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Governance and the provision of roads and mobility in five Japanese 'societies'

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A B S T R A C T

Roads, and policies relevant to roads, impact on the economy and the environment and have profound impacts on society yet there are few studies of the interaction between civil and civic society covering state formation, transformations to the form of government, the administration of the road sector of the economy, and personal mobility. A conceptual diagram of interactions is presented where, through an historical lens, data from secondary literature and government websites in English and Japanese are interpreted for the five "Societies" identified by the Japanese Government, namely, hunter-gathering, agricultural, industrial, information technological and "Society 5.0". These data are interrogated through key propositions based on the New Institutional Economics (NIE): the interplay between economic and political markets holds the key to the dynamics of institutional change; transformation occurs over long periods of time, with the dynamics of change in phases; it is *people* in institutions and organisations who make decisions about what to do when confronted with internal or external pressures for change; it is *people* who are informed by the circulation of ideas on technologies, policies, services and finance (policy transfer); and judgement on which values govern the decision and in what way do they impact on society. The discussion section uses summary tables that shed light on these propositions. The broad perspective taken suggests that policy objectives change over time in response to emerging problems (both internal and external) and that institutions and organisations also evolve in response to changing circumstances. The conclusions suggest areas for further research.

1. Introduction

Case studies of transport policy may be approached from different perspectives. A criticism of academic research into transport policy by Marsden and Reardon (2017) found that two-thirds of the 100 papers reviewed did not engage with real policies, or with policy makers, and focussed only on quantitative analysis. They recommended that researchers needed to "engage with substantive questions of governance which pay greater attention to context, politics, power, resources and legitimacy" (Marsden and Reardon, 2017: 21). Case studies of the historical evolution of transport policy can be added to this quote as it also sheds light on the rupturing of technological path dependencies.

Research that engages with governance and its objectives implies some form of institutional analysis, of which the new institutional economics (NIE) provides one suitable conceptual framework. It poses questions about who is in charge of transport policy development, who are the key actors and what contextual problems they face, how do they obtain their advice, and how do the policy outcomes – intended or otherwise – impact on society's mobility. In the case of transport, the NIE framework has been applied to road management (Groenewegen and de Jong, 2008); road tunnels (Harris et al., 2018); ports (De Langen and Chouly, 2004; Jacobs, 2007; Reveley and Tull, 2012; Pyvis and Tull, 2015; Li et al., 2017; Black, 2021); port container barging (Van der Horst et al., 2018); cruise terminals (Lau et al., 2014); port railways (Van der Horst and Van der Lugt, 2014); the airline industry (Schneider de Almeida and Bettini, 2018); and urban public transport (Low and Astle, 2009; Canitez, 2019; Canitez, 2020).

The road sector is chosen to narrow the focus on transport policy because it is a basic servant to all economies, both developed and developing. A common historical characteristic in the socio-politico-technological-development of all nations is associated with the overland movement of people and goods, where parallel developments have taken place in vehicle technology and propulsion systems. All countries commenced with some form of primitive tracks for walking and beasts of burden, that later evolved into unsealed roads and, more recently, into networks of geometrically designed expressways (see, for example, Lay, 1999; Lay et al, 2020). What is distinctive about such technological transitions across different countries is the range of governance systems, the different purposes of policies in the road sector, and their varying impacts on the mobility patterns in society. To illustrate such transitions, Japan is chosen as a suitable case study of the long-term changes in governance and policy because more recently the Government of Japan

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(Government of Japan, Cabinet Office, n.d.) has clearly divided the historical evolution of its society into five qualitatively different periods (with precise dates that demark each epoch).

Historical and contemporary data on which this paper is based are available from primary and secondary literature in both English and Japanese, as referenced in the bibliography. The methodology covers: identifying different forms of government (absolute monarchy, aristocratic, colonial, democratic, military dictatorship, socialist, theocratic and totalitarian); governance approaches to road provision and policy; the key actors involved (and their legitimacy and power relationships); and the sources of funds needed to implement new technological initiatives. The significance of this NIE approach is that by historicising road provision and policy, this research contextualises and presents possible shifts and changes in governance in a historically grounded analysis that transcends contemporary arguments. No Japanese researcher has previously addressed road governance in this way.

The findings on Japan can be summarised as: road building as a symbol of state authority; road barriers for military defence and to control the movement of ordinary people; post stations as an authoritarian government's monopoly infrastructure to raise revenue; and the encouragement of private vehicle ownership and use in the modern industrial state; and the future "Japan Society 5.0", with responses to climate change and mobility as a service. The general significance of the approach, and its historical and qualitative interpretative methodology, is that it demonstrates how the role of governments have had, and can have, widely different impacts on the personal mobility and freedoms of the population. Also, unlike in other parts of Asia or Europe, in Japan there is "an institutionalized division of kingship between a nominally-reigning monarch [emperor] and a *de facto*-political-ruling regent, abdicated senior sovereign or military leader (*shogun*[1])" (Schley, 2019: 361) that is a uniquely changing landscape of power and authority over a period of two millennia.

The paper is arranged in the following sequence. The literature review defines institutions, introduces the new institutional economics (NIE), noting its key propositions relevant to this research, reviews the limited academic literature in English and Japanese on the NIE and road governance, and summarises briefly the literature on Japanese political institutions and road governance (Section 2). The methodology of the case study approach, and the rationale for the choice of the five Japanese "societies", is explained in Section 3. The substantive part of the paper is Section 4 which contains the interpretations and classifications of the role of governments and the road policies they pursued, and the impacts these policies had on personal mobility and lives of sections of society. Historically, these are arranged from "Society 1.0" through to "Society 5.0". Section 5 is a discussion of the findings on the key propositions extracted from the new institutional economics. In the concluding section, the main points are summarised and areas for further research are identified.

2. Literature review

The literature is organised into three areas. The first part is a definition and description of institutions, and an introduction to key concepts applied in the New Institutional Economics (NIE). The second part is a critical literature review of the NIE as applied to the road sector that also identifies research gaps. As the case study is on Japan, the third part covers the political institutions in each of the five societies, including the Government of Japan's vision for "Society 5.0". There is a limited literature on road governance in Japan from a NIE perspective. Key words were used to search data bases such as Academia (and the snowballing of related references), Google Scholar and Japanese scientific data bases.

2.1. Institutions and the new institutional economics

The term "institution" extends from a nation's constitution to other governing organisations that have a less secure constitutional basis, such as provincial and local government, the bureaucracy, political parties, trade unions and lobby groups. The English language is sometimes ambiguous because the term "organisation" tends to supplant the word "institution" as the context moves further away from constitutional structures (Hague and Harrop, 2001: 63). Duina (2011) provides a detailed introductory discussion of the characteristics of institutions and organisations, and demonstrate their differences, as does Scott, 2008.

One suitable framework to examine specific case studies is provided by the New Institutional Economic – a social science perspective that focuses on institutions and organisations that underlie markets and economic activity. Government institutions are the "rules of the game" (constitutions, laws, rules, regulations and enforcement mechanisms put in place by the government). These are the formal legal rules, and the informal social norms, that constrain individual behaviour and give structure and meaning to economic interactions. *Institutions* are "humanly devised", as North (1991) mentions twice in the first five lines of an article on institutions. Analyses of actors, and interest groups, can uncover where the real power in a society lies, and how power is distributed geographically, institutionally, and socially (The World Bank, 2005:104).

Analyses conducted under the framework of the New Institutional Economics include the role of people as key agents: "organisations are the players" (North, 1991: 97). It is *people* in institutions and organisations who make decisions about what to do when confronted with internal or external pressures for policy change, and who rely on the circulation of ideas on technologies, policies, services and finance to inform their "worldview". The interplay between economic and political markets holds the key to the dynamics of institutional change. There is always a high degree of inertia in changing government regulatory regimes, both in terms of institutions and governance (Williamson, 2000) and this perspective is important when interpreting historical data.

With ideas circulating about the New Institutional Economics for three decades (Richter, 2005), and about Institutional Theory (Scott, 2008), a large specialised literature has been accumulated. This subsection does not attempt any kind of comprehensive review. Instead, we attempt to tease out from selected publications (for example, North, 1991; Williamson, 2000; and Scott and Davies, 2016) some of the central propositions about institutions that can be helpful when formulating a research methodology using the case study approach (Alston, 2008) applied to transport policy. These propositions include: the interplay between economic and political markets holds the key to the dynamics of institutional change; transformation occurs over long periods of time, where social theory considers the dynamics of change in phases; *people* in institutions and organisations (embracing both civic and civil society) who make decisions about what to do when confronted with internal or external pressures for change; and *people* are informed by the circulation of ideas on technologies, policies, services and finance (Campbell, 2018). In addition to who is *involved* in the process (who controls the process, and who gets access and on what terms) and the *relations* between those involved (what procedure and style of debate), Healey *(et al.*: 223), in analysing the British planning system, add judgement concerning an acceptable decision (which values govern decisions and in what way are decisions presented).

2.2. New institutional and road research

The search of Japanese data bases using the keywords "Japan, road administration, Society 5.0 road issues" 「日本、道路行政、ソサエティー5.0道路問題」- "*Nihon, dōro gyōsei, sosaetī 5. 0 Dōro mondai*") verified that the NIE framework has not been exploited by Japanese researchers. Using Google Scholar® and the key words, "road provision and the new institutional economics", relatively few academic publications have applied the NIE framework to the road sector of the economy, and we have not located any publication that considers NIE propositions. Exceptions are Groenewegen and de Jong (2008), who

discussed Williamson's Transaction Cost Economics and Aoki's Comparative Institutional Analysis, Harris (*et al*, 2018) who analysed road tunnel projects in Australian within their institutional context that emphasised actors, the 'rules of the game' and power, and Black (2022: Chapter 7) who provides an historical interpretation of Japanese road policies and their impact on personal mobility.

2.3. Institutions in the five Japanese societies

There is a vast literature in English on the political institutions and economic history of Japan from archaic times to the present day. The book by Ishii (1980), although now dated, is the standard work in English on the history of Japanese institutions from a legal perspective. *Japan: An Illustrated Encyclopedia* (Kodansha, 1993), written by leading Japanologists, is a valuable reference source but requires an understanding of concepts, events and the names of key people in order to search the encyclopedia effectively. Other important works on Japanese institutions include, but are not limited to, Beasley (1972), Hall et al. (1990), Hall et al. (1993), Hall et al. (1999), Finer (1997), Najita (1998), Andressen (2002) and de de Bary et al. (2002).

Within this body of literature, and noting the largely ceremonial role of the Emperor, is the role of institutions and organisations outside of the government. Until 1868, the Japanese population was divided rigidly into three hierarchical classes: ruling elites (court nobles, war lords, clergy); farmers and artisans; and merchants. In ancient times, the imperial court made decisions, but power was later usurped by the regional warlords. Two successive military governments (Kamakura and Muromachi) failed to unite the country – that is until 1600 and the emergence of the Tokugawa military dictatorship. Merchants, although despised by the noble and military elites, grew in economic importance from the middle ages onwards (Sheldon, 1973: 3), handling, on behalf of the warlords, finance, trade, transport, and rice transactions (the monetary basis of the economy). After the restoration of the Emperor (Meiji), in 1868, merchants formed the great business houses, such as Mitsui and Sumitomo (Morck and Nakamura, 2005: 371-73), and, later, provided the powerhouses of Japanese industrialisation in "Society 4.0".

