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Engineers for Seoul: Sewage Treatment and the Professionalization of Sanitary Engineering in Korea*

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Introduction

Between 1960 and 1990, the keywords for how people understood the environment in Seoul drastically changed. In the early 1960s, "sanitation (위생, 衛生)," "public nuisance (공해, 公害)," and "nature conservation (자연보전, 自然保全)" were the main concerns of city government bureaucrats, limited scientists and medical doctors, and a few conservationists. In the late 1980s a new adjective "environmental (환경, 環境)" became the domain of city and central government bureaucrats, civic activists, engineers and scientists both in the academe and the field. In about 30 years "pollution (오염, 汚染)" and "ecology (생태, 生態)" became part of everyday discourse. The adjective "environmental" has become so universal that everything from education to policy became the domain to be environmentally friendly.

What made this drastic change in epistemology and life possible? Can we identify a single event that drastically changed everything from the idea to a field? Or, was it more like a series of occasions that made multiple transitions possible from one to the next and yet to another? How did what bureaucrats know about the environment influence how engineers taught the next generation?

In this paper I approach the three decades of the 1960s, 1970s, and 1980s as the historical moments of interaction where experts and practitioners in public health,

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public works, civil engineering, and microbiology crossed each other's paths. The field of environmental engineering is still a field in the making after sixty plus years since its first conceptualization due to the particular formation of the field in these time periods. Using examples from university curriculum and field practices, I compare and contrast two major professional organizations in environmental engineering. By showing the ongoing tensions between professional societies and trade associations, the very reason of success in forming a new field of sanitary engineering, I argue, became a hurdle for subsequent development in the professionalization of a new field. This paper focuses on Korean case studies and a general overview of the history of environmental engineering in Korea.

This paper is part of a bigger project that looks at the mutual formation of environmental expertise and infrastructure in Korea. In this project I focus on the meaning of the "environmental" when it is placed as an adjective in front of movements, engineering, and policy. I understand this question of "environmental" as a universal adjective can be applied to other countries and regions of the world. I also contend that this question is supposed to be asked not just as a question in the history of the concept but as a question in the history of expertise and governance. For that particular purpose, I have been looking at multiple origins of American sanitary engineers and their transition to environmental engineers and hope to compare and contrast the experiences of these two countries in near future. I aim to bring together synthetic claims about the co-production of regulatory engineering with case studies on Korean and American environmental engineering education and practices.[1] For now this paper focuses on Korean experience and highlights sewage treatment as the intersection of government, academic, and corporate efforts.

Background and Literature Review

To understand the changes in how we understood urban environmental issues and how society responded to the challenges of pollution and resource depletion, we need to first review the scholarship of environmental history. I will begin this section with previous works of North American and European origin. To serve the purpose of this paper, I will focus more on the works that directly address wastewater problems in urban settings in the long twentieth century. Then I will turn my attention to Korean and Asian scholarship more broadly to set up my topic.

Samuel P. Hays has been regarded as one of the pioneers who contributed to our

[1] On the idiom of co-production, see Sheila Jasanoff, ed., *States of Knowledge: The Co-Production of Science and Social Order* (New York: Routledge, 2004). Jasanoff developed this idea into regulatory science and sociotechnical imaginaries.

understanding of pollution and society from a historical perspective. Hays rediscovered the significance of the ideal of conservation in government and private sectors of American society into the Progressive Era (late nineteenth century to early twentieth century).[2] Hays then tracked down the then-contemporary history of environmental politics in the United States. His attention to technical details and bold argument about reason for American passion of environmentalism (beauty, health, and permanence) resonated with scholars who wanted to find the delicate lines that connect distributed dots.[3]

Martin Melosi took Hays into more technical and urban direction with his seminar book *Sanitary City* and subsequent works and Joel Tarr also dived deep into the intersection of the history of technology and environmental history in his books such as *Search for an Ultimate Sink* and *Making Industrial Pittsburgh Modern*.[4] Some American scholars went ahead to understand particular people who contributed to the development of knowledge and infrastructure for better health and environment in urban settings.[5] Other scholars have traced the developments of public works in urban America to the early sanitation and social reform efforts in United Kingdom and Germany.[6]

Around 1990, following the footsteps of Melosi, Tarr, and Hays, a crew of the historians of technology and environmental historians became more interested in the relationship between technology and nature. A special interest group (SIG) was formed in 2000 with the name "Envirotech" which became more active in annual

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[2] Samuel P. Hays, *Conservation and the Gospel of Efficiency: The Progressive Conservation Movement, 1890–1920* (Pittsburgh, PA: University of Pittsburgh Press, 1999).

[3] Samuel P. Hays, *Beauty, Health, and Permanence: Environmental Politics in the United States, 1955-1985* (Cambridge, MA: Cambridge University Press, 1987); Samuel P. Hays, *A History of Environmental Politics Since 1945* (Pittsburgh, PA: University of Pittsburgh Press, 2000).

[4] Martin V. Melosi, *The Sanitary City: Urban Infrastructure in America from Colonial Times to the Present* (Baltimore: John Hopkins University Press, 1999); Joel A. Tarr, *The Search for the Ultimate Sink: Urban Pollution in Historical Perspective* (Akron, OH: University of Akron Press, 1996); Edward K. Muller and Joel A. Tarr, *Making Industrial Pittsburgh Modern: Environment, Landscape, Transportation, and Planning* (Pittsburgh, PA: University of Pittsburgh Press, 2019).

