


RESEARCH ARTICLE

Supplying the city of Ioannina with ‘modern’ waters, 1913–1940: the ‘modern infrastructural ideal’ in a mid-size Greek town

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Abstract

A part of the Ottoman Empire for centuries, the city of Ioannina integrated into the Greek state following the Balkan wars of 1912–13. This article provides a first in-depth historical account of the city’s water supply system from the early 1910s to the eve of World War II, and traces the path leading from a traditional system relying on private wells and public fountains to a modern water network entering inhabitants’ homes. In doing so, it also offers material and insights contributing to a larger research project on the technological modernization of urban Greece in the inter-war period, during which the Greek state itself was driven by a particularly strong urge to modernize the country.

Introduction

After flourishing as the cultural and commercial centre of the (Byzantine) Despotate of Epirus, which was established in the aftermath of the Fourth Crusade in 1204, the city of Ioannina surrendered to the Ottoman army in 1430. For a long time thereafter it continued to rank amongst the most dynamic urban centres of the Balkan Peninsula, both from an economic and a cultural standpoint.¹ Along with other Ottoman cities of the time, it was affected by the reform movement known as Tanzimat (1830s–1870s) and subsequently embarked on a course of technical modernization. However, this process was rather slow in materializing, since a modern water supply network was eventually built only at the end of the 1930s. In the meantime, Ioannina had ceased to be a part of the Ottoman Empire and had been integrated into the Greek state, one of the victors of the Balkan wars of 1912–13.

This article proposes a first in-depth historical account of the water supply to the (now Greek) city of Ioannina from the early 1910s to the eve of World War II. It traces the path leading from a traditional system relying on private wells and public fountains to a modern water network entering inhabitants’ dwellings. While it focuses on a subject of historical research that is worthy of investigation in its

¹On the Balkan city under Ottoman rule, see the classic work by N. Todorov, *The Balkan City, 1400–1900* (Seattle, 1983).

own right,² this case-study also aims to provide additional material and insights for a larger research agenda on the technological modernization of Greece in general and the modernization process that the country's urban landscape underwent in the inter-war period in particular.³ After being for years a minor subject matter, almost entirely absent from the research agenda pursued by scholars working on the evolution of modern Greece, the subject of the country's technological modernization has recently gained traction. This has resulted in a growing number of studies that progressively depict a nation that periodically launched ambitious technological modernization projects. However, even though the relevant scholarly literature has been enriched and is becoming increasingly varied, most studies on the issue have essentially been concerned with nationwide technological enterprises as well as with projects taking place within the largest metropolitan areas of the country, especially Athens and, to a lesser extent, Salonika.⁴

In studying how the 'modern infrastructural ideal'⁵ in terms of water services came about in the city of Ioannina, we suggest a shift in focus and an emphasis on medium-sized and small cities, a hitherto highly uncharted territory on the country's map of technological modernization. By placing the city's water project

²Several historical works dealing with the various aspects either of traditional urban water supply systems relying on wells and fountains or of modern water networks entering inhabitants' homes have recently been published in *Urban History*: J. Hiller, 'Implementation without control: the role of the private water companies in establishing constant water in nineteenth-century London', *Urban History*, 41 (2014), 229–46; M. Guardia, M. Rosselo and S. Garriga, 'Barcelona's water supply, 1867–1967: the transition to a modern system', *Urban History*, 41 (2014), 415–34; L. Tomory, 'Water technology in eighteenth-century London: the London Bridge Waterworks', *Urban History*, 42 (2015), 381–404.

³'Modernization' is a loaded term and the so-called 'modernization theory', which was developed in the 1960s, has come in for much criticism. The use of this term by the authors of this article does not refer to any specific general theory on the shift from 'pre-modern' to 'modern' societies. For the purpose of our research, we simply posit that certain features of the developed western world – such as the 'modern infrastructural ideal' and the recruiting of functionaries as well as the enlisting of the services of professionals on the principle of merit and not in accordance with heredity and privilege, to name just two such features that directly relate to our research – can be labelled 'modern'. 'Modernization' is therefore used as shorthand for a comparison of those specific features found in the most developed parts of the world and elsewhere, Greece in our case. For such a use of the term 'modernization', see Thomas W. Gallant, *Modern Greece* (London, 2001), xiii.

⁴V. Tsokopoulos, *Megala technika erga stin Ellada, teli 19ou – arches 20ou aiona* (Athens, 1999); A. Karadimou-Gerolympou, 'Poleis kai ypaithros. Metaschimatismoi kai anadiarthroseis sto plaisio tou ethnikou chorou', in C. Chatziisif (ed.), *Istoria tis Elladas tou 20ou aiona*, vol. B1: 'O Mesopolemos, 1922–1940' (Athens, 2002), 59–105; K. Chatzis, 'La modernisation technique de la Grèce, de l'indépendance aux années de l'entre-deux-guerres: faits et problèmes d'interprétation', *Études Balkaniques*, 40 (2004), 3–23; M. Kaika, *City of Flows: Modernity, Nature, and the City* (New York, 2005); K. Chatzis and G. Mavrogonatou, 'Technologia kai dimosia sfaira stin Ellada: to zitima tis ydrodotisis tis Athinas mesa apo to prisma tis "dimopoiisis", 1880–1914', *Ta Istorika*, 28 (2011), 323–42, and 29 (2012), 145–70; L. Theodoridou (ed.), *I ektropi tou Strymona. Ta megala exygiantika erga tou Mesopolemou* (Serres, 2017); A. Sakellaridou, P. Samarinis and E. Chatzikonstantinou, 'To egcheirima kataskevis odikon ypodomon sti mesopolemi Ellada mesa apo to paradeigma tis "Symvasis Makri"', in E. Avdela, R. Alvanos, D. Kousouris and M. Charalampidis (eds.), *I Ellada sto Mesopolemo* (Athens, 2017), 83–106; L. Papastefanaki, *I Fleva tis gis: Ta metalleia tis Elladas, 190s–200s aionas* (Athens, 2017); S. Arapostathis and A. Tympas (eds.), 'History of technology in Greece, from the early 19th to 21st century', Special Issue of *History of Technology*, 33 (2017).