Japan is known as a country in which "a potent central power reigns over a compliant pyramidal hierarchy" (Hein and Pelletier, 2017: xv). In post-war Japan, the basically paternalistic state-society relations were traditionally shaped from the top down (Ohi, 2020), where the long-term, one-party rule under Liberal Democratic Party's (LDP) has evolved into a system of collusion (Andressen, 2002: 148-9; Takayasu, 2014, Van Wolferen, 1989) between politicians, bureaucrats, and businessmen, especially in the construction industry (Feldhoff, 2007). Civil society organisations perceive they have no influence on policies (Tsujinaka and Pekkanen, 2007).

On the history of road administration in Japan, the authoritative source is by Takebe (2016), written in Japanese, although brief summary outlines of road history in English are provided by Ohnishi et al. (2007) and the Road Bureau, Ministry of Land, Infrastructure, Transport and Tourism (2018). There are two excellent research monographs written in English on roads – one by Traganou (2004) and the other by Vaporis (1994), – but their historical scope is limited to the Tokugawa period (1603–1868). However, aspects of road governance in other time periods ("Society 1.0", "Society 2.0" and most aspects of "Society 3.0") have not been researched by Western or Japanese scholars.

"Society 5.0" in Japan is the label attached to a vision of a whole of government, business and academia plan to integrate new technological systems, including artificial intelligence (AI), across various fields to the benefit of society. However, the Japanese general public seem un aware of the Government's plans (Gagan, 2020). Although Holroyd (2020) has explored the conceptual background, rationale, policies and programmes that Japan has enacted in pursuit of its visions for "Society 5.0", there are no publications in English or Japanese that analyses "Society 5.0" from the vantage point of road governance, primarily, because of various barriers (Ding, 2018; Gladden, 2019: 27; and Nagahara, 2019).The research gaps in the Japanese scholarship are clear: the NIE framework has not been applied to the transport sector, in general, nor to the road sector, in particular.

3. Methodology

The methodology of our research is distilled into the following three iterative steps. For any historical slice of time and territorial unit, first, undertake a static descriptive relationship analysis of the ultimate source of power in the selected case study jurisdiction, the form of government, the responsibilities of governance of the road sector, and the key actors involved in civic and civil society. Diagrammatically, this can take the form of a flow diagram (Fig. 1) used in an analysis of transport policy in metropolitan Sydney, Australia (by one of the authors, see, Black et al, 1983, Fig. 1, p. 95).

The second step is to elaborate on these relationships in terms of the issues that are relevant to the road sector. These include: the key people involved, the governance of road provision, the policy responses, including cultural transfer, or, the "policy transfer framework" (Glaser et al, 2021), and some form of critical analysis, or value judgement, of the impacts of programs and policies on society.

The third step is to introduce the dynamics of institutional and organisational change, along with its key agents and what was achieved with the reforms. In the short term, and in response to changing issues and government priorities, the road bureaucracy may be restructured, and other players from the bureaucracy and the civil society may be engaged in different relationships. The results may be inferred from step 3. In the long run, new forms of power authority may emerge from domestic or foreign interference, and a different landscape will be formed (a variant on step 1). The second step may be repeated with different institutions and organisations, and key players, with the outcomes subject to some form of judgement.

These steps in this conceptual model are merely a means to articulate responses to the questions posed in the introduction to this paper. Some of the key propositions from the literature on NIE examined in the model are: the interplays between economic and political markets that hold the key to the dynamics of institutional change; the transformation occurs

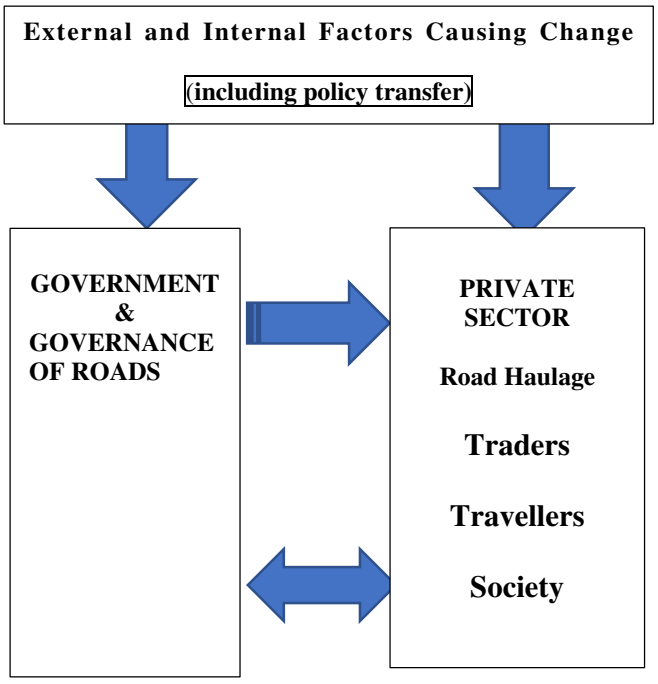

Fig. 1. Diagram to Illustrate Interactions in a Conceptual Model of Road Governance (Source: Authors).

over long periods of time, with the dynamics of change taking place in phases; the *people* in institutions and organisations who make decisions about what to do when confronted with internal or external pressures for change; the *people* who are informed by the circulation of ideas on technologies, policies, services and finance (policy transfer); and the judgement on which values govern the decision and in what way do they impact on society. Primary and secondary historical data sources, as described in the next section, can be readily structured into diagrammatic and tabular form for the Japanese case study of road governance.

The territorial unit chosen is Japan whose population as of May 2022, in a land area of 364,546.41 km^2, is 125.05 million, according to the Statistical Bureau of Japan. The time period for the case study stretches from the earliest migration of people into the Japanese archipelago to the present day. There are different ways of classifying historical time periods, such as Ishi (1980: viii), or the five volumes of *The Cambridge History of Japan*, but we have instead chosen to analyse the five societies as identified more recently by the Government of Japan (Government of Japan, Cabinet Office, n.d.). It is important to note here of the need to explain the evolution of the territorial units in the first three societies because Japan was only unified in 1600.

The state formation of *Wa* (倭 – the oldest attested name of Japan from Chinese sources) can be traced to the late 2nd Century, but it was a relatively small area (Yamato) to the west and southwest of Lake Biwa (Kawanabe et al., 2012). The ancient period saw the expansion of territory away from this heartland in central Honshu in the 6th and 7th Centuries (Harding, 2020: 23), involving long and frequently bloody internal wars, that fashioned the archipelago's first recognisable state (Toshiya, 1993). The country then fragmented then into numerous self-governing provinces in the medieval period until the early years of the 17th Century, when the territorial extent of Japan as it exists today was forged by its third military government.

4. Analysis and interpretations

The five societies are considered in turn with the aim of describing the institutional arrangements and how they changed over time. Within each society, road government and the impacts of policies on society are analysed from data obtained from the literature on history, and from contemporary government reports accessed through websites.

4.1. Society 1.0 (hunting and gathering)

There is no evidence that roads were important in "Society 1.0". About 35 thousand years ago Japan was once connected to continental Asia through several land bridges routes that allowed migration into the Japanese archipelago from China and Austronesia. This Jomon culture was distributed widely on the Japanese archipelago from the southernmost Okinawa to the northernmost Hokkaido (Hay, 2016). The Ainu (or *Emishi*) came from Siberia and settled in Hokkaido and the northern parts of Honshu some 15 000 years ago, just before the water levels started rising again. The Jomon lived in relatively small tribes, estimated about 24 individuals per human settlement and were hunter-gathers. These tribes cemented their social order by believing in spirits (Harari, 2015: 31) but there were no political institutions (Harari, 2015: 52). Shamanistic practices, possibly influenced by Daoist practices from China, have been identified to suggest a hierarchical ordering of society. For coastal and river transport, dug-out canoes were important in a hunter-gathering society as were primitive tracks. The remains of Y-shaped sledges and carriages (*shura*) reveal how large timber logs and stones were moved overland (Shimotsuma et al, 2011) and are indicative of the earliest form of primitive road technology for moving heavy objects.

4.2. Society 2.0 (agricultural)

When the second wave of migration arrived around 2 300 years ago, its Mongoloid populations (Yayoi) eventually became dominant, with their territorial gains from the Jomon, and initiating border disputes with the indigenous Ainu population to the north. The Yayoi introduced rice paddy agriculture and long-distance trade (Yoshida and Ertl, 2016). Yayoi society was structured around agriculture with clan chiefs commanding small, local, territories that gradually enlarged in geographical area, primarily through the expansion of kinship networks. The development of rice cultivation was closely related to progress in the development of irrigation systems (Tabayashi, 1987). The combination of these natural and man-made water courses formed the basis of the rural infrastructure that included water transport. This infrastructure facilitated the movement of agricultural produce, especially the taxation surplus designated to centres of power held by the clan chiefs, and complemented porterage along local tracks.

Over time, "Japan" (*Wa*) had "over one hundred" separate countries (Ishii, 1980: 133) after which the Yamato kingdom emerged as an embryonic state with governance under Queen Himiko (Harding, 2020). During the Kofun period (300–538 CE), a complex political system developed in which social classes were controlled by elites who monopolised production and used military force to control the people or to expand territory (Pearson, 2016: 21). The form of government was tribal, and its direction was spiritually determined by shamans. The wealth of the Yayoi society was based on rice, and a command-and-control policy ensured peasants and slaves (resources) planted and harvested produce and transported it to the chief's village by porters or by boat.

These territories of land under the direct rule of the King/Queen (later designated as Emperor) required administration and this gave rise to the court-appointed governors (*kuni no miyatsuko*), who sometimes were the local chieftains. Provinces (*kuni*) and districts (*agata*) served as the local government arms of centralised control by the imperial court. The resources used to clear vegetation for road connections, and to move harvested rice (wealth) to places of political power, were predominantly slave labour – human porters and boat crews.

The dynamics of institutional change can be identified by a shift from imperial court appointments, based on hereditary titles, to one based on merit with the introduction of a twelve-tier system of court ranks. Reformers, including Fujiwara no Kamatari and Prince Naka no Oe (later Emperor Tenji) finally broke the power of the clan chieftains (Kodansha, 1993: 1496–7) to institute a unified government over a large territory. The principle that it was the Emperor – and not the chieftains – who should rule the state was institutionalised with the Taika Reform edict proclaimed in 646 (Kiley, 1999). Court nobles ruled on behalf of the Emperor, but there were other key players in administering policies such as monks and warriors (Adolphson, 2000).

Japanese scholars (for example, Takebe, 2015) are confident in their speculation that road infrastructure (and, by implication, some embryonic system of road administration) was established in the Kofun period (about 300–538 CE). For example, archeological excavations in 1983 of the Otsu Road, built in the late 5th Century to link Kofun burial mounds for elites in society, revealed that the road formation was 1.7 m wide and 0.3 m deep (Pearson, 2016: 50). These roads were symbols of advanced technology that were imposed by the state to impress and awe the population. In what the Japan Heritage Portal Site (2019) claims as the oldest "national highway" in Japan, the "Road of the Sun" was a 26 km-long road, over 20 m wide, connecting the port of Sakai and the Asuka capital at Nara (Ong, 2019). Sections of this east-west road – the Take no uchi Kaido – linked Nara to the important imperial burial tombs at Konda Gobyoyama kofun and at Daisenryo kofun (Pearson, 2016: 50). This road's strategic significance to the social and cultural development of Japan is that Chinese missionaries travelled to the capital along this road, introducing Buddhist culture and Chinese technology, including written characters (*kanji*).