[5] Martin V. Melosi, *Pragmatic Environmentalist: Sanitary Engineer George E. Warning, Jr.* (Chicago, IL: American Public Works Association, 1977); Joel A. Tarr, *Transportation Innovation and Changing Spatial Patterns in Pittsburg, 1850-1934* (Chicago, IL: APWA, 1978); Jeffrey K. Stine, Nelson P. Lewis and the City Efficient: The Municipal Engineer in City Planning during the Progressive Era (Chicago, IL: APWA, 1981).

[6] Christopher Hamlin, "Edwin Chadwick and the Engineers, 1842-1854: Systems and Antisystems in the Pipe-and-Brick Sewers War," *Technology and Culture* 33:4 (1992), 680–709; Amy L. Fairchild, David Rosner, James Colgrove, Ronald Bayer, and Linda Fried, "The Exodus of Public Health: What History Can Tell Us about the Future," *American Journal of Public Health* 100 (2010), 54-63. European scholars created their own society for environmental history and the scholarship has been increasing in the recent years. http://eseh.org/

meetings of historians and STS scholars since. Envirotech SIG members have performed anchor roles to connect scholars of similar interests across disciplines, topics, and borders.[7] In 20 years, Envirotech scholars have published review articles, monographs, and edited volumes in various intersections. Institutionally, Envirotech is moderated by scholars who volunteered to serve, and awards and travel grants have been given to new and emerging members. It would take more time to evaluate the productivity and accomplishment of this scholarly endeavor. I am certain that it did what it wanted to achieve in a reasonable amount of time. It is also true that there has been other approaches that interconnect science, technology, and nature before and will come more after Envirotech such as atmospheric history, climate history, ocean history, animal history, and agriculture history.[8]

The rise of "environmental" thoughts and practices has been be one of the important socio-political transitions in South Korea for the past 50 years. Many historians and social scientists have written about the role of activists, journalists, politicians, and public officers in order to pinpoint the major factors of this gradual rise.[9] Following up on Lee & Jeong (2003), Ku (2004), and others' works on the importance of political empowerment, civic discourse, and democratization, my research sheds light on the role of engineers and scientists who constructed sewage plants, nurtured their subsequent generations through curriculum development, mentoring, and professional networking.[10] I argue that these technical and mundane routines were as important parts of engineering endeavor toward environmental future

[7] Ann Greene, Timothy LeCain, Sara Pritchard, Finn Arne Jorgensen, Hugh Gorman, Christopher Jones, Jenny Smith, Mitchtake Aso, Kellen Backer, and Etienne Benson were those who served Envirotech in various capacities.

[8] Jeffrey Stine and Joel Tarr, "At the Intersection of Histories: Technology and the Environment," *Technology and Culture* 39:4 (1998), 601-640; Hugh S. Gorman and Betsy Mendelsohn, "Where Does Nature End and Culture Begin? Converging Themes in the History of Technology and Environmental History," in Martin Reuss and Stephen H. Cutcliffe eds., *Illusory Boundary: Environment and Technology in History* (Charlottesville, VA: University of Virginia Press, 2010), 265-290; Dolly Jorgensen, Finn Arne Jorgensen, and Sara B. Pritchard, eds., *New Natures: Joining Environmental History with Science and Technology Studies* (Pittsburgh, PA: University of Pittsburg Press, 2013); Sara B. Pritchard and Carl Zimring, *Technology and the Environment in History* (Baltimore, MD: Johns Hopkins University Press, 2020).

[9] Park Sun-Ae et al. 박순애 외, *Hwan-gyeongjeongchaekeui Yeoksajeok Byeondonggua Jeonmang* 환경정책의 역사적 변동과 전망 (Historical Transformation and Future Prospects of Environmental Policy) (Seoul: Munwusa 문우사, 2015).

[10] Rhee Jeong-jeon 이정전, Jeong Hoi-Seong 정회성, "Han-guk Hwan-gyeongjeongchaekui Baldaldong-in: Jeongchaekui Changmuneun Eotteoke Yeollyeonneun-ga 한국 환경정책의 발달동인: 정책의 창문은 어떻게 열렸는가? (Dynamics of Environmental Policy Development in Korea: How did the Policy Windows have been opened?)," *Journal of Environmental Policy* 환경정책연구 2:1 (2003), 1-29; Ku Dowan 구도완, "Han-guk Hwan-gyeong-undong Saryewa Gukjebigyo 한국 환경운동 사례와 국제비교 (Korean Environmental Movements and International Comparison)," Han-guk Hwan-gyeong-undong-yeonhap Gin-geup-jeongchaektoronhoe 한국환경운동연합 긴급정책토론회 (Emergency Policy Discussion of Korean Federation of Environment Movement) (2004. 5. 12).

as their political and seemingly more innovative counterparts.