⁵S. Graham and S. Marvin, *Splintering Urbanism: Networked Infrastructures, Technological Mobilities and the Urban Condition* (London, 2001).

within the broader context of the technological modernization of Greece, the evidence provided below will therefore be utilized to help deal with a series of more general and still largely unanswered questions including those that follow. Did Greece's technological modernization in the inter-war period remain confined to a limited number of areas and sectors or was it much more diffuse and inclusive? Was it just a 'top-down' undertaking, essentially only initiated and carried out by the central state and its expert bureaucracy, or did local political elites and municipal engineers partake in the process as well? What was the part played by non-state actors, such as consulting engineers and public works firms for example, in modernizing urban Greece?

The article is organized as follows. The core is dedicated to the detailed history of the water supply of the city of Ioannina from the early 1910s to the end of the 1930s. This central part is bookended by two much shorter sections. It is preceded by a brief description of the 'Ottoman waters' of the city, taking the reader to the point of departure of the story told within the article, namely the year when Ioannina was incorporated into the Greek state. The article ends with a conclusion, where the evidence that has been presented will be brought together to shed additional light on the process of technological modernization that urban Greece underwent in the inter-war period.

The 'waters' of the Ottoman city

The Istanbul Municipality Law was promulgated in 1868, and two years later, in 1870, provisions were made for the establishment of councils in provincial cities along the same general lines as in the code of regulations for Istanbul.⁶ These provisions were replaced by the Vilayet Belediye Kanunu (Cities Municipal Act), promulgated on 5 October 1877 and probably the most comprehensive piece of Ottoman municipal legislation.⁷ According to the laws of 1870 and 1877, the mayor was appointed by the provincial governor from amongst the now elected members of the municipal council, which had to include an engineer.⁸ Before 1870, the technical requirements of towns were dealt with by central government engineers who were sent out to the various provinces of the empire.⁹

⁶There is only a small corpus of scholarly work on the history of the city of Ioannina in the nineteenth and twentieth centuries. See nevertheless E. Dimitriadis, *To Vilaeti ton Ioanninon kata to 19o aiona. Giannena. Apo tin 'poli-pazari' stin 'poli-praktoreio'*. *Istoriki Chorologiki-poleologiki-ktiriologiki meleti* (Salonica, 1993).

⁷G. Young, *Corps de droit ottoman*, vol. I (Oxford, 1905), 69–84. On the technical and administrative modernization of the Ottoman city, see among others: U. Freitag, M. Fuhrmann, N. Lafi and F. Riedler (eds.), *The City in the Ottoman Empire: Migration and the Making of Urban Modernity* (New York, 2011); N. Lafi (ed.), *Municipalités méditerranéennes. Les réformes urbaines ottomanes au miroir d'une histoire comparée (Moyen-Orient, Maghreb, Europe méridionale)* (Berlin, 2005); J.L. Arnaud, 'Modernization of the cities of the Ottoman Empire (1800–1920)', in R. Hood, A. Petruccioli and A. Raymond (eds.), *The City in the Islamic World* (Leiden, 2008), 953–76, and 1399–408.

⁸According to the law of 1870, the municipal engineer took part in the deliberations of the council and was even able to vote. In the law of 1877, he sat in on council meetings as a 'consultant member' only.

⁹For examples of works in Ioannina carried out by engineers of the province, see A. Karadimou-Gerolympou, *Metaxy Anatólis kai Dysis. Boreioelladitikes poleis stin periodo ton Othomanikon metarrythmision* (Athens, 1997), 126–31.

From the 1870s until the incorporation of Ioannina into the Greek state in 1913, the municipality was run according to the laws of 1870 and 1877, even though it took some time for several of their provisions actually to be applied. Thus, despite the aforementioned laws, no municipal council elections were held until 1883.¹⁰ However, the obligation to have an engineer on the municipal council was complied with from 1870 onwards, while from 1871 to 1913, the office of town engineer was occupied by several technicians of various nationalities.¹¹

As regards the city's water supply, based on information collected from disparate sources, Ioannina seems to have displayed similar characteristics to other Ottoman towns of the time.¹² Thus, according to the local historian Ioannis Lampridis, in the 1880s, almost all of the town's households had their own wells.¹³ The town's inhabitants could also draw their water either from the lake of Ioannina or from a series of public water distribution points, public wells and fountains scattered throughout the town.¹⁴ The town's fountains appear to have been supplied via two aqueducts: the first brought spring water from the western to the northern part of the city;¹⁵ the second, whose construction, according to the archaeologist S. Dakaris, predates 1835, supplied the southern part of the town through two water tanks.¹⁶ On a map of Ioannina drawn in 1902 by an amateur surveyor, one can identify 41 public wells located on various city streets and squares, as well as two public fountains.¹⁷

Despite a clear willingness to modernize, the Ottoman municipality eventually did not succeed in pulling the town out of its *ancien régime* past, as far as the water supply was concerned at least. The chronic insufficiency of the municipal revenues seems to have sapped the will to act.¹⁸ Would the Greek municipality be able to act any more effectively?

The 'waters' of the Greek municipality, 1913–40

The incorporation of Ioannina into the Greek state in 1913 did not at first signify any radical changes at municipal level. In 1913, the Greek government appointed Yaya Bey, the last acting mayor of the Ottoman period, as head of the (now Greek) municipality of Ioannina (the Greek government continued to appoint the town's mayor until 1925) as well as all the members of the outgoing municipal

¹⁰V. Pyrsinellas, *Istoria tis poleos ton Ioanninon* (Ioannina, 1959–60), 66.

¹¹*Ibid.*, 66–8, 72. On the figure of the Ottoman engineer from the end of the eighteenth century to the early twentieth century, see D. Martykánova, *Reconstructing Ottoman Engineers: Archaeology of a Profession (1789–1914)* (Pisa, 2010).

¹²On the city of Heraklion (*Kandiye*), see S. Spanakis, *I Ydrepsi tou Irakleiou, 828–1939* (Heraklion, 1981), 89–102.

¹³I. Lampridis, 'Perigrifi tis poleos Ioanninon' (1887), *Ipeirotika Meletimata*, vol. B, 2nd edn (Ioannina, 1993), 14–15.

¹⁴Dimitriadis, *To Vilaeti ton Ioanninon*, 166.

¹⁵S. Dakaris, 'I ydrepsi ton Gianninon stous chronous tis Tourkokratias', *Ipeiroteki Estia*, 17 (Sep. 1953), 919–23 (especially 919–20).

¹⁶On water fountains in this part of the city as well as the probable route of the aqueduct, see D. Salamagkas, *Giannotika Symmeikta* (Ioannina, 1959), 85–90. On the two reservoirs, see Dakaris, 'I ydrepsi ton Gianninon', 920–3.