The first clear example of road policy development based on external borrowings (policy transfer) is the Taiho reforms (702 CE) that introduced national administration based on the Chinese model (the *Ritsuryo*

system). Road procurement became institutionalised. Initially, the design of this highway system was a direct copy of the road system in China that was established centuries earlier during the Chou dynasty (1122–1222 BCE), and subsequently improved in the Chin dynasty (222–207 BCE). Chin highways were 50 paces wide, paved or well compacted, and lined with shade trees with each tree located at an interval of every 10 m. Post-stations, at intervals of every 30 *ri* (approximately every 112 km), provided fresh horses for those on official business. The Taiho Code stipulated similar dimensions for the Japanese highway system, but, given the different, and more mountainous, topography, modifications were made with Japanese roads being narrower, and the post-stations were placed at an average interval of 5 *ri* (20 km).

As shown in Fig. 2, ancient Japan was divided into seven major regions plus the five 'home provinces' (*Kinai*) that immediately surrounded the capital of Nara (Heijo-kyo was established in 710). These main administrative units of the Asuka Period (538–710) were a component of the legal and governmental system of Japan. The country was further divided into 58 provinces (*kuni*), each administered from a provincial capital (*kokufu*). As typified by the military role of road construction (for example, in the Roman Empire), the seven main roads (circuits) facilitated good communications for administering the laws and policies of the central government in the regions, and the efficient movement of imperial troops in times of unrest, especially to control the indigenous *Emishi* (Ezo) tribes in the northeast of Honshu (Matsuda, 2019). In 789, an imperial force of some 50 000 soldiers were defeated at the Koromo River (near Haraizumi, modern-day Iwate Prefecture), with a loss of about 3 000 lives (Harding, 2020: 39-41). Parts of northern Honshu, and the island of Hokkaido, remained unconquered.

The seven "official" highways were ranked according to three grades: the principal highway (San'yodo), where regulations stipulated the availability of 20 horses at each post station; two secondary highways (Tokaido and Tosando) with post stations that provided 10 horses; and four lesser highways (*shoro*) with post stations providing five horses. Virtually no other service, such as the provision of food and lodging, were available at these early post stations. The Taika Reform of 645 (Kodansha, 1993: 1496–7) introduced *sankan* (three barriers) located at Suzuka (now Mie Prefecture), Fuwa (Gifu Prefecture) and Arachi (Fukui Prefecture) that were on strategic routes in case of state dissidents, or incursions from the *ara-emishi* (wild-emishi) from the north eastern provinces of Mutsu and Dewa. A point can be made about policy inertia in that barrier stations (*sekisho*), along with post stations, became firmly embedded into government road policy until 1868.

The Confucian model of government (Mervant, 2014: 104), established in Japan (based on the Tang dynasty model) by the seventh century A.D. gave way over centuries to a loose unity of semi-autonomous fiefdoms that appeared to fit the same category of government as the classical ancient dynasties of China up to the Zhou Dynasty. This fragmentation of a centralised state into numerous independent units occurred during the Heian period (794–1185). The rise of the *bushi*[2] (regional warlords), and two successive military governments from 1185, meant there was little incentive to improve road communication because the economy was largely self-sufficient agricultural provincial domains. The majority of the population were peasants (90 per cent of an estimated population of 22 million in 1600); farmers toiled in fields day in and day out, and they transported the taxation rice, foodstuffs and handicrafts to their provincial overlords. The period up to 1600 was characterised by territorial disputes amongst the warlords. Control over roads and barriers (*sekisho*) fell to local interests. Long-distance travel by land for the merchant class became extremely difficult.

When forces loyal to Tokugawa Ieyasu were victorious at the Battle of Sekigahara (modern day Gifu Prefecture), the third military dictatorship unified the country and moved its government (*bakufu*) headquarters in 1603 to Edo (now Tokyo).To guarantee its survival3, the domains of warlords (han) were re-allocated to loyalist daimyos. The new domains of the fudai daimyo (hereditary vassals of Ieyasu before the Battle of Sekigahara) surrounded Edo. The institutional landscape may be summarised as follows. Roughly three-quarters of Japan was governed by *daimyo (han* provincial government) and about 15 percent by the Tokugawa *bakufu* (an additional 10 percent was governed by the *fudai daimyo*). Only 2 percent of the land was in the hands of the imperial family, temples, and shrines. Thus, since this time, Japan has dual institutions of the Emperor (with a court reduced to ceremonial functions), and the "national" governments with laws administered by the Office of *Shogun*. The provincial governments were administered by the *daimyo* warriors. This power sharing of governance (*bakuhan*) continued until 1868.

The Office of *Shogun* nominally headed the government and was invested in 15 successive heads of the Tokugawa family in an unbroken line that eventually came to an end in 1867 with the resignation of Tokugawa Yoshinobu. Fig. 3 illustrates the principal officials of the *bakufu.* To reinforce absolute *shogun* power were seven senior officials reporting directly to the *shogun* – positions were held by loyal, hereditary vassals (*fudai*). What is immediately obvious is the importance of military and security governance, dealing with the Emperor's Court in Kyoto and maintaining Tokugawa hegemony. In a fiscal-military state, policies were predominantly a matter for the regional *daimyo*, where their merchants handled economic transactions and provided local and national transport services.

Fig. 2. Five Provinces and Seven Circuits, Asuka Period, Japan, 538–710 (Source: https://en.wikipedia.org/wiki/Gokishichidō, accessed 27 December 2022).

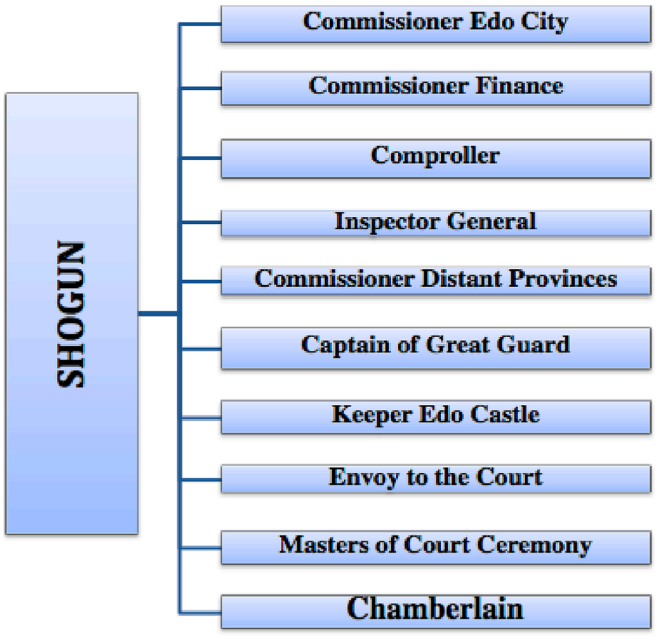

Fig. 3. Principal Officials of the Tokugawa Shogunate, 1603–1868 (Source: Authors based on, and redrawn from, Kodansha, 1993: 1580).

The *bakufu* faced numerous challenges following decades of civil war. From the early 17th Century onwards, road administration was a key element in the national unification strategy, and measures were designed to reinforce Tokugawa hegemony, to reduce power of the regional *daimyo* and to raise revenue for the Tokugawa treasury. The first step was to survey the existing state of the roads. In 1601, Tokugawa Ieyasu dispatched Okubo Nagayasu (Senior Councillor with governmental functions, including infrastructure, tax collection, and judicial matters) and Hikosaka Motomasa (Chief Intendant) to survey the Tokaido, including the facilities and services offered at each post station. Designated post stations on the Tokaido were granted official status by *the bakufu* with a policy directive to maintain 36 horses at each post station. Five roads radiating from Nihonbashi in Edo to other parts of Japan (Vaporis, 1994: Map 1, p. 20) were designated the Gokaido. All contained officially designated barrier stations (*sekisho*) and post stations. These radial roads provided a secure means for the government to control all sections of society, with four classes strictly identified under a hierarchical neo-Confucian philosophy (Najita, 1998). This decree – relating to the number of horses – was extended to post stations on all Gokaido roads. Post stations were a cleverly designed Tokugawa government-business monopoly to further enrich the House of Tokugawa. The costs of the operations of post-stations were born by the *daimyo* domains together with obligations placed on local villages: the taxation profits went directly into Tokugawa coffers. Most post station managers were of *bushi* lineage – often heads of villages and/or operators of *honjin* inns that were reserved for official travellers. The stipends to post station managers, and to the messenger relay service, were paid out of local *daimyo* taxation rice. Unlike in previous eras, post stations now provided refreshments, lodgings for different classes of traveller, food, and prostitution – services that were subject to Tokugawa taxation.

Post towns had inns and taverns that were well-staffed with *meshimori* – the rice serving waitresses allotted to individual male customers. After bathing the customer on arrival, *meshimori* served food and entertained the client with light conversation, then offered sexual acts for an additional fee (Bornoff, 1991: 149). For example, at the Shinagawa post station (11 km south of Nihonbashi in Edo), the *bakufu* regulations permitted five hundred prostitutes. However, eye-witness accounts suggest that there were almost three times that number. The *bakufu* taxed prostitutes' incomes: in the mid-19th Century, this taxation amounted to about 7 per cent of the post-station incomes along the Tokaido (Vaporis, 1994: 81).

The most restrictive mobility policy was directed towards the elites in society. The movement of *daimyo* and samurai was controlled by the *sankin-kotai* – a policy introduced in 1635 as part of the Law of Warrior Houses reform that required the *tozama* ("outside") *daimyo*, and their household retainers (typically 150 to 300 people), to spend equal time in Edo and in their domains. Female members of a *daimyo* family were kept hostage in one household compound in Edo. The *daimyo* had to maintain two households, thus draining them of money: the expenditure for *sankin-kotai* amounted to from 70 to 80 per cent of income (Kodansha, 1993: 1311). There was an officially designated route from the *daimyo* domain for the procession that followed the route of the Gokaido. The overnight stays of a large number of retainers at the government-owned post stations were an additional burden on *daimyo* finances, and an important source of taxation revenue to the *bakufu*.

The Tokugawa *bakufu* solved the road maintenance problem in 1612 to its satisfaction by the devolution of responsibility to provincial governments (*han*). This imposed additional financial burden on the *daimyo*. Four years later, in order to keep road surfaces in good shape, a load limit for horses transporting goods was imposed at 40 *kan* (150 kg) – a figure that remained constant during the Tokugawa era. Compliance to national policies on the upkeep of roads was the responsibility of the Magistrate of Road Affairs (*dochu bugyo*), created in 1659. *Bakufu* officials periodically checked to ensure approved road and bridge maintenance had been completed satisfactorily to orders. The Office also processed petitions about issues on the state of roads, barriers and post stations and on communication policy with *bakufu* intendants (*daikan*) who reported on all matters under their jurisdiction to the *bakufu*.

One obvious economic and political function of post stations was to facilitate the speediest of communication of state business with the Emperor's court in Kyoto where a system of relays of horse riders (*roppara hikyaku*) would allow the journey to be completed in 72 h (Moriya, 1990). During the Edo period, the number of courier services (*hikyaku*) proliferated such as the *tsugi-bikyaku* (only available to high-ranking *bakufu* officials), the *hikyaku tonya* (commercial message-carrying services available to everyone else) and the *toshi-bikyaku* (a single runner, without relay, who carried a message or parcel from the sender to the addressee). The *daimyo* established their own communication network with couriers (*daimyo-bikyaku*) taking messages between their domain and the *daimyo* residence in Edo and between their domain and their rice warehouses in the port towns.