Environmental History as an academic field in Korea has been growing recently. The Western History Society in Korea and Korean History of Science Society held conference sessions and co-hosted workshops since the early 2000s and special issues and edited books came out as a result. Leading scholars in the field argued that environmental history will revolutionize the field of history as environmental history is not just a field that investigates the historical interaction between human and nature but a movement that inspires people to re-conceptualize human agency in a changing climate and environment. In fact, review papers and research papers came out in the academic journals such as *ECO* (environmental sociology) or *the Journal for the Ecological and Environmental History*.[11]

The special issue of *the Korean Journal for the History of Science*, which this paper belongs to, critically engages with and builds upon the track records of these scholarly activities in Korea. Korean History and Korean Studies scholarship based out of Korea also responded to the rising interests in the historical and contemporary studies of the environment.[12] It is possible that Japanese History and Asian Studies scholarship could have contributed to the increase of scholars and readership but I think there are other reasons that need more integrative and comprehensive research on organizational and contingent factors.[13] I will come back to this point of how

[11] Kim Kiyoon 김기윤, "Hwan-gyeongeui bigyosajeok yeon-gu: Jegukeui nun, sikminjieu nun 환경의 비교사적 연구: 제국의 눈, 식민지의 눈 (Comparative Historical Research on the Environment: Eyes of the Empire, eyes of the Colony)," in *2008 Han-gukseoyangsahakhoe Haksulbalpyononmunjip* 한국서양사학회 학술발표논문집 (Proceedings of the Korean Society for Western History) (2008. 9. 19), 27-51; Kim Gi-Bong 김기봉, "Hwan-gyeongsaran mueosinga: Hwan-gyeonggwa inganeui sanghojakyongeui yeoksa 환경사란 무엇인가: 환경과 인간의 상호작용의 역사 (What is Environmental History?: The History of Human-Environment Interaction)," *Ibid*., 5-37; Kim Do-Kyun 김도균, "Han-guk hwan-gyeongsa yeon-gu-ui donghyanggwa gwaje: Han-guksa gwanryyeon haksuljireul jungsimeuro 한국 환경사 연구의 동향과 과제: 한국사 관련 학술지를 중심으로 (Trends in Research of Korean Environmental History and its Future Directions: A Literature Review Based Assessment)," *ECO* 12:1 (2008), 217-249; Ko Tae-woo 고태우, "Han-guk geundae saengtaehwan-gyeongsa yeon-gueui donghyang-gwa Gwaje 한국 근대 생태환경사 연구의 동향과 과제 (The Research Trends and Challenges of Korean Modern Ecological and Environmental History)," *Journal of the Ecological and Environmental History* 생태환경과 역사 2 (2016), 31-70; Lee, John S., "Editor's Introduction: New Perspectives from Korean Environmental History," *International Journal of Korean History* 25:1 (2020), 1-13.

[12] David Fedman, *Seeds of Control: Japan's Empire of Forestry in Colonial Korea* (Seattle: University of Washington Press, 2020); David Fedman, Albert Park, and Eleana Kim, eds., *Forces of Nature: New Approaches to Korean Environments* (Cornell University Press, forthcoming).

[13] Brett Walker, *Toxic Archipelago*: *A History of Industrial Disease in Japan* (University of Washington Press, 2011); Robert P. Stolz, *Bad Water*: *Nature, Pollution, and Politics in Japan, 1870-1950* (Duke University Press, 2014); Ian Miller, *Fir and Empire: The Transformation of Forests in Early Modern China* (University of Washington Press, 2020); Ian Miller, Julia Thomas, and Brett Walker, eds., *Japan at Nature Edge: The Environmental Context of a Global Power* (University of Hawaii Press, 2013).

Korea appropriated the influence of foreign development imported in the section on wastewater treatment plants.

While directly engaging with the tradition of environmental history in Korea and abroad, this paper aims to connect environmental history with the neighboring fields. While most historians maintained their reservations about the implications of their historical inquiry on the contemporary issues, this tradition is recently changing in two ways. One strain of change seems apparent in the growing number of historical works that reviews the past one hundred years with a clear goal in mind to find the connection between the past and the present. For example, several interdisciplinary works have been published that include humanities scholarship like history and social science approaches like sociology and anthropology.[14]

Another change is the growing number of research that looks at the recent past of Korea. Quick browsing at the major history departments in Korea show that contemporary historians are not underrepresented members of the historian's community. This trend is not particular in Korea and it can be understood as a result of the historical formation of the history departments in Korean universities. Most departments framed themselves as both a research enterprise that produce important new research and a teaching and service unit that provides courses for the general education of all college students and sometimes basic training for humanities, social science, or fine arts post-graduate students. As more new and emerging scholars in history aim to look at topics of the recent past, the tradition of reservation changes slowly. The willingness of historians to address issues of contemporary society and to connect their historical research with contemporary struggles found an incentive on their risky business as more venues to publicize historian's work became available with the rise of new media, social media, and funding agencies' growing emphasis on the outreach aspects of scholarship.[15]

[14] Lee Hyuon Jung 이현정, Kim Taewoo 김태우 eds., *Uiryo: Asiaui geundaeseongeul ingneun chang* 의료: 아시아의 근대성을 읽는 창 (Medicine: A Window to Read Modernity in Asia) (SNU Press, 2017); Kim Sang-Hyun 김상현, "Jiseongsa, Gwannyeomsaeseo 'saheogwahakeui yeoksa'ro 지성사, 관념사에서 '사회 과학의 역사'로 (From the History of Idea and the History of Concept to the 'History of Social Science')," *The Korean Journal for the History of Science* 한국과학사학회지 38:1 (2016), 151-158; Shin Wook Hee 신욱희, Kwon Heonik 권헌익 eds., *Geullobeol Naengjeongwa Dongasia* 글로벌 냉전과 동아시아 (Global Cold War and East Asia), (SNU Press, 2019).

[15] Kim Tae-Ho 김태호 ed., *'Gwahakdaetongryeong Park Chung Hee' sinhwareul neomeo: Gwahakgwa gwollyeok, geurigo gukga* '과학대통령 박정희' 신화를 넘어: 과학과 권력, 그리고 국가 (Beyond the Myth of 'Park Chung Hee as President of and for Science': Science, Power, and the State) (Seoul: Yeoksabipyeongsa, 2018).

