarios, rather than as static long-term facility inventories.

5.3. Policy Implications

Three policy implications follow from these findings. First, the PFMP should not merely be maintained as a standalone long-term document; its points of connection with the Basic Plan, Fiscal Vision, and Administrative Management Policy must be explicitly specified. For example, partially synchronising PFMP review timing with Basic Plan and Fiscal Vision revisions, or introducing a mechanism to re-examine key PFMP assumptions during medium-term plan updates, would directly address the temporal mismatch and help bridge the implementation gap between long-term infrastructure strategy and medium-term fiscal execution.

Operationally, this implies a first reform scenario: institutionalising an intermediate PFMP review point that coincides with Basic Plan and Fiscal Vision revision cycles. Such a review would not require rewriting the entire PFMP every few years. Instead, it would require municipalities to verify that assumptions about population, facility demand, renewal costs, and consolidation schedules remain consistent with the latest fiscal and administrative plans. This would convert temporal mismatch from a latent coordination risk into a routine object of plan management.

Second, population visions should not be treated solely as political documents outlining future aspirations, but must be repositioned as explainable premises linked to projections of total facility stock, renewal demand, and fiscal burdens. Discrepancies between external projections and locally projected populations should be reviewed regularly, and the manner in which such discrepancies are reflected in planning assumptions should be made transparent. Crucially, a large temporal lag in planning horizons should not be taken to imply that population assumptions are automatically elevated; both dimensions require separate scrutiny.

A second reform scenario is to require explicit rechecking of demographic assumptions whenever a Basic Plan or a major fiscal plan is revised. The purpose would not be to force local population visions to conform mechanically to IPSS projections, but to require an explanation of why local assumptions differ from the common external benchmark and how those differences affect facility stock targets, service demand forecasts, and fiscal burden estimates. This would make the governance role of DOG (annualised) transparent as a diagnostic reference point for explaining demographic assumptions.

Third, even where fiscal visions or administrative management policies are integrated into the Basic Plan, the roles and time horizons of each plan should be clearly specified, and both the benefits of integration and the risks of ambiguity should be actively managed.

Accordingly, when fiscal or administrative components are integrated into the Basic Plan, local governments should make the review mechanism explicit: integration may support alignment only if PFMP assumptions are rechecked at Basic Plan revision points and the fiscal implications of facility renewal remain visible rather than being absorbed into broad policy language.

A third reform scenario is to stress-test PFMP assumptions under multiple conditions: population decline faster than assumed in the local population vision, a fiscal shock that reduces investment capacity, climate-related hazard exposure that accelerates renewal needs, pandemic-like service disruption, and supply chain constraints that increase construction and maintenance costs. Such stress-testing would move policy implications beyond the generic recommendation to 'link plans better' and would provide mayors and senior administrators with a practical basis for deciding when to prioritise service life extension, consolidation, facility closure, or phased restructuring.

The international significance of this study lies not in presenting Japan as a special case, but in positioning it as a leading example of institutional adjustment in a country undergoing sustained population decline. Japanese cities have faced planning challenges associated with contraction ahead of most other nations [21–25], and the analysis of temporal mismatch and population assumption positioning in ordinance-designated cities thus offers transferable insights for cities that will encounter analogous challenges in the future.

Beyond Japan, the transferable element is the two-dimensional diagnostic framework rather than the specific institutional names of Japanese plans. Cities in Korea and Taiwan, European shrinking regions, and North American cities facing ageing infrastructure can apply a similar comparison by identifying a long-term infrastructure or asset management plan, the medium-term fiscal and administrative plans that operationalise it, and a common demographic benchmark. The relevant question is then whether long-term infrastructure assumptions are periodically translated into medium-term governing documents, and whether demographic assumptions are treated as explicit planning premises. In this sense, Japan's ordinance-designated cities provide a leading case for a broader international problem: governing infrastructure systems under simultaneous demographic, fiscal, environmental, and institutional uncertainty.