The movement of taxation rice, and other commodities, including building materials for the construction of Edo, was in the hands of the merchant class who provided all transport services. Nakane and Oishi (1990) provide extensive details of societal and economic developments in the Tokugawa period. The merchant class increasingly gained wealth as key agents in the transport logistical chain, and as moneylenders to the *daimyo*, but they had no political power and the *bakufu* restricted their wealth by various means. The government kept a close eye on the economic power of the merchant class by forcing the wealthy to make donations to the government. Furthermore, most of the infrastructure of Osaka – main roads as urban thoroughfares, and bridges over canals – were constructed and maintained by wealthy citizens of Osaka. Of the estimated 200 bridges in this area only 6 per cent were built by the *bakufu* (Matsumura, 2004: 16).

Tokugawa control over the personal mobility of elites and ordinary people alike was achieved with a series of other, interconnected, policy areas. The purposes of the new, national road barriers were military defence guarding potentially hostile borders, and to apprehend criminals[4]. Barriers ensured that firearms were not smuggled into the capital, that the wives of defeated *daimyo* who were held captive were not smuggled out of Edo, and that the movement of ordinary peasants and merchants were strictly monitored through the issue of travel permits. Roads also provided government forces escape routes from Edo should any attempted military coup from dissenting *daimyo* have occurred

(Vaporis, 1994: Table 1, p. 23 and pp. 32–34). As emphasised by Vaporis (1994: 101-102): "The creation of a sekisho network must be seen as the act of a nascent political power to establish and extend its authority over the other daimyo and over a society that had been experiencing tremendous upheaval…"

As peace and stability were established, the purposes of barrier stations evolved into the control (and tax) of commodity flows, the restriction on the mobility of merchants and peasants and the prevention of peasants escaping their domain. In 1625, the government issued an edict on instructions as to how travellers passing through *sekisho* barriers should behave, and what personal information must be presented. Females were prohibited from travelling unless accompanied by a male. In 1661, there was a standardisation of travel permits, or passports (*sekisho tegata* or *kitte*) that had existed from the 1620s. The permit contained specified personal details on females. The majority of travel permits issued to peasants and merchants in the early years of the Tokugawa government were for the purpose of going on a pilgrimage to various sites of historical and religious importance.

Pilgrimages to famous temples and shrines have a long history in Japan. Of the countless temples and shrines scattered throughout the country, Ise, with its inner shrine (constructed in the 3rd Century) and its outer shrine (constructed in the 5th Century), has been a premier pilgrimage destination from the 10th Century onwards. However, it was only during the Edo period that mass tourism exploded as a social phenomenon (Suzuki n.d.). The desire to make a pilgrimage to Ise Shrine, at least once in a lifetime, was universal amongst Japanese men of the day. After paying their respects at Ise Shrine to the Shinto gods, pilgrims headed off to the Furuichi district pleasure quarters. In the early 17th Century, a small, red-light district (*yukaku*), consisting of six teahouses, grew larger, and more prominent, over time, growing in the Kansei era (1789–1801) to 70 teahouses with about 1000 courtesans. This was one example of the mass tourism that developed across Japan when peace and stability was secured by the Tokugawa Government.

Table 1
Key Instigators of Japanese Government Transformations, 2nd to 21st Centuries.

Transformative Event and Date	Instigator (s)
Yamato State created from coalition of chiefdoms (c. 180)	Queen Himiko
Imperial House gains control of Western Japan (645)	Fujiwara no Kamatari; Prince Naka no Oe
Oath of allegiance: principle that emperor should rule the state not the chieftains (645); Taika Reform edict (646)	Emperor Kotoku
Taiho Code – Compilation and adoption of the Chinese-style law and penal administrative law (702)	Prince Osakabe; Fujiwara no Fuhito
Imperial Court officially recognises Kamakura *Shogunate* when warrior families throughout Japan pledge loyalty the "chief of the warrior houses" (*buke no toryo*) (1193)	Minamoto no Yoritomo
Formation of Muromachi *Shogunate* (1338)	Ashikaga Takauji
Muromachi *Shogunate* ousted from Kyoto (1573); Ashikaga Yoshiaki resigned as *shogun* (1588)	Oda Nobunaga
Battle of Sekigahara confirmed hegemony of Tokugawa Ieyasu (1600); Tokugawa *Shogunate* (1603–1867) that governed Japan for two-and-half centuries	Tokugawa Ieyasu
Foreign demands – the U.S. East India Fleet enters Uraga Harbour; international treaties and a selective open port policy (1853)	Commodore Matthew Perry
Daimyo of Choshu and Satsuma obtain Imperial permission to attack *bakufu* forces (1867) and the Meiji Restoration	Saigo Takamori and Kido Takayoshi
Japan modernises its government, bureaucracy and industry and becomes a colonial power	Meiji Emperor and Military Advisors
Defeated in World War 2; Occupation forces write new constitution and a bicameral Diet (1946)	General Douglas MacArthur
Modern, democratic state welcomed by the international community by hosting Tokyo Olympics in 1964 (and 2021)	Government of Japan Democratic Liberal Party

(Source: Authors).

4.3. Society 3.0 (industrial)

A coup – partially the result of Western powers interference with the imposition of unequal trade treaties on Japan – overthrew the Tokugawa Government and the Emperor was restored to power (Beasley, 1972; Atsumi and Bernhofen, 2011; Kawashima, 2020). A new constitution was declared based on Western models, and an elected government came to power. Thus, a feudal state had a mission to urgently catch up with Western powers through a period of rapid modernisation (Natalizia, 2014). This transformation included borrowing models of government institutions and setting up a bureaucracy. The Home Ministry (*Naimusho*) was established in November 1873. Public Works was included within this portfolio. The Japanese Government did not see road development as being important given the priorities allocated to railway construction and to industrialisation (Ministry of Land, Infrastructure, Transport and Tourism, 2021). From 1881 to 1900, the annual public expenditure on roads amounted to 7 million yen (approximately US$ 3.5 million), and, from 1901 to 1916, expenditure increased only three-fold (Moulton with Ko, 1931: 87).

Society 3.0 was characterised by low investment in road infrastructure because motorised traffic levels were low. In 1909 (Japan's population was 45.5 million), there were only 61 motor cars registered with the Home Ministry. In comparison, in 1911 (population 49.8 million), there were approximately 1.8 million goods wagons, 172 000 horse-drawn carts, 144 000 *jinrikisha*, 36 000 ox carts and 9 000 horse-drawn carriages (Moulton with Ko, 1931: 87). A census of motor cars and trucks taken in 1920 (population 55.5 million) showed there were still only 7,912 throughout the country (Steele, 2016: 88). With the car ownership rate at 0.0014 per capita, roads offered little to the general population by way of personal mobility. In 1920, the government authorised 282.8 million yen (US$ 113 million) over a 30-year period for the construction of new highways and bridges, specifically for motorised vehicles, and for the paving of national and prefectural roads (Moulton with Ko, 1931: 87). This annual equivalent sum was only marginally above the investment at the turn of the 19th Century.

4.4. Society 4.0 (information)

In the aftermath of the Second World War, consumer sentiment surveys in Japan continued revealed that private motor vehicles would have little, or no role, in the daily lives of ordinary people. In the early 1950s, of the 140 657 km of national highways and prefectural roads, only 15 per cent had two or more lanes and only 5.4 per cent were paved (David, 2014: 18). At the 1952 census, less than 6 per cent of the national highways and prefectural roads in Japan were paved; bicycles accounted for 87 per cent of registered vehicles, other slow modes of transport (horse and ox-carts and handcarts) accounted for 7 per cent, and private cars accounted for only 6 per cent (Black and Rimmer, 1981: 30).

The Korean War (1950–1953) not only kick-started economic growth in Japan but also gave an impetus to the development of the domestic automobile industry. Government industrialisation policies, along with national development plans, dramatically shaped consumer demand. The Ministry of International Trade and Industry announced the "People's Car" Plan, in May 1955 which gave local car manufacturers a chance to develop original models of their own based on technical specifications for a four-wheel motor car weighing less than 400 kg, and with an engine displacement of from 350 to 500 cc. Although the "People's Car" Plan was eventually scrapped it did encourage manufacturers of two- and three-wheeled motor vehicles to enter the four-wheeled market. In 1960, Toyo Kogyo (today's Mazda company) introduced the Mazda R360 Coupe, and, in 1961, Toyota began marketing the 700 cc, Publica – brands clearly influenced by the "People's Car" concept.

Prime Minister Ikeda Hayato (in Office, 1960–1964) stated the Government's goal of doubling national income within a decade and launched a high-rate, economic growth policy based on expanded public-sector spending, reduced taxes, and efforts to keep both inflation and interest rates low. These policies were dubbed "No Longer in the Post-war Era". Production of motor cars expanded dramatically beginning in 1965. From 1967 to 1976, the number of four-wheeled vehicles owned by Japanese jumped from 10 million (0.1 per capita) to a little in excess of 30 million (0.27 per capita). In 2019, there were nearly 62 million passenger vehicles registered (Statistics Bureau, Ministry of Internal Affairs and Communications, 2021: 13.5) and slightly more registered bicycles at 69 million.

Post-war reconstruction also involved investment in road infrastructure as "social overhead capital" and as a means to accelerate economic growth. In 1952, the law concerning Special Measures for Highway Construction was enacted that provided loans from a Trust Fund in the Ministry of Finance to construct roads, and the law also approved the collection of tolls from users to repay the loan. The government established a five-year road improvement program from 1954 onwards. In 1953, a petrol tax of 54 per cent of the retail price was also introduced to accelerate the road construction program. Earmarked funds for road improvement were also introduced in 1954 and expanded as a major fund-raising channel for road construction and maintenance at both national and regional levels.

The *Nihon Doro Kodan* (Japan Highway Public Corporation) – a non-profit government corporate entity – was established in April 1956 to construct and manage expressways and ordinary toll roads. The corporation's activities expanded in 1966 when the National Development Arterial Expressway Construction Law was enacted to provide a comprehensive construction plan covering 7 600 km of national expressways, but when the law was revised in 1987 the Japanese government approved expanding the expressway network to 11 520 km with an additional 2 480 km of access-controlled national highways.

Fig. 4 shows the network as of 1 April 2018 where the broken lines indicate sections requiring completion. Japan's expressways are a collection of technologies, expertise, and systems developed over half a century through experience with diverse and complicated topography, weather, and disasters (Japan International Expressway Company, 2021). It is highly unlikely that the network shown in this figure will expand in the future because of the contextual threats facing Japan, such as population decline and a stagnant economy.

With a recognition of a declining national population, and that land transport networks were largely mature, road administration was placed within a new "super" ministry. The Ministry of Land, Infrastructure, Transport and Tourism (MLIT) was established as part of administrative reforms on 6 January 2001 with the merging of the Ministry of Transport, the Ministry of Construction, the National Land Agency and the Hokkaido Development Agency. The Ministry is in charge of the comprehensive and systematic use of national land, development and conservation, infrastructure development, implementation of transport policies and maritime safety and security. In order to achieve more effective, efficient and transparent road administration, Japan has promoted a result-oriented administrative management for roads (Road Bureau, Ministry of Land, Infrastructure, Transport and Tourism, 2018:19).