Managing Seoul's wastewater before the 1960s

The city of Seoul went through important social and political changes under the Japanese colonization period.[16] Following the earlier studies of the Joseon rulers and colonial government, some historians and social scientists have recently turned their heads toward the inner working of the city and people living in Seoul.[17] Yeom Bok Gyu focused on city planning in colonial Seoul. While Japanese colonial authorities considered Seoul as one of the local cores of its empire, Seoul continued to be a model for other cities in Korea. Unlike other colonial cities set up by "Western" colonizers in Asia and Africa which strictly separated the city of colonizers and the city of the colonized, Japanese colonizers did not enforce artificial separation. As a result, Seoul became a city of hybridization and mixture. The appearance and interior of the colony city of Japan consequently expressed a mixture of Japanese elements and other "Western" elements that Japan imported. Yeom argued that the Japanese empire, at the end, needs to be understood as a West introduced by Japan.[18]

Todd Henry captured one important change with his key word of assimilation. Using three types of assimilation (spiritual, material, and civic), Henry argued that Seoul went through the modernization process through assimilation policy imperatives of Governor-General. However, this process was not implemented as intended as the Korean public and elites appropriated and resisted Japan-initiated "reforms" in their belief system, business life, and public hygiene. While Henry's scholarly contribution to the literature on modernization versus exploitation by Japan sits primarily on the expansion of "assimilation" into the broader lives of the Korean public,

[16] There were certainly ongoing changes in the late Joseon period which led to the 1910s. Scholars have shown that Cholera outbreaks created momentum to create Hanseongwisaenghoe 한성위생회 in 1907 whose work was transferred to Keijo 경성 government in 1913. Son Jung Mok 손정목, *Hanguk Gaehang-gi Dosibyeonhwa Gwajeong Yeongu* 한국 개항기 도시변화 과정 연구 (A Study on the Process of Urban Change during the Port Opening Period in Korea) (Seoul: Iljisa, 2001).

[17] See, for example, Kim Young-Mi 김영미, "Ilje sigi dosiui sangsudo munjewa gonggongseong 일제 시기 도시의 상수도 문제와 공공성 (The Problem of Urban Drinking Water and Publicness under Japanese Empire)," in Yun, HaeDong 윤해동 and Hwang Byeong Ju 황병주 eds., *Singminji Gonggongseong: Silchewa Eunyuui Geori* 식민지 공공성: 실체와 은유의 거리 (Publicness in Colony: Distance between Reality and Metaphor) (Seoul: Chaekgwahamgge, 2010), 255-288.

[18] Yeom Bok Gyu 염복규, *Seoul-ui giwon, Gyeongseong-ui tansaeng: 1910-1945 Dosigyehoek-euro bon Gyeongseong-ui yeoksa* 서울의 기원, 경성의 탄생: 1910-1945 도시계획으로 본 경성의 역사 (Origin of Seoul, Birth of Gyeongseong: 1910-1945, History of Gyeongseong from Urban Planning) (Seoul: Ide-a, 2016). Cheonggyecheon provides an interesting example of how Japanese and Korean elites approaches the issue of separation and assimilation differently but created a common outcome resultantly. See also, Tristan R. Grunow, "Cultivating Settler Colonial Space in Korea: Public Works and the Urban Environment under Japanese Rule," *International Journal of Korean History* 25:1 (2020), 85–119.

Henry's description of the public response to the Japanese hygiene campaign got richer as he showed both resistance and compliance aspects.[19]

Both Henry and Yeom raised the awareness of the significant role of hygiene practice and planning activities of Japanese bureaucrats and Korean elite counterparts. The importance of sanitation in the history of imperialism and colonialism has received due attention by the scholars of many stripes and can be explored further by other inquiries.[20]

This irony of modernity is also well shown with an example of Cheonggyecheon. Yeom showed that Cheonggyecheon was an important issue of Colonial Seoul where public health concerns met with congestion and poverty issues. 300 thousand citizens produced quite an amount of waste and most went into the very streams of Cheonggyecheon. However, the living condition near Cheonggyecheon deteriorated, and people at the edge of poverty still populated the neighboring areas. The population increase can be tracked up to the two major wars in Joseon dynasty. King Yeongjo began regular maintenance on certain parts of Cheonggyecheon every two to three years. Sometimes the rights to do business were given to people with the agreement to make them residents of the newly reclaimed area to make it more livable.[21] In order to address this combined wastewater and housing issues, Japanese

[19] Todd A. Henry, *Assimilating Seoul: Japanese Rule and the Politics of Public Space in Colonial Korea, 1910–1945* (University of California Press, 2014).