¹⁷E. Ntatsi, 'Enas agnostos poleodomikos chartis ton Gianninon tou 1902', in *Ipeiros: Koinonia-Oikonomia, 15os–20os aionas* (Ioannina, 1987), 91–108.

¹⁸Pyrsinellas, *Istoria tis poleos*, 64.

council elected in 1910.¹⁹ This 'new-old' local authority in turn reappointed the numerous employees of the former Ottoman municipality, including the then town engineer Periklis Melirrytos (1870–1937).²⁰ Hailing from a family of local notables, Melirrytos was a graduate of the civil engineering department of the Polytechnic School of Athens in 1893²¹ who filled the post of town engineer until the mid-1930s.²²

This continuity in terms of municipal actors – from 1913 to the mid-1930s, several people who had served as city officials during the Ottoman rule also sat on the new (Greek) municipal council²³ – should not, however, conceal the fact that for the city of Ioannina the year 1913 marked the end of an era. Indeed, the city's departure from the Ottoman Empire was accompanied by the arrival upon the local political and administrative scene of a new actor, the representative of the (Greek) central government, called the Geniki Dioikisis Ipeirou (General Governorship of Epirus, hereafter General Governorship). Whilst the main administrative unit of the Greek state at that time was the prefecture (*nomos* in Greek), the so-called New Lands, including Epirus, which became part of Greece following the Balkan wars of 1912–13, were organized into much larger regional units, themselves split into prefectures.²⁴ As will be seen shortly, the General Governorship would rapidly emerge as a major actor on the municipal water stage throughout the period 1913–40.

The city had hardly become part of Greece when the General Governorship took action, asking, on 9 April 1914, the municipal council to approve a draft contract between the representative of the central government and Christos Zavitsianos, a Greek businessman residing in Lausanne and the winner of the tender launched by the General Governorship for the city's electric lighting and water supply. Although the councillors expressed their gratitude to the General Governorship for its initiative and approved the draft contract in total, they refused to give up their role as managers of municipal affairs. They therefore demanded changes to 13 out of the 47 articles of the draft contract and even managed to incorporate the bulk of the proposed amendments into the final contract.²⁵ Under the terms of the latter, Zavitsianos was to bring to the city on a daily basis 600 cubic metres of drinking water from the spring of Plitsi, located near the lake of Ioannina and to distribute it via 30 public fountains scattered throughout the urban area. For his services, Zavitsianos would receive from the municipality an annual payment of 27,000 drachmas, while he was also allowed to sell water directly to the city's

¹⁹*Ibid.*, 74.

²⁰See the minutes of the municipal council meetings (hereafter MMCM) housed in the Ioannina Municipal Archives (hereafter IMA): IMA/MMCM, 26 Feb. 1913, 27 Feb. 1913, 4 Apr. 1913.

²¹N. Kitsikis (ed.), *Techniki Epetiris tis Ellados*, vol. B (Athens, 1934), 210. Unless otherwise mentioned, information about Greek engineers is drawn from this publication.

²²IMA/MMCM, 23 Oct. 1935, 10 Dec. 1935.

²³Ch. Tsetsis, *Afto pou kyvernisan ta Giannina. Dimarchoi-Dimotikoi Symvouloi, 1913–1998* (Ioannina, 1998).

²⁴P. Poulis, *Istoria tis Ellinikis Dimosias Dioikisis*, vol. I: 1821–1975 (Athens and Komotini, 1987), 89–92; E. Nikolaïdou, 'I organosi tou kratous stin apeleftheromeni Ipeiro, 1913–1914', *Dodoni*, 16A (1987), 497–610.

²⁵IMA/MMCM, 9 Apr. 1914, 14 Apr. 1914.

households at the annual rate of 80 drachmas per cubic metre.²⁶ The winner of the tender had to complete the water works within 21 months after the contract was signed, while the concession was granted for a period of 30 years starting from the date of the completion of the works.²⁷ In view of the town's meagre revenues, the council decided to make use of the Greek legislation on municipalities to levy a tax of 2 per cent on the value of goods imported into the region as of 1 January 1915 and for a period of four years.²⁸

This first attempt initiated by the General Governorship to create a new water system for the city of Ioannina proved unsuccessful. The outbreak of World War I, which was to spark prolonged civil strife between the followers of the king and those of the liberal modernizer Eleftherios Venizelos (1864–1936),²⁹ would lead to the definitive cancellation of the planned works in the first half of the 1920s.³⁰ However, a new attempt, once again emanating from the central government, to find a permanent solution to the problem of supplying the town with water took place in the mid-1920s. In the early autumn of 1924, Petros Loprestis (1870–1941), a civil engineer working for the Ministry of Transport (the first technical ministry in the history of modern Greece, established in 1914)³¹ and specializing in urban hydraulics,³² was dispatched to the region of Ioannina to address the city's water issue. A few months later, Loprestis communicated to the councillors the main outcomes of his field trip. The state engineer had identified two springs as sources for the water supply, Sentenikos and Krya, both of which had the required production capacity to satisfy the city's needs. According to his rough estimation, the cost of the works required would amount to around 20,000 pounds sterling (around 7,700,000 drachmas).³³ Shortly after they had received the results of Loprestis' study, the council contacted the engineer Aristippos F. Kousidis (1871–1934), a former professor at the National Technical University of Athens and an Epirote himself. In a letter dated 17 November 1926, Kousidis affirmed the estimate of costs given by Loprestis and proposed that he

²⁶To facilitate cross-country comparisons, sterling to drachma rates in the inter-war period were as follows: in 1914, one pound sterling was equal to 25.2 drachmas; in 1922, the rate was 166.5; in 1923, 296.4; in 1927, 368.6; in 1931, 352.8; and in 1936, 539.3.

²⁷A copy of the contract, eventually signed on 18 Jun. 1914, can be found in the Genika Archeia tou Kratous – Istoriko Archeio Ipeirou (General State Archives of Greece – Historical Archive of Epirus) (hereafter GAK–IAI). See 'Ar. 1185: Ergoliptikon fotismou kai ydrefseos tou Dimou Ioanniton', GAK–IAI/Geniki Dioikisis Ipeirou (hereafter GDI), F. 224, Ypf. IV, 1923. See also IMA/MMCM, 9 Apr. 1914.

²⁸IMA/MMCM, 2 Jul. 1914.

²⁹G. Hering, *Die Politischen Parteien in Griechenland, 1821–1936* (Munich, 1992).