The impost of road development and private vehicle ownership on

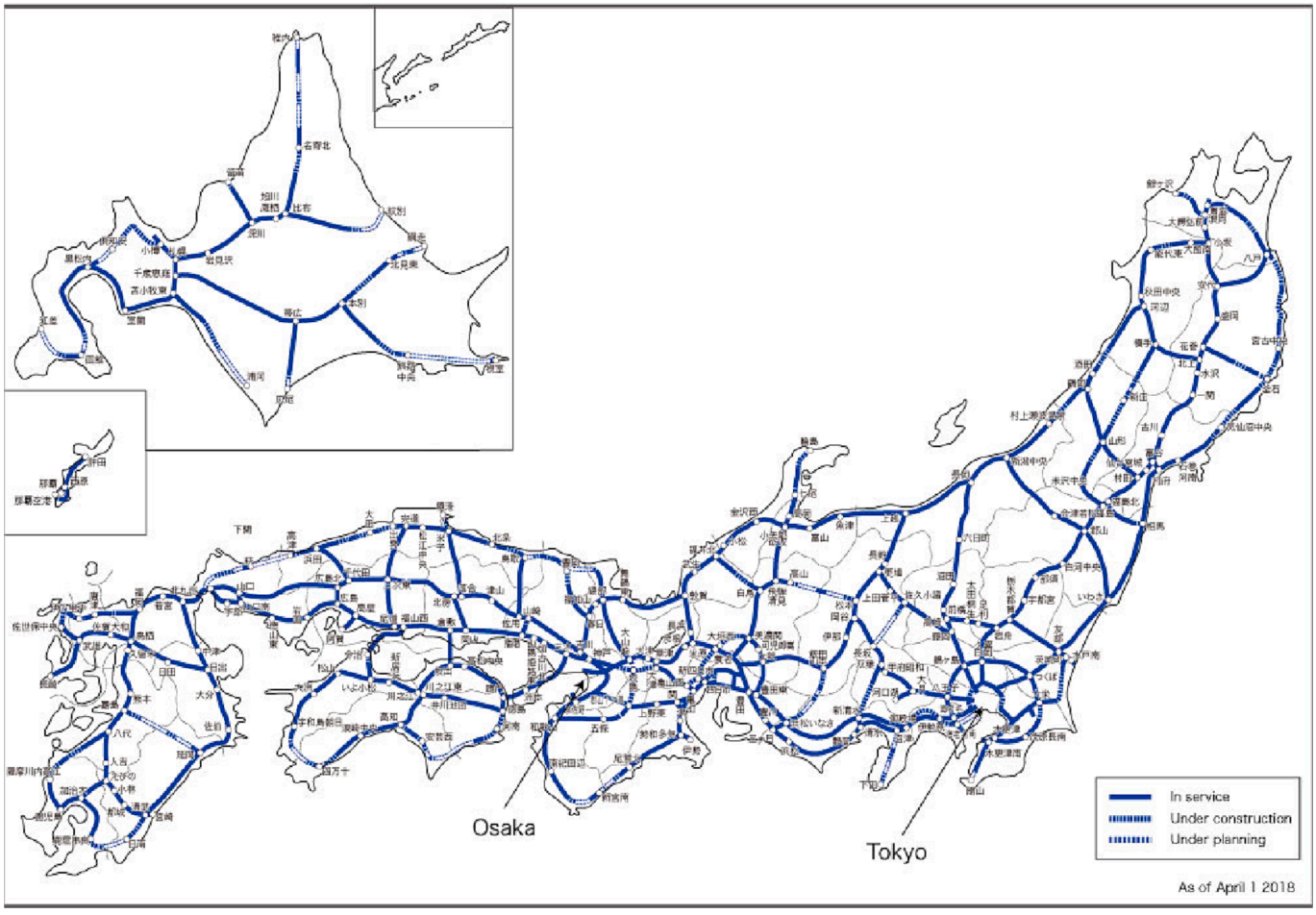

Fig. 4. Japanese Expressways on Kyushu, Honshu and Hokkaido, as of 1 April 2018 (Source: https://www.mlit.go.jp/road/road_e/images_n/policies/p1_1_1.jpg, accessed 6 July 2022).

society, and on the environment, has been substantial. In 1970, the annual number of fatalities from road traffic accidents reached a peak of 16.1 fatalities per 100 000 people prompting, in the same year, the national Government to enact the Traffic Safety Measures Basic Acts. As a consequence, the number of traffic accident fatalities fell in 2018 substantially to 3 532 (2.8 fatalities per 100 000 people) – the lowest number since 1948 (where a high proportion of accidents involved pedestrians), when the current traffic accident statistics were adopted (Statistics Bureau, Ministry of Internal Affairs and Communications, 2021: 161–2).

In terms of nitrogen dioxide and particulate matter emitted from road vehicles, at the 392 roadside atmospheric monitoring stations across Japan in 1998, environmental standards were breached, respectively, at one third and two-thirds of the locations (Suzuki, 2000: Figs. 1 and 2, p. 7). In 2014, motor vehicles were responsible for 15 per cent of Japan's carbon dioxide emission (Oba, 2016: 3). Tokyo's Environmental Policy *Creating a Sustainable City* introduces automotive regulations to reduce emissions and promotes the use of bicycles (Tokyo Metropolitan Government, 2021: 35-36).

As with other environmental problems, technology in Japan is seen as the solution with Prime Minister Suga Yoshihide's (in Office, 2020–2021) quest for net-zero, lifecycle, green-house gas, emissions by 2050, achieved by manufacturing and running cars on energy generated only by renewables (Nikkei Asia, 2020). Road traffic noise perceived by the human ear is a function of traffic flow, speeds, road pavement materials and distance from the source so roads have been a source of continued community annoyance. Noise mitigation has been achieved primarily through the construction of roadside barriers that are effective although often aesthetically unpleasing. The introduction of electric vehicles has helped reduce noise pollution.

The technological revolution in the transport sector has demanded increased inter-ministerial cooperation. In 2015, Prime Minister Abe Shinzo (in Office, 2006–7 and 2012–2020) announced the 2015 revision of the Japan Revitalization Strategy that included, as a strategic item, autonomous driving vehicles, and in doing so established the Panel on Business Strategies in Automated Driving in the Ministry of Economy, Trade and Industry (METI), and in MLIT. The panel was tasked to resolve current problems, and to formulate actions that would secure Japan's competitiveness in the field of autonomous driving systems and would solve various societal problems, such as road congestion, road safety and personal mobility for the elderly (Ki, 2020: 31). The major governmental players in the Japanese autonomous vehicle policy making are the Ministry of Internal Affairs and Communications (MIC), METI, MLIT, and National Police Agency. To support this panel, the Strategic Industry Partnership (SIP) was established as the Japanese government's cross-ministerial research and development program (Ki, 2020: F. 3.1., p. 33).

4.5. Society 5.0 (new society)

The exact transition to "Society 5.0" is difficult to determine but the Government's vision is clearly long term and aspirational, and, without details, it is currently impossible to evaluate transport policy in terms of the United Nations' Sustainable Development Goals (SDG) of economic, social and environmental impacts, and it is certainly premature to do so. In November 1995, Japan enacted the Science and Technology Basic Law. The Science and Technology Basic Plan aims to comprehensively and systematically advance science and technology policy. The Plan was endorsed by a Cabinet Decision on 22 January 2016, covering the 5-year period between the fiscal years 2016–2021. That plan was the first to introduce "Society 5.0" as the sort of society that Japan should aspire towards in the 21st Century (Government of Japan, Cabinet Office, n.d.).

An initial step towards achieving "Society 5.0" was made when, in August 2019, the Japanese Government established the Smart City Public-Private Partnership Platform to promote collaboration to achieve "Society 5.0" with more than 100 cities and more than 300 companies and research institutions signed up. Information technologies and artificial intelligence in every industrial sector, and in social activities, aims to address stagnant economic growth, increasing government debt to GDP (266 per cent in 2020), a shrinking and ageing population, and solutions to emerging social and environmental problems, including meeting SDGs, such as energy transitions to a de-carbonised economy.

More specific transport challenges being faced in "Society 5.0" are contained in the 2020 White Paper issued by the Ministry of Land, Infrastructure, Transport and Tourism (Policy Bureau, Ministry of Land, Infrastructure, Transport and Tourism, 2020): climate change; keeping safe from disasters; achieving a sustainable infrastructure maintenance cycle; securing regional transport; and making use of new technologies. The policy goals of an "inclusive" society for transport are to reduce road and public transport congestion, to lower CO_2 emissions, to reduce road traffic accidents, and to stimulate mobility consumption (especially the purchase of autonomous vehicles and "smart", self-driving wheelchairs for the elderly). New "added value" mobility will be generated through the artificial intelligence (AI), analyses of big data in a database spanning diverse types of information that might include sensor data from motor vehicles, real-time information on the weather, road traffic conditions, accommodation, food and drink, and an individual's personal history (Government of Japan, Cabinet Office, n.d.).

The most likely short-term change in the institution of government is the introduction of "agile governance" (Fig. 5) that requires the collaboration of a diverse range of stakeholders, including governments, businesses, individuals, and communities. Participants are expected to carry out ongoing analyses of the social situations they find themselves in, define the goals they seek to achieve in "Society 5.0", design the various systems for achieving these goals, and carry out ongoing dialogue-based assessments of outcomes to make improvements to these systems (Japan, Ministry of Economy, Trade and Industry, 2021: v). Governance-related issues for realising "Society 5.0" are wide ranging, from privacy, system security and transparency to the allocation of responsibilities and cyber security. "Society 5.0" will be socially fluid in terms of its (yet to be determined goals) requiring governments to be more flexible and adaptable to changing circumstances than is currently the case: solutions are constantly revised to ensure their optimality based on conditions and goals that constantly change.

The need to frequently implement the cycles in Fig. 5 imply that a greater spatial devolution of decision making is required. "Society 5.0" should facilitate "innovation by citizens and for citizens" (Deguchi and Karasawa, 2020b: 165), and this supports the proposition that more leadership at the local government level is required. If there is a genuine desire in "Society 5.0" for "Sustainable Growth and Self-sustaining Regional Development," then greater authority should be devolved to Prefecture and Local Governments than is presently the case.

The implications of "agile governance", when formulating future road transport policies, is as follows. Road policy will be designed to continuously, and rapidly, run cycles of "goal-setting", "conditions and risk analysis", "system design", "operations", "evaluation" (with a full range of economic, environmental and social inputs), and "solutions" (Fig. 5) in a closer partnership between the civic and the civil spheres of society. Such communications could be best described as "two-way symmetrical communication" as opposed to one-way asymmetrical communication (see, Black, 1997) that has so dominated "Society 4.0", described by Takayasu (2014) as a top-down, paternalistic approach.