[20] Park Yun Jae 박윤재, *Han-guk Hyeondae Uiryosa* 한국현대의료사 (The Modern History of Medicine in Korea) (Paju: Dulnyouk, 2021); Seo Ho-Chul 서호철, "Seourui ttongojum sugeochegyeui hyeongseonggwa byeonhwa: 1890-nyeondae hubanbuteo 1930-nyeondae jeonbankkaji 서울의 똥오줌 수거체계의 형성과 변화: 1890년대 후반부터 1930년대 전반까지 (Formation of Human Waste Disposal System of Seoul in Colonial Period)," *Seoul and History* 서울과 역사 93 (2016), 175–220; Shin Dong Won 신동원, "Joseon marui kollera yuhaeng 1821-1910 조선 말의 콜레라 유행 1821-1910 (Cholera Epidemics in Korea in Late Choson, 1821-1910)," *The Korean Journal for the History of Science* 한국과학사학회지 11:1 (1989), 53-86; Matsumoto Takenori 마츠모토 다케노리 and Chung Seung-Jin 정승진, "Honam jiyeogui wisaeng, uiryo munje:ilje 'wisaenggyuyul'-ui singminji jiyeoksahoe-e daehan chimtuwa hangye 호남 지역의 위생, 의료 문제: 일제 '위생규율'의 식민지 지역사회에 대한 침투와 한계 (The Penetration of 'Sanitary Discipline' in Colonial Local Society: Hygiene and Medical Care Problem in the Honam Plain in Korea)," *Korean Journal of Medical History* 의사학 27:3(2018), 357-396; Lee Jong Chan 이종찬, "Bogeondaehakwon moder-ui yeoksaseong: 1910nyeondae migug-eul jungsimeuro 보건대학원 모델의 역사성: 1910년대 미국을 중심으로 (Professionalizing Public Health as a Branch of Medicine: The Emergence of the Johns Hopkins School of Public Health in the United States in the 1910s)," *Korean Journal of Medical History* 의사학 5:2 (1996), 111-127; Michael Shiyung Liu, "From Japanese Colonial Medicine to American-standard Medicine in Taiwan: A Case Study of the Transition in the Medical Profession and Practices in East Asia," in Liping Bu, Darwin Stapleton, and Ka-che Yip eds., *Science, Public Health and the State in Modern Asia* (New York: Routledge, 2012), 161-176.

[21] Jeon Wu Yong 전우용, "Yeoksa sogui cheonggyecheongwa geu imiji 역사 속의 청계천과 그 이미지 (Cheonggyecheon and its image in History)," in *Cheonggyecheon, Cheonggyegogareul Gieokamyeo* 청계천, 청계고가를 기억하며 (Remembering Cheonggyecheon and Overpass) (Seoul:

and Korean bureaucrats wanted to cover Cheonggyecheon. Stream coverage began finally but stopped and continued because of budget issues. After multiple stop-and-goes, it was finally put on hold.[22] Henry and Yeom emphasized the importance of the Korean elite who strived for a different type of self-reliance and self-support who ended up working under the restraints of Japanese budget and capacity. Aside from putting the assimilation strategy of Japan in its due place, how can we connect this with the history of expertise on the environment?[23]

As more people moved into Seoul, the urban living environment of Seoul deteriorated. In the 1960s and 1970s, increasing population coupled with insufficient infrastructure generated a series of problems including traffic congestions, air and water pollution, and housing shortages. However, for better opportunities in employment, education, and business, more and more Koreans relocated to Seoul.[24] Waste and wastewater management became the new concerns of the Seoul mayor, Kim Hyeon Ok. As the population increased in the northern areas of the Seoul metropolis, treatment plans for human waste and wastewater became apparent. The plan for these treatment plants was established but was put on hold for several reasons including budget constraints, foreign loan complications, and diplomatic difficulties.[25] More comprehensive study is needed to understand why wastewater treatment became the agenda of the Seoul City government at this moment. It is worth noting that drinking water has always occupied a higher place on the list of priority compared to wastewater treatment. Lack of capital and less visibility might have contributed to the decisions.

To make wastewater issues more cumbersome, Korea had four distinct seasons and summer in Seoul invited heavy rainfall called *jangma*, a rainy period that extends over days and weeks. Big floods were regular happenings in post-war Seoul.

Mat, 2009) quoted in Yeom (2016), op. cit., 227 (note 61); Son Jung Mok 손정목, *Seoul Dosigyehoeg Iyagi 5* 서울 도시계획 이야기 5 (The Story of Seoul City Planning 5) (Paju: Hanul, 2003), 181-190.

[22] Henry (2014), *op. cit*., 130-167; Yeom (2016), *op. cit*., 234-243. See the next footnote for the story after 1945.

[23] For a more recent controversial restoration project in Seoul, see Chihyung Jeon and Yeonsil Kang, "Restoring and Re-Restoring the Cheonggyecheon: Nature, Technology, and History in Seoul, South Korea," *Environmental History* 24:4 (2019), 736–765. On the general issues of ecological and environmental restoration, see Rebecca Lave, *Fields and Streams: Stream Restoration, Neoliberalism, and the Future of Environmental Science* (Athens: University of Georgia Press, 2012).

[24] For more information on these data, see "Jidoro boneun Seoul 지도로 보는 서울 (Seoul on Map)" at https://seoulsolution.kr/ko/seoul-map

[25] The history of Seoul as a metropolis is the history of expansion. Based on Son Jung Mok, I assume the construction of treatment plants is part of Seoul city's efforts to create Gangnam 강남 to expand Seoul geographically. Son Jung Mok 손정목, *Seoul Dosigyehoeg Iyagi 3* 서울 도시계획 이야기 3 (The Story of Seoul City Planning 3) (Paju: Hanul, 2003), 177-198.

In September 1959, a typhoon named Sarah beat down on the Korean peninsula during the Chuseok holidays.[26] In 1972, typhoon Betty created another serious flood in Seoul and throughout the Korean peninsula. Many left their houses behind and stayed in temporary shelters. Many were injured and some lost their lives.[27] Likewise frequent floods and related damage created public opinion that the Seoul city government needed to quickly address the issues.