³⁰Ar. 174: Antigrafon Apofaseos tou Dimotikou Symvouliou tou Dimou Ioanniton', GAK–IAI/GDI, F. 224, Ypf. IV, 1923; IMA/MMCM, 10 Jul. 1935.

³¹20 years later, the Ministry of Transport employed more than 300 engineers. See Y. Antoniou, M. Assimakopoulos and K. Chatzis, 'The national identity of inter-war Greek engineers: elitism, rationalization, technocracy, and reactionary modernism', *History and Technology*, 23 (2007), 241–61.

³²On Loprestis, a graduate of the R. Scuola d'Ingegneria di Padova in 1893, see K. Chatzis and G. Mavrogonatou, 'Marathon dam: a collaboration between American and Greek engineers', *Engineering History and Heritage*, 166 (2013), 13–25, on 6 and 21.

³³Ar. 20: Antigrafon apofaseos tou Dimotikou Symvouliou Dimou Ioanniton' (meeting of 31 Jan. 1927), GAK–IAI/GDI, F. 300, Ypf. I, 1928; 'Ar. 45: Antigrafon apofaseos tou Dimotikou Symvouliou Dimou Ioanniton' (meeting of 22 Feb. 1927), GAK–IAI/GDI, F. 300, Ypf. I, 1928; IMA/MMCM, 31 May 1926.

would himself undertake a detailed study on behalf of the city for the sum of 122,500 drachmas.³⁴

Headed by the mayor Vasileios Pyrsinellas (1878–1959), a cosmopolitan lawyer and a seasoned politician,³⁵ the council moved quickly. During the negotiations for the provisional budget for the financial year 1927–28, and after a rather calm debate, it was decided to allocate the amount of 100,000 drachmas for a detailed study of Ioannina's future water system.³⁶ It was Loprestis himself, in tandem with his colleague from the Bureau of Water Works at the Ministry of Transport, Dimitrios Arliotis,³⁷ who eventually authored the study, completed in August 1927 and approved by the Ministry of Transport on 20 December 1927.³⁸ After thoroughly examining the two natural springs that could potentially supply the town of Ioannina with water, namely Krya and Sentenikos, the two state engineers opted for the second one on the basis of lower costs, while the expenses to build the water infrastructure were now estimated at 12,350,000 drachmas. On top of that amount came the annual cost of pumping water from the Sentenikos spring into a storage reservoir, from where water would flow with gravity downhill to the town. According to the authors, the annual additional cost would amount to 940,000 drachmas.³⁹ It would take approximately 12 years eventually to bring the Loprestis–Arliotis study to fruition, a period marked by constant shilly-shallying between the town's technical services, the municipal council, the General Governorship of Epirus, the central government technical services as well as the various engineering consultants and public works firms involved in implementing the project. What follows is just a selective account of the most important episodes in a rather twisted story.

Pyrsinellas lost the municipal election of 1929, but the question of the water supply was of such fundamental importance to the city that the new mayor of Ioannina, Dimitrios Vlachleidis (1875–1951), a cosmopolitan doctor who headed the municipality from 1929 to 1941,⁴⁰ immediately took up where his predecessor left off. At the end of 1920s and in the early 1930s, despite considerable amounts spent by the city just purchasing water from springs on the outskirts of Ioannina and subsequently carrying it into the town with the help of tanks – 800,000 drachmas for the year 1934 alone⁴¹ – water was still among the most pressing matters for

³⁴Ar. 45: Antigrafon apofaseos tou Dimotikou Symvoulίου Dimou Ioanniton' (meeting of 22 Feb. 1927), GAK–IAI/GDI, F. 300, Ypf. I, 1928.

³⁵After studying law at the University of Athens, Pyrsinellas continued his studies in Paris. In 1915, he was elected as a member of parliament for the Popular Party (Laiko Komma), the party opposed to the Venizelos liberals. He was appointed mayor of Ioannina on 3 Nov. 1920 and headed the municipality until 20 Feb. 1923. He became the first elected mayor in Oct. 1925 and remained in this post until Aug. 1929. In 1932–33, Pyrsinellas was again elected as a member of parliament. On Pyrsinellas and his family, see M. Zagli-Boziou, *Oi oikogeneies Makri-Pyrsinella* (Ioannina, 1998); Tsetsis, *Aftoi pou kyvernisan*, 42–5.

³⁶Ar. 45: Antigrafon apofaseos tou Dimotikou Symvoulίου Dimou Ioanniton' (meeting of 22 Feb. 1927), GAK–IAI/GDI, F. 300, Ypf. I, 1928.

³⁷Like Loprestis, Arliotis also graduated from an Italian engineering school – the Regio Institute Technico Superiore di Milano – in 1914.

³⁸IMA/MMCM, 10 Jul. 1935.

³⁹IMA/MMCM, 10 Jul. 1935, 21 Jan. 1931.

⁴⁰Tsetsis, *Aftoi pou kyvernisan*, 76–8.

⁴¹IMA/MMCM, 29 Nov. 1934.

the municipal authority. Lack of access to adequate quantities of drinking water was not the only problem. As the shortage of water had also made street cleaning a rare operation, the town was often also overwhelmed by dust.⁴² In addition, as a whole host of wells located inside the city walls were drying up during the summers, entire neighbourhoods lacked water for significant periods of time. To add insult to injury, several city wells were polluted by sewage and at the turn of the 1920s, Ioannina experienced some 200 cases of typhoid and paratyphoid fever each year, around 10 per cent of which proved fatal.⁴³

It was during one such adverse period that the new municipal council resurrected the 1927 Loprestis–Arliotis study. However, in order to minimize the risks inherent in such major projects, the councillors unanimously voted to allocate the sum of 15,000 drachmas to commission an additional expert to assess the existing study.⁴⁴ Georgios Georgalas, a graduate of the Technische Hochschule Berlin in 1918 and a lecturer at the National Technical University of Athens, submitted his report to the council on 31 May 1931.⁴⁵ Although he agreed that the only natural springs that could permanently supply Ioannina with water were those of Krya and Sentenikos, Georgalas did not support his colleagues' ultimate preference for the latter and declared himself in favour of the Krya spring, mainly on the basis of the larger quantity of water available.⁴⁶ The municipal council approved his findings and unanimously decided that the town would be supplied with water from the Krya spring on the basis of the Loprestis–Arliotis study, which now needed to be modified slightly. The mayor himself therefore set to work on finding an engineer to recast the original study accordingly.⁴⁷