The issue is for governments in Japanese is how best to decentralise and outsource state responsibilities to the private sector. The success of "Society 5.0" will be based on leadership for reform in response to the social needs that arise in the agile cycle of governance and not falling back on the vested interests of government and the old-style, private-sector companies. Digitalisation is paving a way towards significant changes in the way infrastructure is built, operated and financed, with a profound impact on the entire lifecycle of an infrastructure (Cruz and Sarmento, 2021). However, leadership in Japan is still poor in progressing digitisation no matter how the technology advances. This is revealed by the Japanese Government's limited response to the Covid-

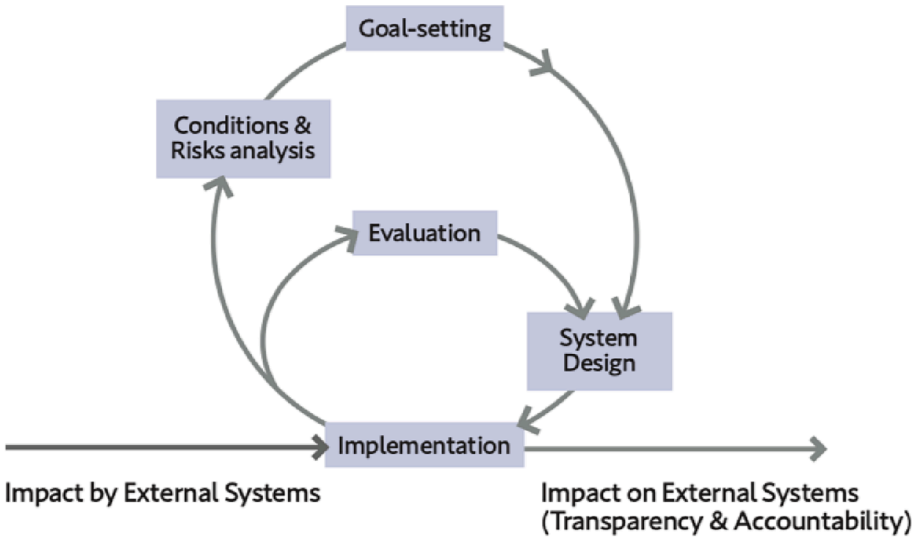

Fig. 5. Flow Diagram Illustrating the Concept of Agile Governance (Source: Study Group on New Governance Models in Society 5.0, 2021: Fig.1.2, p. 8).

19 pandemic.

Japan's basic road infrastructure was developed on a massive scale during the country's high economic growth period of the 1960s, and 1970s. Some of these major roads, tunnels and bridges are more than 60-years old and, despite maintenance programs, they are decaying, placing upward pressure on maintenance and replacement costs. The Technical Subcommittee of the Social Capital Development Council, and the Transportation Policy Council, found that the maintenance and renewal costs for the FY2013 were approximately 3.6 trillion yen (US $27,353,340,000) and estimated that it would be up to 5.5 trillion yen (US$ 41,788,868,000) in 2033 (Ministry of Land, Infrastructure, Transport and Tourism, 2013). According to estimates, around 190 trillion yen (US$ 2,087,481,943,300) will be required for infrastructure renewals over a 50-year period from 2011 to 2060 (Matsuoka and Hirai, 2020: 29). With a significant decrease in the productive-age population in the future, and a shrinking taxation base, the national government must find innovative funding solutions for roads and maintenance, including the role of community organisations in identifying infrastructure maintenance issues. A report by the Tokyo-based Strategic Lifecycle Infrastructure Management (SLIM) has advocated that the local community be involved in periodic inspection programs of roads and bridges and report problems to the local or prefectural governments.

The introduction of autonomous driverless vehicles raises a raft of issues for governments, including defining the "driver" and related legal obligations during an accident, and amending the road rules as society moves towards level 5 automation. Whilst research and development are imperative to transform the transport sector, the major obstacles to the introduction of fully driverless vehicles (Level 5) are legal and regulatory.

The challenges around security and privacy are to make the communication channel secure and to prevent malicious agents attacking the network (Taeihagh and Lim, 2019). Japan is one of the countries that has been developing 'City OS', which involves data security management. The 'Smart City Security Guideline' (Ministry of Internal Affairs and Communications, 2021) provides the framework, potential risks and measures with the target audience directed to those who promote and manage smart cities and mobility service providers. The guidelines provide enough information and procedures with regard to data security management to suggest that personal data can be protected given industry best practice. The privacy issue of vehicles is to hide the real identities to avoid tracking, and the international research indicates that this issue will be addressed through software development (for example, Adeboye et al., 2022).

However, it is important to qualify this optimism because securing enough high-quality experts in computer engineering is a challenge. Distinguished engineers tend to get jobs overseas for higher remuneration offers and better work environments (this outflow of talented human resources is a serious problem across sectors in Japan). Thus, securing human resources for the management of smart cities is an ongoing issue. The transport sector remains a male-dominated sector, and so the encouragement of more females to work in this sector will be important to redress these skilled labor shortfalls.

Japan is a relatively conservative society and encouraging the use of smart technology by some sections of society is not easy and this leads to potential inequities with technological developments. The Japanese government is struggling to implement 'my number card' which is a citizen ID card that contains personal information in one place, and there is a reticence to embrace the digital economy. For example, even at supermarkets when there are long queues at manned checkout counters, most people do not even use the 'self-serve' checkouts (even during this time of the Covid-19 pandemic). Japan is behind some other countries in terms of a Digital Transformation (DX). Education and support of residents needs enhancement to progress societal change and the new Digital Agency, established in 2021, is currently working on this issue.

In the case of Japan, there is every reason to be optimistic that challenges of autonomous vehicle security and privacy will be solved through a partnership of institutions of government, the private sector and academia. The future challenge is to take experience from the numerous demonstrations and trials undertaken across Japan and convert them into operational systems of automated vehicles, freight vehicles and public transport. All trials have involved multiple actors and the future land transport in Japan will involve more delivery actors than at present. The major governmental players in the Japanese autonomous vehicle policy making are the Ministry of Internal Affairs and Communications (MIC), METI, MLIT, and National Police Agency. To support this panel, SIP was established as the Japanese government's cross-ministerial research and development program (Ki, 2020: F. 3.1., p. 33) where challenges identified by Taeihagh and Lim (2019) are being addressed.

The equity issue of AVs, or the affordability of AVs, are not discussed in Japan as much as in Europe and in the USA, but there has been a recent report of panel discussion discussing the use of AVs as part of Japanese Mobility as a Service (Sato and Hashimoto, 2022). They suggest that it will be effective and equitable to use AVs in small- and mid-sized cities in Japan where public transport operators are struggling financially to keep an adequate level of service. The Japanese

Government has a policy objective addressing road transport in more remote regions especially directed towards the mobility of the elderly in an ageing population. The last-mile problem is a particular concern, and AVs can help meeting the demand of people who wish to travel from/to home to bus stops/train stations. With this mobility system, connected AVs and public transport are not necessary competitors.

Advanced AVs are also relevant to public transport operators. For example, a demonstration experiment of a self-driving bus was conducted by the Council for Area Development and Management of Otemachi, Marunouchi, and Yurakucho, in Tokyo. The trial comprised companies, and other organisations in the neighborhood, and the Japanese telecom giant SoftBank's subsidiary Boldly Inc., formerly SB Drive (Michinaga, 2021). Furthermore, digital players, supported by mega-fund investors, are revamping Japan's long-stagnant taxi industry (Argwal *et al*, 2018).

Finally, we add our own perspective on the future new information technology devices for personal mobility in Society 5.0. Future travel patterns will not change a great deal in purpose or quantity (maybe, more working from home, less working hours per day offset by more annual holidays) but the substantive transformation will be in accessing information instantly about any proposed journey. With advances in computing power, miniaturisation and AI, a wrist watch will allow a person to call up a voice app to offer detailed information on customed-made options on any proposed journey/destination (modes available, timetables travel times and costs), to make bookings for a driverless vehicle, or map out the route for a personal autonomous vehicle level 5 and, more importantly, through AI value-added data, obtain a personalised itinerary at the destination, such as tourist sites, hot springs, shopping, cafes, restaurants, etc, all tailored to the personal preferences of the user. Given photos of travellers posted on SNSs are increasingly taking an important role as advertisements, the whole experience of that trip can be re-lived by taking videos/photos that are stored on the Cloud and retrieved at a later date (even years afterwards).

5. Discussion

Based on the information presented in Section 4, we interpret the propositions from the literature on NIE in terms of the evolution of Japanese governments, and governance of the road sector in Japan. First, the interplay between economic and political markets holds the key to the dynamics of institutional change. The evidence from the case study suggests that institutions in agrarian societies changed initially without much influence of economic markets because they were largely non-existent. The most enduring institution is that of the Emperor of Japan, and its earlier manifestations – some of which are surrounded in myth (Ishii, 1980: 3; Kidder, 1993). Japan claims to have the world's oldest unbroken line of rulers (Schley, 2019). In the preamble to the 1889 Constitution, its articles designate the Emperor as the "fountain of order, power and privilege", but, as emphasised by Gordon (2003: 2–3), the early phenomenon of strong, politically active emperors was short lived. Emperors from the 9th through to the 19th centuries had little political influence, and they predominantly carried out ceremonial roles. Other figures came to rule in the name of the Emperor: first, aristocratic families linked to the imperial court; and then military families with diverse social and political bases.

However, the interplay between economic and political markets was important in the dynamics of change from a feudal society in "Society 3.0" to the industrial state of "Society 4.0". The downfall of the Tokugawa *bakufu* can be traced to the external pressures imposed by Western powers, especially diplomatic requests from the Government of the USA to open up Japanese ports for international trade. The unequal treaties imposed on the Japanese economy (Atsumi and Bernhofen, 2011) caused dissent amongst a group of *daimyo*, whose armies, with the agreement of Emperor Komei, overthrew the Tokugawa regime (Sadler, 1937: 246–257). The Meiji restoration introduced a new constitution and the first democratic form of Government. The Meiji Government capitalised and subsidised numerous state-owned enterprises (SOE), but government-failure problems soon triggered a fiscal crisis (Morck and Nakamura, 2007: 4), until wealthy families and entrepreneurs assembled former SOEs into *zaibatsu* (large diversified pyramidal groups of listed firms).

Another example of the interplay between economic and political markets and the dynamics of institutional change was the imposition of a new Constitution by the Americans, following Japan's defeat in the Pacific War of 1945. (Andressen, 2002: 124). In dismantling Japan's war industries that were aligned with the deposed Military Government, the big four *zaibatsu* (Mitsui, Mitsubishi, Yasuda and Sumitomo) were special targets: 83 of their holding companies were broken up. External influences by the Allies had a direct impact on the structure of private-sector organisations in the post-Pacific War period, including the public road sector.

The transformation of institutions of national government, and the governance of the road sector, has occurred over long periods of time, with the dynamics of change tacking place in phases. It took fourteen centuries from the formation of the Yamato state in the late 2nd Century to the unification of Japan (but not Hokkaido) in 1600, The Tokugawa military government lasted 250 years. The following constitutional monarchy has had phases of rapid modernisation to catch up with the west, colonial expansion, militarism, an extraordinary rapid post-second world war economic boom and currently a stagnant economy with a declining population. Local government administration has been an enduring feature of political economy from the Asuka period of the 6th Century.

Roads and road barriers were part of the state security machinery of the Asuka period and were used by the regional *daimyo* for territorial defence. A formal government road bureau appeared in Japan only in the mid-17th Century. This was dissolved with the restoration of the Meiji Emperor in 1868 and the modernisation of Japan used Western forms of government and administration when roads were placed under Public Works and received low investment priority. Stimulated by the Watkins Report (Watkins and Nihon Doro Kodan, 1957), a powerful expressway and highway bureaucracy was established that drew heavily on USA highway design (Black and Rimmer, 1981) – another example of policy transfer. In addition, following overseas models and experiences, the management of the expressways was privatised in 2005 (Mizutani and Uranishi, 2006).