Covering of Cheonggyecheon began during the colonial period and stopped because of budget constraints. When the city government finally completed the covering in 1978, the surrounding areas and the composition of the population and business in and near the stream changed significantly. What made the difference was the overpass. The overpass was suggested by the Mayor and completed in 1971. The construction created new changes as the overpass made it difficult to move between the northern and southern half.[28]

While Cheonggyecheon became a hotspot for city planning where bureaucrats' aspiration for orderly nature met with business and development profit seekers and helpless dwellers, more levees were built alongside Hangang to prevent frequent floods. Riverside roadways were built and traffic congestion issues were better addressed to make Hangang more attractive. Levees seemed to lessen the damage by the floods but flood damages continued to happen in other parts of Seoul, though less frequently and with lesser impacts. In addition to the amount of water falling from the sky, another concern began to rise above the ground which is the issue of water quality and odor coming from the filthy water.[29]

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[26] Joint Typhoon Warning Center, "Typhoon Sarah (11-18 September, 1959)," *1959 Annual Tropical Cyclone Report*, 102–105; *Liberty News: Special Issue on Super Typhoon Sarah* 리버티뉴우스 태풍특보 (USIS-Korea, 1959).

[27] Joint Typhoon Warning Center, "Typhoon Betty," *1972 Annual Tropical Cyclone Report*, 38–39.

[28] Kim Jong-Lip 김종립, "Cheonggyegogadoro geonseoreul tonghae bon 1960nyeondae huban seourui dosi gaebal 청계고가도로 건설을 통해 본 1960년대 후반 서울의 도시 개발 (City Construction of Seoul in the Late 1960s through Construction of Chonggye Expressway)," (Master thesis, Seoul National University, 2013); *Annyeong! Gogadoro* 안녕! 고가도로 (Goodbye! Elevated Motorway) (Seoul Museum of History, 2014).

[29] On the public works and construction works by Seoul city government, see Son Jung Mok 손정목, *Seoul Dosi Gyeohoek Iyagi 1-5* 서울 도시 계획이야기 1-5 (The Story of Seoul City Planning 1-5) (Paju: Hanul, 2003). See the following for the discussion of odor and water quality issues in Seoul. Won Chuyoung 원주영, "Akchwi eomneun dosi mandeulgi: Seoul ollimpikgwa dosi akchwi gyujeui jeonhwan 악취 없는 도시 만들기: 서울 올림픽과 도시 악취 규제의 전환 (Making an Odorless City: The 1988 Seoul Olympic Games and the Transformation of Urban Odor Regulation)," *Journal of Science & Technology Studies* 과학기술학연구 20:1 (2020), 1-38.

Establishing academic programs for the next-generations

To partially respond to the issue of water odor from Hangang, the Seoul municipal government constructed two sewage treatment plants and two human waste treatment plants with capital loans from so-called developed countries, two from Japan, one from the U.K., and the last one from the U.S.A.[30] The capital investment and operations and maintenance costs were very high for the central government and Seoul Mayor to afford. Building of the four municipal plants was not an easy process. Execution of the plans was often delayed because of changes in the leadership, difficulty in communication, engineering knowledge and expertise in movement, and other numerous reasons undisclosed to Seoul from the U.K., U.S.A., and Japan.

First two human waste plants were based on a Japanese loan and wet oxidation technology was applied with imported Japanese machines and facilities. Each covered the western half (1972) and the eastern half (1976) of Seoul. The first sewage treatment plant (1976) was based on a USAID loan and the second sewage treatment plant (1979) was based on British funding. Both plants were built in Gunja-dong in the eastern end of then Seoul. My conversation with a Seoul city officer and a Gunja-dong plant manager revealed that the different origins of these plants made it difficult for engineers and managers to share knowhow between the different plants.[31] Kim Dong-Min, Seoul City University professor trained in the Netherlands and the U.S.A., reflected on the development of wastewater and human waste technology in Korea at his retirement and argued that the 1979 sewage plant was superior to the 1976 sewage plant as the former employed anaerobic method and the latter used aerobic method. The anaerobic method used less energy and was easier to maintain but slow and less efficient. On the corporate side, Pfizer Korea was the first to set up industrial wastewater treatment plant in Gwangjang-dong, Seoul.[32]

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[30] Kim Dong-Min 김동민, "Oegukchagwangongsa-ui Munjejeom: Seoul-si Joongranghasu cheorijang-eul Jungsim-euro 외국차관공사의 문제점–서울시 중랑하수처리장을 중심으로 (Problems in Foreign Loan Construction Projects: The Case of Joongryangchun and other Municipal Sewage/Nightsoil Treatment Plants in Seoul)," *Research Journal* 연구논총 10 (1982), 175-184.

[31] Yang Haesun 양해선, personal communication with the author (2021. 3. 12); Lee Do Hun 이도훈, personal communication with the author (2021. 5. 7).

[32] Kim Dong-Min 김동민, "Pyesucheoriui gwageowa hyeonjaewa mirae 폐수처리의 과거와 현재와 미래(Past, Present, and Future of Wastewater Treatment)," *Environmental Managers* 환경관리인 122 (1996), 6-9: See the following for more discussion about the imported technology in Korea. Choi Hyungsub 최형섭, "Imported Machines in the Garden: the Kyŏngun'gi (power tiller) and Agricultural Mechanization in South Korea," *History and Technology* 33:4 (2017), 345-366.