Once these decisions made by the council had been approved by the General Governorship of Epirus, the city initially turned to Loprestis to make the necessary adaptations. The latter however turned down the invitation. The next to be approached was the co-author of the initial study, Arliotis, who responded positively by immediately dispatching a young engineer named Alexandros Machairas in return for a payment of 30,000 drachmas. A graduate of the civil engineering department of the National Technical University of Athens in 1923, Machairas had begun his career as engineer at the technical department of the city of Athens and specialized in urban hydraulic works. Machairas' study was submitted in March 1932 and approved both by the municipal council and the mighty representative of the central state in Epirus, the General Governorship.⁴⁸ Three years later, the city engineer Athanasios Aliefs, another civil engineering graduate of the National Technical University of Athens, supplemented Machairas' study with an additional mains pipe destined to supply a new neighbourhood named

⁴²See the accounts provided in local newspapers of the time, cited in I. Nikolaidis, *Ta Giannina tou Mesopolemou*, vol. IX (Ioannina, 1995), 228.

⁴³IMA/MMCM, 21 Jan. 1931.

⁴⁴IMA/MMCM, 21 Jan. 1931, 31 Jul. 1931.

⁴⁵IMA/MMCM, 31 Jul. 1931, 10 Jul. 1935.

⁴⁶When commenting on Georgalas' report, the mayor noted that the Krya source would also provide better quality water, as revealed by the chemical analyses requested from the chemical laboratories of the Ministry for the Economy by Loprestis himself when preparing his study (IMA/MMCM, 31 Jul. 1931).

⁴⁷IMA/MMCM, 31 Jul. 1931.

⁴⁸IMA/MMCM, 9 Nov. 1931, 10 Jul. 1935.

Nea Kolchis, inhabited by Greeks from Asia Minor who had settled in the region of Ioannina following the population exchange agreement between Greece and Turkey in 1923. Those changes, along with successive enlargement of the network, always under the strict control of central government engineers, resulted in a slight increase in the cost of the project, as in 1935 the forecast amount totalled 17,433,900.5 drachmas.⁴⁹

The technicalities of supplying Ioannina with water were but one aspect of the project. There was also the sensitive issue of financing, which also remained unresolved. While ‘resurrecting’ the Loprestis–Arliotis study, the municipal councillors started to seek out possible sources of funding for the project. The first option considered was to raise a loan for the sum required. In order to service such a loan and to cover running costs – mainly those associated with pumping the spring water up to the main storage reservoir – the municipal council considered a compulsory subscription from the owners of all town buildings to be supplied by the projected network. This measure was approved by the General Governorship and, despite the protests of some municipal councillors, it was accompanied by a threefold increase in the municipal taxes imposed on goods entering the town.⁵⁰ The severe world-wide economic crisis of the early 1930s, which also hit Greece⁵¹ and resulted, among other things, in a rapid devaluation of the national currency, made the question of a loan even more problematic. Should the loan be made in sterling – as demanded by the National Land Bank (Ethniki Ktimatiki Trapeza),⁵² the potential lender with whom the municipal council had started negotiations – or in drachmas? Most councillors inclined towards a prudent wait-and-see attitude.⁵³ Pending the stabilization of the global economic situation, the municipal council postponed the increase in the municipal tax for goods imported into the town for the financial year 1933–34.⁵⁴

However, the same economic crisis did not prevent a number of foreign and domestic financial actors from expressing an interest in the city’s water supply project. Thus, through the intermediary of its Greek representative, an engineer named Diamantidis, a large French pipe manufacturing company, Pont-à-Mousson,⁵⁵ proposed that it would fund the project in return for a concession. British companies also made similar offers. The Elliniki Ilektriki Etairia (Greek Electricity Company), which was already collaborating with the municipality,⁵⁶ also expressed its interest in a contract to provide the town’s water service. When questioned by the

⁴⁹IMA/MMCM, 10 Jul. 1935. The difference between the sum of 17,433,900.50 and the estimate of 12,350,000 drachmas in the Loprestis–Arliotis study of 1927 can mainly be explained by inflation and the devaluation of the drachma against sterling, which had an impact on the prices of imports used in constructing the water networks.

⁵⁰IMA/MMCM, 21 Jan. 1931, 17 Feb. 1932.

⁵¹M. Mazower, *Greece and the Inter-War Economic Crisis* (Oxford, 1991).

⁵²IMA/MMCM, 17 Feb. 1932.

⁵³IMA/MMCM, 23 Dec. 1931.

⁵⁴IMA/MMCM, 17 Feb. 1932.

⁵⁵A. Baudant, *Pont-à-Mousson, 1918–1939: stratégies industrielles d’une dynastie lorraine* (Paris, 1980).

⁵⁶The Greek Electricity Company was set up in 1899 by the National Bank of Greece, the General Public Works Company (Geniki Etairia Ergolipsion) and the Thomson-Houston Mediterranean Electricity Company (with French and Belgian capital). See N. Pantelakis, *O exilektrismos tis Elladas. Apo tin idiotiki protovoulia sto kratiko monopolio (1889–1956)* (Athens, 1991), chs. 4, 11 and *passim*. It was on 31 May 1926

municipal council, the minister of transport noted that the proposal of the French constructor satisfied the town's interests, although the councillors expressed strong reservations about putting its water supply in private sector hands. They sided with Mayor Vlachleidis, who wanted the town to control its own water supply and consequently, in 1934, they unanimously decided that Ioannina's water supply system would be run by the municipality itself and that the work would be funded by a loan to be serviced through a compulsory subscription programme, a decision approved by the Ministry of Transport. Ultimately, it was the National Bank of Greece (Ethniki Trapeza tis Ellados) that was to grant the town a loan of 20,000,000 drachmas at 7.5 per cent interest over 30 years.⁵⁷ The water supply works were to be executed by a firm to be selected by public tender on the basis of a contract negotiated by the municipality and drawing upon the studies compiled by Loprestis and Arliotis, Georgalas, Machairas and Aliefs.⁵⁸