It is self-evident that *people* in institutions and organisations make decisions about what to do when confronted with internal or external pressures for change. Table 1 identifies some of the key political events in Japanese history and the people who were associated with major transformations in the way the Yamato state evolved from the late 2nd Century into a larger territory ruled by the Emperor and the Imperial Court, followed by the collapse of centralised control until the country was united in 1600 with the third military government. The table traces the external influences that led to the Meiji Restoration in 1868, and the re-establishment of a constitutional monarchy through to the present modern democracy.

Similarly, in the case of road administration in Japan, individuals were responsible for introducing new policies. Table 2 lists the road policies and regulations promulgated in the first half of the 17th Century, and the name of the *shogun* in charge of government at the time. Some of the regulations were addressed to the *daimyo* for implementation in their own domains.

The New Institutional Economics identifies that it is the *people* in government, and those responsible for road administration, who are informed by the circulation of ideas on technologies, policies, services and finance (policy transfer). The historical data on Japan strongly supports this proposition both in terms of reforms to government and to policies promulgated in the road sector. Table 3 summarises some of the major cultural and policy transfers from societies external to Japan. Initially, policies were transferred from China. Horses were imported from the Korean peninsula for transport purposes around the 5th

Table 2
Summary of Road Policies and Regulations, 1601–1661.

Year	Shogun	Policy Initiative/Regulation
1601	Tokugawa Ieyasu	Dispatched Okubo Nagayasu (Senior Councillor) and Hikosaka Motomasa (Chief Intendant) to grant official status to designated post stations on the Tokaido, with requirements to maintain 36 horses at each post station (within a few years decree extended to all roads on the Gokaido)
1612	Tokugawa Ieyasu	Directive to *bakufu* intendants: 1. Maintenance of road surface and digging of drainage ditches by sides of the road; 2. No removal of grass on road embankments; 3. Repair of all bridges – large or small by authority of intendant. Directive to *bakuhan*: allocation of corvée extracted from villages along the road to repair and clean assigned sections of the road
1616	Tokugawa Ieyasu	Regulations Concerning Ferry Crossings (*fune watashi sadame*) primarily to enforce designated crossing points at river barriers. Load limit for horses transporting goods fixed at 40 *kan* (150 kg) – a figure that remained constant during Tokugawa era
1625	Tokugawa Iemitsu	Edict on instructions to travellers passing through *sekisho* barriers
1635	Tokugawa Iemitsu	Laws of the Warrior Houses – introduction of *sankin kotai* alternate residence system, and prohibition of *sekisho* being erected on *daimyo* domains (bur circumvented by erection of *bansho* barriers[#])
1637	Tokugawa Iemitsu	Decree for a limited number of post stations on the Tokaido and Nakasendo that "assisting horses" (*sukeuma*) be requisitioned from nearby villages
1659	Tokugawa Ietsuna	Magistrate of Road Affairs (*dochu bugyo*) – overseeing of the upkeep of road infrastructure and processing of petitions; communication policy with *bakufu* intendants (*daikan*) who reported on all matters pertinent to roads under their jurisdiction. *Bakufu* officials periodically checked to ensure approved road and bridge maintenance had been completed satisfactorily to orders. Apart from a few large bridges repaired at *bakufu* expense, most others were maintained as a cost to the local communities.
1661	Tokugawa Ietsuna[##]	Standardisation of travel permits (*sekisho tegata* or *kitte*) that had existed from the 1620 s and specified personal details on females when applying for a permit

For example, Tosa had 86 bansho in the 1780 s of which 62 (*sakaime bansho*) were located on its borders with Sanuki, Awa and Iyo provinces (Vaporis, 1994: 129).

Vaporis (1994: Table 7, p. 140) lists the 22 issuing authorities for each province, or region, for female travel permits for passage through *bakufu sekisho*. (Source: Based in Vaporis, 1994: 17-174, and Notes pp. 269–331; and on Kodansha, 1993: 1577).

Century (the indigenous, wild horses in the Kiso Valley of Japan were too frail to act as beasts of burden). With the Meiji Restoration, the Japanese leaders searched for best practice in government administration in Europe and the USA. The Allied occupation of Japan from 1945 forced a new Constitution on the country and various other US-derived policy reforms. American technical approaches to highway planning, design and economic evaluation are further examples of policy transfer. With globalisation, many nations have been exposed to international trends. The privatisation of infrastructure and its financing (Private Finance Initiatives) in Japan are examples of policy transfer.

The final proposition to examine is about the values that govern decisions in the road sector, and the ways these decisions impact on society. As detailed in Section 4, the initial dominant value underpinning the road sector was to secure Japan territories by utilising the strategic function of roads for control, including barrier stations. This value placed on security remained in place until the Meiji restoration, when road development was neglected, and investment was not given a priority. Only in the post-war era did the Japanese Government change the value system to encourage personal mobility through the development of a domestic automobile industry and the construction of a

Table 3
Examples of Policy Transfer – Government Reform and the Road Sector.

Description of Government Reform/Policy/Technology	Source of Reform/ Policy/Technology
Road design and location of post stations	Chin Dynasty, China
Introduction of domesticated horses for transport of people and goods	Korea
Taiho reforms introduced national administration (*Ritsuryo* system)	T'ang Dynasty, China
Neo-Confucian philosophy of Tokugawa military Government	China
Meiji Restoration and modernisation of government and bureaucracy	European powers and USA
Formation of Ministry of Public Works	European powers and USA
Toyota's first production model – a sedan that borrowed heavily from Detroit automotive technology following Eji Toyoda's overseas visit	USA
New Constitution imposed after Japan's defeat in Pacific War	USA and Great Britain
Expressway design using US Bureau of Public Roads Manual	USA
Highway administration heavily influence by Watkins Report	USA
Privatisation of highway corporation	USA
Private finance initiatives (PFI)	UK

(Source: Authors).

national expressway system. It is important to point out this is only a superficial assessment of changing values, because, in the contemporary world, where policy options are contested by competing groups, the different values attached to the economy, the environment and society would need to be fully analysed through further research.

However, the data from Section 4 does allow a deeper interpretation of the impacts of road policies on society. Contrasts in mobility between the present-day and previous societies could be summarised, but, for brevity, only a comparison between "Society 3.0" and "Society 4,0" is presented in Table 4. The characteristics of society are described as road governance, road funding, personal mobility, daily routines, working conditions, transport technology, mass communications and transport energy sources. Governments of both "societies" formulated clear policies for roads, and both societies had mechanisms for maintaining roads. Of course, the vehicle technologies, and the power systems to move those vehicles, are dramatically different.

Travel is a derived demand from the socio-economic activities in which people are engaged so it is in these aspects of society that the most profound changes have occurred. In an agrarian society the majority of the population were farmers and were tied to the land. In addition, both *bakufu* and *han* (provincial) governments restricted the movement of ordinary people unless there were successful applications to obtain a travel permit. Not only were there spatial restrictions but little change in inter-generational occupations so society was very static. The major qualitative transformations in "Society 4.0" included: a reduction in transaction and travel costs; removal of the Confucian class system; an expansion in occupations; unbounded personal mobility; inter- and intra-regional migration; choice of residential and workplace locations; and optimism that, over time, prosperity and well-being would continue to increase as it had in the 1970 s.

When speculating on the difference between "Society 4.0" with "Society 5.0", our working assumption is that agile governance (Fig. 5) is successfully introduced in Japan at all levels of government, and that NPOs (Not for Profit Organisations) and the community are formally engaged in the process of formulating policies, programs and projects. The context for this is that in October 2020, Prime Minister Yoshihide Suga declared the aim of Japan was to achieve a carbon neutral, decarbonised society by 2050. The Ministry of Economy, Trade and Industry is focusing its efforts on innovative technologies and financial investments for the "de-carbonisation" of all sectors of the economy, including transport. An over-riding consideration is the introduction of a

Table 4
Characteristics of Societies 3.0 and 4.0 – Transport and Mobility.

Characteristic of Society	Society 3.0	Society 4.0
Road Governance	Policies formulated by *bakuhan* system	Policies formulated by national government
Road Funding	Impost by *bakufu* on *daimyo* (*han*) government plus local corvée inputs by peasants	National and Prefecture Governments budget allocations with money raised from taxation
Personal Mobility	Highly regulated market	Intra- and inter-regional migration; unrestricted travel in domestic and international markets
Daily routines	Fixed, and tied to agricultural seasons; barter and markets	Flexible; commuting; shopping malls; on-line shopping
Working Conditions	Every day except for recognized festivals	Regulated working hours, paid vacations, public holidays
Transport Technology	Horses, carts, *norimono*, *kago*, and walking	Motor vehicles, taxis, buses, coaches, trucks, *jinrikisha*, bicycles, walking
Mass Communications	Written edicts nailed on posts; gossip	Newspapers*, radio, cinema, television, internet
Transport Energy Sources	Animals and humans	Petroleum, diesel, batteries, hydrogen fuel-cells

* The first publication date of the *Yokohama Mainichi Shinbun* (横浜毎日新聞), was in 1871. It was a daily news paper that reported on foreign and domestic affairs. (Source: Authors).

new "agile" governance model from the perspectives of the processes (rulemaking, compliance, monitoring and enforcement) and stakeholders (government, companies, individuals and communities) of governance (Japan, Ministry of Economy, Trade and Industry, 2021).

Policies formulated by agile governments at all three levels will become a characteristic of road governance. The regulatory framework (see, for example, Australia, NSW Regulatory Policy Framework Review Panel, 2017) will remain a critical determinant of how Japanese governments deliver their services effectively The functions of national and prefecture road authorities, and the responsibilities of local government – and the way they are structured – are not static over time but have evolved with regulatory and policy reform. There are signals from the national government of a desire to decentralise government decision making and to increase the participation of the private sector through greater consultation.

Although road funding will remain the responsibilities of government there will be a greater application of user-pays principles, such as road pricing. Personal mobility may not change dramatically but the quality in planning a trip precisely, and value-added information at the destination, will be enhanced through the application of AI software. Daily routines will become more flexible and many routine chores replaced by autonomous delivery vehicles and drones in rural areas. Autonomous driving vehicles will become the dominant road transport technology in Japan "Society 5.0" and all modes of transport will be powered by green energy sources. There is a strong belief in the Japanese vehicle manufacturing industry that technology can help solve personal mobility problems, without over-burdening the energy sector, adding to environmental pollution and solving road safety problems.

In the case of Japan, there is every reason to be optimistic that challenges of autonomous vehicle security and privacy will be solved through a partnership of institutions of government, the private sector and academia. The major governmental players in the Japanese autonomous vehicle policy making are the Ministry of Internal Affairs and Communications (MIC), METI, MLIT, and National Police Agency. To support this panel, SIP was established as the Japanese government's cross-ministerial research and development program (Ki, 2020: F. 3.1., p. 33) where challenges identified by Taeihagh and Lim (2019) are being addressed. There already exists a roadmap of autonomous vehicle development has been updated annually since 2014 (Promotion of Advanced Information and Telecommunications, 2019: 103–111) that will propel driving on the road into Society 5.0. The road traffic law was revised in April 2022 (coming into effect in April 2023) for Level 4 autonomous driverless vehicles to be introduced on more remote roads (Japan, Library of Congress, 2022).