Table 1. First Four Treatment Plants in Seoul (Source: Kim Dong-Min, 1982)

Item	Seobu Human waste Treatment Plant	Dongbu Human waste Treatment Plant	Cheonggyecheon Sewage Treatment Plant	Joongryangcheon Sewage Treatment Plant
Location	Seongsan-dong	Gunja-dong	Gunja-dong	Gunja-dong
Capacity (m^3/day)	600	600	250	210
Core Process	Wet oxidation	Wet oxidation	Activated sludge	Activated sludge
Construction Period (months)	24	14	75	42
Operation began	1972	1976	1976	1979
Local Fund (million KRW)	620	2,000	3,100	6,100 *
Foreign Loan (million USD)	2.85	5.65	6.3	8.26
Loan from	Japan	Marubeni, Japan	USAID	Brandts Bank, U.K.

*. Includes 1,500 million KRW for Interceptor construction.

Building of large-scale water infrastructure was not uncommon in developing countries during the Cold War period. Foreign knowledge and capital were critical in creating dams, waterways, and wastewater treatment plants.[33] Kim Dong-Min, in a journal article in 1979, argued that exclusive foreign designs prevented the formation of Korean domestic engineering capacity. In particular, the foreign supply of machinery, Kim argued that, "delayed know-how development of domestic manufactures and caused maintenance of plants difficult mainly due to the problem of parts acquisition, lack of local knowledge of foreign engineers, high prices of foreign supplies and services resulted in less economical investments."[34] Kim, as an educator himself, thought of treatment plants not just as an accomplishment for water quality

[33] J. R. McNeill and Corinna R. Unger, eds., *Environmental Histories of the Cold War* (Washington, D.C. & New York: German History Institute & Cambridge University Press, 2013), 139-166.

[34] Kim Dong-Min 김동민, "Urinaradosiui bunnyo mit sseuregicheoriui hyeonhwanggwa munjejeom 우리나라 도시의 분뇨 및 쓰레기처리의 현황과 문제점 (Current Status and Issues related with Human Manure and Household Waste in Korean City)," *City Problems* 도시문제 14:8 (1979), 47-63.

and city planning but as a lost opportunity for domestic skill and expertise development.

While Kim Dong-Min was right that there were alternative pathways for Seoul to design and construct treatment facilities for human waste and wastewater, it was also correct that Seoul city's decision to pursue foreign money and expertise was a common practice during the Cold War Asia and Africa. Seoul city borrowed money from countries overseas to build their first few treatment plants. There were two rationales for these transactions between Korea and so-called advanced countries like the U.K., U.S.A. and Japan. The first one was quite obvious. Treatment plants were very expansive for a country like Korea. Sufficient budget did not exist and it had to come from overseas. The second reason for the countries to lend money to Korea was for them to send engineers to Korea. Engineers visited Seoul to set up the plants and to train novice technicians to run the machineries and devices. Critical factors in choosing a particular technology to use came from political and diplomatic considerations. These considerations were not known to the field-level actors then.

Sanitary engineering educators claimed this as a chance to learn new knowledge from advanced countries. Kim Dong-Min continued to argue this point in his paper published by the research institute of Seoul City College where he teaches. He defined that self-support as the main goal of the alternative path and explained that learning new knowledge and refining existing skills can be achieved by fostering domestic vendors of the machines and facilities for the treatment plants. But if we take one more step into the question of how to formulate domestic capacity the answers were not easy to formulate. How to create new human power to maintain the new system was a thorny problem to solve.

Who were the practitioners in the field when treatment plants were built? Hyundai Industrial Development was one of the companies that started to develop their expertise in building and maintaining treatment plants for wastewater. Government employees in the treatment plants came from various backgrounds and domain of expertise including construction, public works, and public health. It took more years for the Seoul government to create a new line of public officers which directly deals with environmental management called environmental job series.[35]

Challenges and opportunities rose in front of sanitary engineering educators and practitioners as soon as Seoul's plants for treating sewage and human waste were built by foreign money and expertise. In the remaining part of this section, I will first overview civil and chemical engineers that became interested in environmental issues. Then I will focus on one university that became involved in dealing with public health and sanitation issues from an engineering perspective. Like other engineering departments in South Korea, most early engineering educators at the time had a hard time

[35] Kim Dong-Min and others argued for this. It was not until the early 1990s that new environmental management lines were hired.

finding enough resources to run the academic programs.[36] Further research on the other sectors such as government, industry, and civil society is needed.[37]

Academic departments had more challenges than they could possibly take care of at the same time. Faculty members were inexperienced. Most had up to masters and some lacked field experiences. So the quality of teaching did not meet the students' expectations. When we turn our eyes to the laboratories, there were not sufficient apparatus for conducting experiments. In addition, most departments did not have enough funds to buy and maintain the material for the experiments. As there were no graduate schools yet, graduate teaching and research assistants did not exist. No wonder the departments were not in good shape even compared to other engineering or science departments.

To make matters worse, insufficient industry positions existed for the new graduates from the departments. University professors tried hard to create both private and public positions for the new generation to be hired at. Considering all this, the construction boom of treatment plants must have appeared as a big opportunity. That was why first-generation educators tackled the topic of wastewater management laboriously.