In the summer of 1935, the stage appeared to be set for the start of the tender process. Yet the question of the energy that would be used to lift the water from the spring to the storage reservoir still remained unresolved. Although the initial study by Loprestis and Arliotis envisaged the use of diesel motors,⁵⁹ the arrival in town shortly after the study of the Greek Electricity Company changed matters as it enlarged the potential sources of energy that could be utilized for that purpose. When contacted by the council, the company first delayed making concrete proposals. While waiting for the company's answer, on the advice of the town's technical department and after receiving General Governorship's approval, the municipal council decided to split the water supply project into two large and relatively independent segments: the construction of the (main) network itself and the construction of the pumping station. Thus, while awaiting the response of the Greek Electricity Company, the town engineer Periklis Iliopoulos, a graduate of the mechanical and electrical engineering department of the National Technical University of Athens in 1923, who had previously worked for the company, drafted the contract and terms of the tendering process for the water supply network only.⁶⁰

A year or so elapsed between Iliopoulos' initiative and the public tender process itself, which eventually took place on 6 September 1936⁶¹ – a year that witnessed the exchange of strong views between the city and central government engineers over the terms of the contract and the conditions of the tender process. While the Ministry of Transport favoured the use of pipes manufactured by centrifugation,⁶² this type of pipe had barely been tested in Greece and so both the town engineer and the municipal council initially refused to follow the Ministry's recommendations. However, after numerous discussions and a series of requests for further information to the Ministry of Transport, the mayors of other towns and the Technical Chamber of Greece, the professional association of Greek engineers

that the municipal council entered into a contract (drafted on 26 Apr.) with the company (IMA/MMCM, 31 May 1926, 16 Sep. 1926).

⁵⁷On the terms and conditions of the loan, see IMA/MMCM, 20 May 1936.

⁵⁸See IMA/MMCM, 28 Feb. 1934, 25 Oct. 1934, 29 Nov. 1934, 10 Jul. 1935.

⁵⁹IMA/MMCM, 1 Nov. 1935.

⁶⁰IMA/MMCM, 10 Jul. 1935, 13 Aug. 1935, 2 Sep. 1935.

⁶¹IMA/MMCM, 4 Feb. 1936.

⁶²Baudant, *Pont-à-Mousson, 1918–1939*.

established in 1923, the municipal councillors eventually decided that centrifugally manufactured pipes could be used alongside traditional pipes.⁶³

The public tender of September 1936, concerning the water supply network itself (specifically, the collection and storage of spring water and the network of main pipes) resulted in an agreement between the city and Konstantinos Manolakis. A graduate of the mechanical and electrical department of the National Technical University of Athens in 1908, Manolakis was at the time the director of ETKA, a 1,000,000 drachmas nationwide construction company, whose origins can be traced back to the 1920s.⁶⁴ It is worthy of note that in addition to being an energetic entrepreneur,⁶⁵ Manolakis distinguished himself as an active member of the professional association of Greek engineers in the 1930s, even presiding over its public works committee.⁶⁶ It was on 2 November 1936 that the contract was signed between the town and ETKA, with the engineer Alexandros Machairas acting as Manolakis' legal representative. Construction works started in April 1937.⁶⁷ As agreed with the General Governorship, it was Iliopoulos, the town engineer, who had overall control and was responsible for overseeing the work. Under the terms of the contract, Manolakis had to submit a detailed study of his own. His report on 5 December 1936 included many proposals that altered the initial study used as the basis for the public tender procedure.⁶⁸ This triggered yet another series of negotiations between the town engineer, the municipal council, central government and its engineers and the construction firm.⁶⁹ If in most cases the opinions of the various parties ended up converging without too much fuss, albeit after much to-ing and fro-ing, certain more enduring differences sometimes emerged and became the subject of heated debates.

One such difference concerned the diameter of the central collector pipe. Manolakis wanted this to be 300mm, 25mm larger than the diameter favoured by the town engineer and approved by the General Governorship. To justify this proposal, Manolakis relied on estimates he had made on the basis of the so-called Darcy formula, while the municipality's technical service had derived its own calculations from the Kutter equation.⁷⁰ Based on information contained in the sales catalogues of the Pont-à-Mousson company, Manolakis argued that 300mm diameter pipes were standard and readily available on the market, whereas the 275mm diameter pipes had to be ordered specially. In other words, Manolakis was brandishing the spectre of a long delay in the project's execution. Nevertheless, the municipal councillors were apparently little impressed by this threat and unanimously

⁶³On these exchanges, see IMA/MMCM, 1 Nov. 1935, 4 Mar. 1936, 13 Mar. 1936, 29 Apr. 1936.

⁶⁴ETKA stands for Ergoliptiki Etaireia Technikon Kataskevov. In the early 1930s, it was a general partnership company. Information on ETKA can be found in the Archives of the National Bank of Greece (Istoriko Archeio tis Ethnikis Trapezas (hereafter IAET): see IAET, IA/ETE S36 Y7.3 F1559).

⁶⁵Manolakis appears to have been very active at this time, since he was in the process of negotiating the contract to begin the work of providing water to the city of Volos. See A. Dimoglou, 'Poli kai topiki aftodioikisi: I periptosi tou Dimou Pagason (Volou), 1881–1944', University of Ionian (Corfu) Ph.D. thesis, 2003, 229.

⁶⁶*Technika Chronika*, III (35) (1933), 580; VI (178) (1938), 593; VI (64) (1934), 744–5.

⁶⁷IMA/MMCM, 7 Apr. 1938.

⁶⁸IMA/MMCM, 4 Feb. 1937.

⁶⁹IMA/MMCM, 4 Feb. 1937 and 20 Sep. 1937.

⁷⁰On these formulas, see H. Rouse and S. Ince, *History of Hydraulics* (Iowa, 1957), 170–1 and 177–8.

rejected Manolakis' proposal, which resulted in larger pipe diameters and, therefore, increasing costs.⁷¹ This decision made by the council greatly irked the governor general, who at that time enjoyed the privileges of an Interior Ministry (within the region of Epirus) in the government of the dictator Ioannis Metaxas (4 August 1936–1 January 1941). On 3 March 1937, the representative of the central government in Epirus convened the municipal council and used particularly forceful language to demand that the latter reconsider its decision. The councillors were accused of demonstrating unpardonable irresponsibility as, in attempting to make petty savings, they risked further delays in the construction of the network at a time of great political instability in Europe, when nobody could really tell what the future held in store. Both the engineer of the General Governorship and the town engineer were summoned to clarify their views and further explain their choices. Though they both valiantly stuck to their initial arguments in favour of the 275mm diameter pipes, the governor general was adamant about defending Manolakis at all costs, declaring that he knew the businessman personally and held him in high esteem. The municipal council came under heavy political pressure and reversed its decision.⁷² A new agreement was reached, with Manolakis being required to complete the project within 300 working days of the signing of the new contract.⁷³