Distinctive features of the roadmap are the respective scenarios for three types applications: passenger vehicles; logistics services; and public transport services. This revolution in the transport sector, such as the protype Toyota's Woven City near Shizuoka (https://www.woven-city.global/) has demanded increased inter-ministerial cooperation which may break down institutional silos across all levels of government administration. For example, the Panel on Business Strategies in Automated Driving is housed in the Ministry of Economy, Trade and Industry (METI), and in the Ministry of Land Transport and Tourism (MLIT). Miniaturisation and increased computation power of devices will allow continuous access to information in a socially connected society. The constraint on a digitising society will be the supply of electricity: the concerns about the safety of nuclear power plants still remains high after the Fukushima Daiichi crisis of 2011.

With an emphasis on an "inclusive" society in "Society 5.0", the elderly, and those physically challenged, will be enabled to move about on their own through the use of self-driving wheelchairs. According to Deguchi and Karasawa, 2020b: 161), planners must achieve a perspective of harmony between individual and group interests when designing the environment and institutions, as the "principle of honouring human dignity requires no less." All of this seems to be predicated on a substantial shift in values from the current position of a predominantly paternalist government in road planning – described by Healy (1977: 205) as "a positivist procedure which has been criticized as technical and elitist" – to genuine co-production in road planning and implementation and solving mobility problems. Thought also needs to be put into the most suitable model of road administration (see the options in).

6. Conclusions

The academic literature on case studies of transport policy has been criticised as being too focused on the quantitative paradigm and they have not analysed an adequate number of real-world policies. In response, this paper has provided a transdisciplinary case study of Japan where the evolution of both government systems, the administration of roads, road policies and impacts on society have been described. The Government of Japan has divided the history of society in terms of five, distinctive epochs commencing with the hunter-gather society and finishing with the information technology and a digitised society. Our empirical approach has taken these five societies as an organising framework for describing the primary and secondary data (in English and Japanese) on governments and governance of the road sector. These data are interrogated through the lens of the New Institutional Economics (NIE) to shed light on the following key propositions:

- the interplay between economic and political markets holds the key to the dynamics of institutional change;
- transformation occurs over long periods of time, with the dynamics of change in phases;
- it is *people* in institutions and organisations who make decisions about what to do when confronted with internal or external pressures for change;
- it is *people* who are informed by the circulation of ideas on technologies, policies, services and finance (policy transfer); and
- judgement on which values govern the decision and in what way do they impact on society.

The political context for road administration in Japan has evolved with time, as would be the case in all societies, and transformations have been, of course, unique. The country evolved from the Jomon hunter-gatherer society to the Yayoi society that was dominated by kinship clans. Territorial consolidation of clans led to the formation of the state of *Wa* under Queen Himiko and the power of the Court that later morphed into a country headed by an Emperor. Centralised power declined with the rise of military governments and independent territories ruled by *daimyos*. It was not until 1600 that the Japanese archipelago was united under one warlord (*shogun*). In 1868, the Emperor was reinstated as Head of State and a modernisation program, based on Western models, introduced a bureaucratic system that included roads. Following Japan's defeat in the Pacific War a new Constitution was imposed by the USA and its allies. A modern democratic system of government (with three tiers) has prevailed with a Ministry of Land, Infrastructure, Transport and Tourism (MLIT) now responsible for the national road and mobility sector.

Successive government regimes have formulated road policies with various objectives. Early road policies were aimed at securing state boundaries (the use of barriers) – a common policy in the state formation of many countries. Many instruments, such as road widths, pavement formation and drainage, and the provision of post stations, were imported from China (policy transfer). The medieval period in Japan was characterised by largely independent domains as the central power of the Emperor was eroded and roads (and waterways) served the purpose of moving agricultural produce, especially rice, within the domain. With the unification of the country in the early 17th century, the Tokugawa military government used roads as an instrument of social control. Barriers were used to ensure no guns were smuggled into Edo, that checkpoints ensured that hostages in the capital did not escape and that ordinary people only travelled with permits, mainly issued for purposes of a pilgrimage.

The Tokugawa Government's policy of an alternate attendance system for the *daimyo* and their retainers meant they had to travel to and from Edo on the national highway system, spending money at post stations on the way (where the government obtained taxes). The system drained their financial resources with the result that the merchant class, as money lenders to these *daimyo*, grew richer. With the restoration of the Emperor, a modern road bureaucracy was created but its importance in providing personal mobility to the masses was delayed until post-Second World War reconstruction and the promotion of living standards that included a domestic automobile industry, private vehicle ownership and an expansion of a national expressway system. A whole range of environmental and technological issues have arisen from these developments that still resonate as Japan (and other countries too) moves through the 21st century into "Society 5.0". The characteristics of this future society have been described, along with the challenges being faced with particular reference to the road and mobility sectors. The implications for all levels of government and the private sector in Japan have been identified, especially the need for agile governance and the need for a continuous cycle of rapid responses to emerging issues (Fig. 5), and the need for the devolution of decision making to the local level. including a greater role for the private sector and the community in the mobility sector.

The current focus in Japan, as in all countries, is how to construct "a post- pandemic world"C. The ovid-19 pandemic has had a large impact on the transport sector. In Japan, public transport in mid-to small-sized cities has been affected by patronage loss and this continues in 2022 and connected autonomous public transport services are a government priority, especially for the mobility of the elderly. However, preparatory studies to progress "Society 5.0" seems to be low priority at the beginning of 2023. For example, the transport sector is not receiving any financial support from the national government who merely keeps issuing 'state of emergency' funds or equivalent rules. Many public transport operators are "private" companies in Japan, which is different from other countries. This budget situation is impacting on their abilities to invest in smart mobilities, as identified for "Society 5.0"- and described in this paper. History informs us that institutions of governance are fluid. There appear to be no external or internal treats to the legitimacy of the modern democratic state of Japan, and the ceremonial role of the Emperor, and this will continue to mid21st Century at least, but when there truly is a need to change, and it is widely supported, the system can alter course relatively quickly and effectively (Andressen, 2002: 149-50).

The findings from this research on Japan suggests that the New Institutional Economics (NIE) provides a robust framework of questions to pose then analysing transport policy in any jurisdiction, and, at any time. The interplay between economic and political markets was important in the long-term dynamics of change from a feudal society in "Society 3.0" to the industrial state of "Society 4.0". The downfall of the Tokugawa *bakufu* can be traced to directly the external pressures imposed by Western powers to open up Japanese ports for international trade and the imposition of unequal trade policies. It is obvious that *people* in institutions and organisations make decisions about what to do when confronted with internal or external pressures for change. Table 1 identifies some of the key political events in Japanese history and the people who were associated with the major transformations in government whereas Table 2 illustrates the *shoguns* in the 17th Century who were responsible for various road policies and directives. Similarly, Table 3 reinforces the proposition that leaders and bureaucrats are informed by the circulation of ideas on technologies, policies, services and finance (policy transfer) with examples drawn from policy transfers on government reform and road policy development. Finally, the extensive historical perspective has not allowed any substantial judgement on which value systems have governed the decisions in the road sector when there are competing policies, such as in the modern era: this is an area for further research. However, the road policies and their impact on society's mobility are much more amenable to analysis and interpretation as demonstrated in Tables 4 and 5.

The framework provided by New Institutional Economics (NIE), and its central propositions, is a useful starting point for designing qualitative transport policy research case studies in any spatial unit or time period that can complement the mainstream research approach of quantification of policy options and their costs and benefits. International studies with common protocols could assess the policies and outcomes with evidence-based measures for designated countries, regions or cities (for example, funding under the East Asia Society for Transportation). Japan has its long history and an extensive written record which allowed us to conduct this historical analysis, which is not available in new countries, such as the USA, but obviously the scope of any research can be over a shorter period of time. Studies in European countries where there is a long history, where hunter-gather societies were a basic way of living, and international invasion was the main threat to clan leaders, would provide an interesting comparative aspect in researching transport policy and society.

In the application of the NIE framework to research in Japan the bibliography in this paper on institutions would provide a suitable springboard for case studies of specific eras and geographical locations. The framework is suitable to apply when there is a regime change, or a change in political party, and a different policy agenda is proposed. Under traditional departmental arrangements, the Minister has the authority to make decisions that directly affect road-related outcomes, but there are other institutional arrangements for road provision in "Society 5.0" that require further research, such as output-based management, the road fund model or the public utility model.

Footnotes.

1. The Taika Reforms established the "position of *seii taishogun* (征夷大将軍)", or "generalissimo who conquers the barbarians" – the supreme military chief with the mandate to quell frontier rebellions within Japan. The position of *shogun* evolved with time: the military

Table 5
Characteristics of Societies 4.0 and 5.0 – Transport and Mobility.

Characteristic of Society	Society 4.0	Society 5.0?
Road Governance	Policies formulated by national government	Policies formulated by agile governments at all three levels
Road Funding	National and Prefecture Governments budget allocations with money raised from taxation	National and Prefecture Governments budget allocations with money raised from taxation; Increased user-pays contributions
Personal Mobility	Intra- and inter-regional migration; unrestricted travel in domestic and international markets	Arranged through a personal app with AI personal preferences include in the app
Daily routines	Flexible; commuting; shopping malls; on-line shopping	More flexible; working from home; on-line shopping and delivery by ADV and robots; drone deliveries
Working Conditions	Regulated working hours, paid vacations, public holidays	Less paid working hours; greater gender household equality in household tasks; More equal opportunities for all genders and generations
Transport Technology	Motor vehicles, taxis, buses, coaches, trucks, *jinrikisha*, bicycles, walking, shared car services (Uber/Lyft)	On demand transport; ADV for people and freight; Emphasis on rural disadvantage of elderly population
Mass Communications	Newspaper, radio, cinema, television, internet	Miniaturisation; Hand-held devices for information; Regulated social media; WWW and Cloud Computing
Transport Energy Sources	Petroleum, diesel, electric batteries, hydrogen fuel-cells	One hundred percent green renewable energy

(Source: Authors).

chief won power by force of arms, with the emperor legitimising this title.

2. *Bushi* (military gentry) were the warrior elite that emerged in the provinces of pre-modern Japan from the early 10th Century (Kodansha, 1993: 1306). By the late 12th Century they became the ruling class of the country (until 1868) and were more widely known as samurai ("One who Serves").
3. Tokugawa *Shogunate* political strategy in its first fifty years was to control the provinces with the active allocation and withdrawal of domains. 172 new *daimyos* were created and 206 were given fief increases for notable service; there were 281 occasions that *daimyos* were transferred from one domain to another with the quality of the new fief in proportion to service rendered; and 213 *daimyos* lost all or part of their estates in punishment (Kodansha, 1993: 1580). The principal officials of the Tokugawa shogunate were held by the *fudai daimyos* with other lesser offices held by the *hatamoto* and *gokenin* (liege vassals) such that governance was in the hands of the most powerful "warlords".
4. For example, at Hakone (about 87 km southwest of Nihonbashi), there were in total 51 guards (in 1688) comprising of head guards (*banshi*), who inspected the surrounding areas, regular guards (*joban*), who inspected authorised travel permits, foot soldiers (*ashigaru*) and attendants (*chugen*). Its arsenal contained 10 match-lock guns, five Japanese native long bows, 15 long-handled spears and halberds and 12 staves (Vaporis, 1994: T 6, p. 117).

CRediT authorship contribution statement

John A. Black: Funding acquisition, Methodology, Conceptualization. **Hitomi Nakanishi:** Methodology, Conceptualization. **Yasuko Hassall Kobayashi:** Methodology, Conceptualization.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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