5.4. Limitations

Several limitations apply. First, the analysis is limited to Japan's 20 ordinance-designated cities. Although these cities constitute the full population of ordinance-designated cities, the stability of correlation estimates and the generalisability of the findings to other types of municipalities remain limited. The cross-analysis is therefore exploratory and aims at identifying patterns rather than establishing causal relationships. Second, the study relies on published planning documents; it does not directly verify how documented horizons and population assumptions relate to actual processes of budget allocation, facility reorganisation, and organisational operation. The temporal mismatch identified here should be understood primarily as a descriptive indicator of documentary and institutional consistency. Third, target years differ across local authorities (2040–2070), limiting direct comparison. DOG (annualised) addresses this issue as the primary indicator, while DOG (simple) remains a supplementary level-difference measure. The two indicators showed $\rho = +0.823$ and sign agreement in 15 of 20 cities, but the remaining five cases show that population-level and annual rate indicators can produce different assessments. Fourth, the analysis covers only plan documents; it does not examine the internal decision-making processes behind projection selection or plan revision.

Fifth, the treatment of integrated plans is necessarily document-based. Assigning the duration of the host Basic Plan to an embedded fiscal or administrative component improves comparability, but it does not prove that the integrated component has the same procedural force, review discipline, or budgetary salience as a standalone Fiscal Vision or Administrative Management Policy. The effect of integration on temporal mismatch should therefore be interpreted as conditional on review design and budgetary visibility rather than as a uniform mitigating or exacerbating mechanism. Sixth, this revision does not include a full binary coding table of explicit cross-references among plan documents. Such coding would help distinguish cases in which different terminal years are mitigated by formal cross-references, rolling reviews, or other coordination mechanisms from cases in which temporal mismatch more directly signals institutional exposure to coordination risk. Developing this cross-reference coding is therefore an important task for future work.

6. Conclusions

This study conducted a descriptive and exploratory examination of temporal mismatch centred on PFMPs and the relative positioning of population assumptions in population visions against a common external benchmark, focusing on Japan's 20 ordinance-designated cities within a shared institutional environment. Temporal mismatch was interpreted as a risk indicator of potential coordination exposure rather than as proof of policy failure. The mean PFMP duration of 20.80 years clearly exceeded those of basic plans (10.00 years), fiscal visions (7.65 years), administrative management policies (7.95 years), and implementation plans (4.30 years). Regarding population assumptions, whilst only a small number of cities anticipated future growth, even within the group assuming decline, cities positioning themselves above the external benchmark coexisted with those positioning themselves below. Using DOG (annualised) as the primary indicator, the Spearman correlation with Mismatch Ratio was $\rho = -0.382$ (Basic Plan), $\rho = -0.192$ (Fiscal Vision), and $\rho = -0.071$ (Administrative Management Policy); all were weakly negative or close to zero, and no monotonic positive association between the two dimensions was observed.

These results suggest that temporal mismatch and demographic assumption positioning do not show clear positive monotonic co-movement and should be treated as two separate governance dimensions requiring distinct scrutiny. The contribution of this paper is therefore diagnostic and framing-oriented: it documents both dimensions simultaneously within the same institutional setting and shows descriptively that they cannot be reduced to a single composite indicator. Future research should connect these document-based risk indicators to budget execution, facility consolidation outcomes, and formal cross-plan coordination mechanisms.

Supplementary Materials: The following supporting information can be downloaded at: <https://www.mdpi.com/article/10.3390/urbansci10070411/s1>, Supplementary Table S1: Start and end years and planning periods of major plans in the 20 ordinance-designated cities; Supplementary Table S2: Descriptive statistics on plan periods by plan type; Supplementary Table S3: Population vision data and DOG indicators for the 20 ordinance-designated cities; Supplementary Table S4: Descriptive statistics for Mismatch Ratio and DOG indicators; Supplementary Table S5: Exploratory correlation diagnostics for DOG (annualised) and Mismatch Ratio.

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