Meanwhile, the town engineers began to focus on the work not included in the initial contract, namely the construction of the pumping station and the connection of the city's buildings to the central network. The same intense exchanges of views occurred between the town and central government engineers to determine the very content of the new studies and set the terms of both the contract and the tender procedure.⁷⁴ On 21 November 1938, two contracts were awarded for connecting the first set of 1,500 dwellings to the central network⁷⁵ and for the installation of 40 public fountains and 50 fire hydrants. The winner was an old acquaintance of the municipal council and the town's technical services, Alexandros Machairas. But as soon as the outcome of the public tender was notified, the newspaper *Ipeiros* began to publish a series of articles claiming that the amount of 2,650 drachmas per connection was particularly high. The General Governorship immediately turned to the council for clarification. Placed once more in an embarrassing situation, the council decided not to ratify the outcome of the bidding procedure prior to the approval of the General Governorship. At the same time, the municipal councillors requested a written statement from the Ministry of Transport, which also found the price too high. The state engineers considered that a price of 2,484 drachmas would be more reasonable. Machairas, who was notified by Iliopoulos, declared himself willing to lower his price by 100 drachmas, but he rejected the price proposed by the Ministry. After a tense discussion, a majority of the council members accepted Machairas' new offer and ratified the outcome

⁷¹IMA/MMCM, 25 Feb. 1937.

⁷²Even so, the minutes of a subsequent meeting referred to pipes 275mm in diameter. See IMA/MMCM, 7 Apr. 1938.

⁷³IMA/MMCM, 3 Mar. 1937.

⁷⁴IMA/MMCM, 20 Sep. 1937, 20 Dec. 1937, 20 Jul. 1938, 9 Aug. 1938, 1 Nov. 1938.

⁷⁵As for the remaining water connections, the municipality reserved the right to undertake the work required either by public tender or by carrying out the work by itself (IMA/MMCM, 9 Aug. 1938).

of the bidding procedure.⁷⁶ The pumping station proved an even more complex issue. Town engineer Iliopoulos suggested that the mayor give priority to the proposals of the Greek Electricity Company, already in partnership with the town, and, if the municipality found them acceptable, to negotiate the contract directly – subject to the approval of the General Governorship – and without putting it to tender. However, the mayor wanted maximum transparency and felt that awarding any public contract directly, however well-founded from an economic perspective, would inevitably result in public criticism. The mayor's stance was supported by the municipal council, which decided to put the contract out to public tender on 20 December 1937. What followed was the usual to-ing and fro-ing between the municipality and the state engineers concerning technical specifications and the definition of the terms of the public tender procedure. As usual, these two documents were initially drafted by Iliopoulos, the town's engineer. In the summer of 1938, the council voted to put out a tender for the installation and operation of a pumping station at the Krya spring for a 20-year period.⁷⁷ Invitations to tender were initially received on 15 December 1938, but the only bidder to materialize, the Greek Electricity Company, was excluded from the process on a technicality as it had not submitted a specific tax document.⁷⁸ Invitations were again received on 1 March 1939 and this time the candidates consisted of the aforementioned company and Alexandros Machairas. After lengthy debate, the municipal council decided not to award the contract immediately.⁷⁹ However, the Greek Electricity Company, which was connected, as has been seen, to the National Bank of Greece, i.e. the lender of the city for the water project, eventually won the tender, and in the summer of 1939 the council approved the resulting contract.⁸⁰

Although the pumping station was still characterized as 'provisional' in February 1940,⁸¹ spring water flowing into a modern network had already reached the town's buildings on 1 May 1939.⁸² Shortly after, and with the essential part of the works completed, the municipality decided to take direct charge of distributing water to the city's inhabitants by establishing a special municipal water department⁸³ and by introducing mandatory water meters for the subscribers to the brand new network.⁸⁴ By 1940, a quarter century after it had been incorporated into the Greek state, Ioannina could pride itself on being one of those urban areas on the periphery of Europe where the 'modern infrastructural ideal' (as far as water supply was concerned at least) had materialized to a significant extent.

⁷⁶IMA/MMCM, 28 Dec. 1938.

⁷⁷IMA/MMCM, 20 Dec. 1937, 26 Jan. 1938, 20 Jul. 1938, 9 Aug. 1938.

⁷⁸IMA/MMCM, 28 Dec. 1938.

⁷⁹IMA/MMCM, 6 Mar. 1939, 28 Mar. 1939.

⁸⁰IMA/MMCM, 6 Mar. 1939, 28 Mar. 1939, 14 Apr. 1939, 31 Jul. 1939, 21 Aug. 1939.

⁸¹IMA/MMCM, 2 Feb. 1940.

⁸²IMA/MMCM, 5 Sep. 1939.

⁸³IMA/MMCM, 5 Sep. 1939 and 13 Nov. 1939. See also IMA/MMCM, 11 Aug. 1939, 22 Aug. 1939.

⁸⁴Under the system adopted, each dwelling received a fixed quantity of water in return for which the house owner had to pay the municipality a fixed price (15 drachmas per cubic metre, i.e. the 'obligatory part of the subscription'). Excess consumption, which was measured by metering, was billed in addition to this fixed amount (IMA/MMCM, 22 Aug. 1939). On water metering and the different types of subscription, see K. Chatzis, 'Breve storia dei contatori dell'acqua a Parigi, 1880–1930', *Storia Urbana*, 116 (2007), 77–99.

Conclusion

With a population oscillating around 20,000 over the period 1920–40, the city of Ioannina ranked 17th among the 45 ‘largest’ cities – those with population of over 10,000 – in Greece in 1940.⁸⁵ Although a mid-sized town by Greek standards, it proved able, in the space of the quarter century after it was incorporated into the Greek state in 1913, to achieve the ‘modern infrastructural ideal’ in terms of water services: in fact, while exclusively relying on private wells and public fountains when they first became Greek citizens in the early 1910s, by 1940, the town’s residents could enjoy water at home thanks to a modern network. Now that the details of the history of water supply and distribution in Ioannina from 1913 to 1940 are known, it may be useful to place this case-study in a series of broader contexts in order to connect it to a number of current historical debates.

Bloated and ineffective, fraught with corruption and clientelistic: these are some of the terms often used to describe the (modern) Greek state. However, a wave of new scholarship has started casting it in a much more favourable light, emphasizing, among other aspects, its significant involvement in the modernization of the country.⁸⁶ The present article, whether through its subject matter or via the general perspective it adopts, intersects with and may hopefully enrich this (relatively) new approach to the Greek state as an active, and frequently effective, agent of technological modernization of the nation. Through its subject matter: by deciding to work on the history of Ioannina’s water supply system, the authors have aimed to expand the scope of the research agenda on Greece’s technological modernization by shifting the focus from nationwide technological enterprises (such as the building of an asphalt road system covering large parts of the country, its electrification, or the vast land reclamations carried out in the north of the country) and from infrastructural projects taking place essentially within the largest metropolitan areas of the country (especially the region of Athens and, to a lesser extent, Salonika)⁸⁷ to mid-sized Greek cities, a largely unexplored area so far for scholars of technological modernization in Greece. Through the general perspective the article adopts, in contrast to the majority of studies focusing on the history of the Greek state and economy, which make use of macroscopic and statistical-based approaches, the authors of the article, in line with recent trends in Greek historiography, have accorded a central position to the various (micro)actors, be they (formal) organizations or living and interacting people, all participating in the achievement of the ‘modern infrastructural ideal’ in Ioannina from 1913 to 1940. What general lessons and insights into Greece’s technological modernization process can therefore be gained from this one-off study dealing with a mid-sized city and carried out with the aid of an analytical framework that emphasizes the role of the various (micro)actors – such as high-ranking state officials, local political elites,

⁸⁵In 1920, the town had a population of 20,765; by 1928, the population was 20,485 and in 1940, it had risen to 21,877 (Karadimou-Gerolymou, ‘Poleis kai ypaithros’, 62).

⁸⁶For a survey and references, see K. Chatzis and G. Mavrogonatou, ‘From structure to agency to comparative and “cross-national” history? Some thoughts regarding post-1974 Greek historiography’, *Contemporary European History*, 19 (2010), 151–68.

⁸⁷See the references cited in n. 4.

state and municipal engineers, consultants and engineering firms – in the modernization process?⁸⁸

Judging from the very early and steady involvement of the central state, especially through the intermediary of the General Governorship of Epirus, in the successful building and operation of a modern water supply network serving the city of Ioannina, one can reasonably argue that the modernizing zeal permeating Greece in the inter-war period was not confined to a limited number of areas and sectors, but it reached, on the contrary, large parts of the country, including the medium-sized cities. It should be noted that this interest expressed by the central state in Ioannina's 'water affairs' took a twofold form. Not only did the central state set the legal framework for the activities of the (now Greek) municipal council and closely monitored decisions made by it as well as their implementation, but it also constantly proved willing to provide the municipality with its own technical expertise, accumulated mostly within the Athens-based Bureau of Water Works, while informing the councillors about the experience of other municipalities as far as water supply issues were concerned.⁸⁹ Despite their growing intervention in municipal affairs, the representatives of the central state and its expert bureaucracy cut, on the whole, a rather fatherly, supporting figure and, with only a few rare exceptions – such as the intervention of the General Governorship in favour of Manolakis' request, which had initially been rejected by the municipal council – they did not seem to have sought to challenge and overturn any of the council's major decisions.

Did the capacity of the Greek central state to penetrate rapidly the territories recently liberated from Ottoman rule make the modernization of Ioannina's water supply system a mere 'top down' undertaking? In light of the empirical evidence provided by the article, the answer appears to be negative. As a matter of fact, the undeniable impetus for modernizing reforms that came from outside the city fell neither on barren soil nor deaf ears. Though they were now caught in the net of a centralized national government, the councillors did not develop a 'subdued' identity; they never stepped down from the stage of the city's water system and, all in all, succeeded in remaining an active part of the modernization process with regard to the city's water supply. There were several reasons for this. From 1913 to 1940, the municipal council largely drew on well-educated, and often cosmopolitan, individuals who shared along with the central government officials and state engineers a willingness to improve the welfare of their constituents.⁹⁰ Judging from the various contributions to the discussions on the water issue at the council meetings, most councillors were, in fact, both aware and advocates of the 'modern infrastructural ideal', while some of them had even already experienced

⁸⁸For the presentation and use of this analytical framework, see D. Bocquet, K. Chatzis and A. Sander, 'For free good to commodity: universalizing the provision of water in Paris (1830–1930)', *Geoforum* 39 (2008), 1821–32; Chatzis and Mavrogonatou, 'Technologia kai dimosia sfaira stin Ellada'.

⁸⁹Thus, in 1927, the General Governorship of Epirus received from the Ministry of Interior detailed information about the water supply systems of the cities of Lamia and Heraklion (GAK–IAI/ GDI), F 300 Ypf I, 1928).

⁹⁰Brief biographies of the city's councillors can be found in Tsetsis, *Aftoi pou kyvernisan*. Nevertheless, a prosopography of the key municipal officials (municipal councillors and municipal engineers) is still required.

it during their time in various European cities, including Paris. Being imbued themselves with an ‘engineering culture’ that foregrounded and promoted the manipulation of the urban setting in order to make it conform to a rising set of expectations,⁹¹ the local political elites could also rely on the expertise of their own city’s engineers, who, on the whole, proved able to interact productively with their state counterparts who were involved in the project to supply the city with a modern water supply in the 1920s and the 1930s.

In the light of the above, the technological modernization process the city of Ioannina underwent in the inter-war period proved a mixture of ‘top down’ and ‘bottom up’ paths, with the two levels of the Greek government, central and local, along with their expert bureaucracies, heavily involved in the process. This shared and strong commitment of various state actors to the ‘modern infrastructure ideal’ should not obscure the fact that the modernization process in Ioannina greatly benefited from the services, and competencies, of non-state actors as well, since consultant engineers and engineering firms – the modern heirs to the roving craftsmen and itinerant guilds that flourished under Ottoman rule, so to speak – also actively took part in the design and building of the city’s modern water supply system.

Monographic in nature, this study necessarily leaves the question of the representativeness of the historical account presented here and the degree of generality of conclusions drawn from this case-study largely unanswered. Future comparative studies eventually may enable to determine what is bound up in the specific characteristics of the city of Ioannina and what, in contrast, is part of more general trends that also concern other similar towns in Greece and the broader region.

⁹¹On the notion of engineering culture(s), see P. Carroll-Burke, ‘Material designs: engineering cultures and engineering states – Ireland 1650–1990’, *Theory and Society*, 31 (2002), 75–114.