Engineering specialists in environmental sectors came from various backgrounds. The expertise of the first generation specialists was diverse in terms of their initial training, job, and advanced study abroad. Physics, civil engineering, chemical engineering, microbiology, nuclear engineering all contributed to the formation of sanitary engineering, soon-to-be called environmental engineering. American and German traditions of sanitary engineering also influenced the curriculum of university departments as the first-generation went abroad for advanced training and came back to Korea. For example, a university professor Kim Dong-Min and government scientist Rho Chae-Shik received their masters or Ph.D. in the United States of America.

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[36] Kang Kichun 강기천 and Choi Hyungsub 최형섭, "Gong-eop eomneun gonghak: 1950-1960 nyeondae Seouldaehakgyo gong-gwadaehak-ui Jihyang-gwa hyeonsil 공업 없는 공학: 1950-60년대 서울대학교 공과대학의 지향과 현실 (Engineering without Industry: The Vision and Reality of Seoul National University College of Engineering in the 1950s and 60s)," *Society and History* 사회와 역사 119 (2018), 41–73.

[37] Rho Chae-Shik 노재식 would be an example of a bureaucrat-scientist who became an active first-generation scholar. After earning his Ph.D. in physics, he began his monitoring work of radioactive material in the air at the Korean Atomic Energy Research Institute. Rho Chae-Shik 노재식, "Urinara hwan-gyeong-oyeom siltaewa geu daechaeg 우리나라 환경오염 실태와 그 대책 (Current Status of and Strategies for Pollution in Korea)," in Han-gukgwahakgisuldanchechong-yeonhaphoe 한국과학기술단체총연합회 (The Korean Federation of Science and Technology Societies) and Jaemihan-gukgwahakgisuljahyeophoe 재미한국과학기술자협회 (Korean American Scientists and Engineers Association) eds., *1976nyeondo Guknae-oe Han-gukgwahakgisulja Jonghap Haksuldaehoe Nonmunjip: Saengmyeong-gwahak and Hwan-gyeong-gonghakbunya* 1976년도 국내외한국과학기술자 종합학술대회 논문집: 생명과학· 환경공학분야 (General Conference for Scientists and Engineers in Korea and Abroad: Panel on Life Science and Environmental Engineering) (1976), 27-51.

Professor Kim Soo Saeng and others received their doctorates in Germany. The nascent stage of formation allowed academics and field practitioners to cross boundaries easier than other fields. Professor Kim Dong Min served in the ROK Army Corps of Engineers as an officer where he received opportunities to get short-term training from the U.S. Army and a master's degree from UC Berkeley under ROK Army sponsorship. Dr. Rho worked for the Air Force before he went abroad for his Ph.D.study. In fact, many science elites in Korea shared a common military background. Public service was also common practice among these specialists. Some went on to higher positions in Korean government agencies, others did their stint and came back to academia. Some others finished their service early in the public sector and moved on to private, independent consulting.

Early academic programs built by these first-generation engineers were undergraduate-only programs. When these students studied four years and graduated with their bachelor of science in engineering degrees, they often found themselves caught in limbo. Compared with technicians who had accrued many years of experience in the field, they lacked tacit knowledge. They also found it hard to explain everything to managers who knew almost nothing about new environmental regulation.[38] New environmental laws and regulations provided jobs for the new graduates, but they had to explain everything to those who were not ready in the field. I will come back to this point of the recognition struggle of the second-generation further in the following section in more detail.

Seoul Industrial College (now The University of Seoul) case shows the two changes in the priority of education and training of the new experts to deal with new problems of Seoul City. The origin of this university goes back to colonial Seoul. Industry development in 1960s Seoul was partially the driving force of this change in university departments. The name change in 1974 from Seoul Agricultural College to Seoul Industrial College was a pivot point. Urbanization of Seoul Metropolitan City became another important factor that brought the change. The department for sanitary engineering education's new cohort of 20 came at the demise of another department of sericulture. The laboratories and offices for the agriculture-related departments (now not accepting new students) were turned into the ones for industry-

[38] It is not easy to find detailed curriculum of the early programs. For surveys of the later periods, see Kim Hui Gang 김희강 et al., *Hwangyeonggonghakgwa Gyoyukpeurogeuraem Gaeballyeongu* 환경공학과 교육프로그램 개발연구 (A Study on the Development of Academic Programs of Environmental Engineering Departments) (Korean Council for University Education, 1993); KSEE 대한환경공학회, *Daehakgyo Hwangyeonggonghakbunya Gyogwagwajeong Simhwa mit Pyojunhwa Josayeongu Saeop* 대학교 환경공학분야 교과과정 심화 및 표준화 조사연구 사업 (Research Project for Advancing and Standardizing Curriculum in the Field of Environmental Engineering at Universities) (The Korean Federation of Science and Technology Societies, 2007).

related departments newly established or recently expanded.[39]

Professor Yoo Myeong Jin, in his 1988 article, reflected on his department during this period. Professor Yoo was a second-generation educator at Seoul City University and who later became the president of one of the professional societies for environmental engineers. Citing the curriculum conference held in 1973 in the U.S.A., Yoo argued that environmental engineering now became an umbrella term to protect humanity from pollution, to protect the environment from human induced harm, and to better the quality of the environment for human health and welfare.[40]

Busan was the second biggest city in Korea after Seoul and there were two universities that opened sanitary or environmental engineering programs from the 1960s. Dong-A University was the first university in Korea to establish a separate academic unit for sanitary engineering in 1967. Dong-A University, which was the biggest private university, in Busan city, already had departments for civil engineering and other departments. In 1975 Busan Susan University (now Pukyong University) also opened an Ocean Environmental Studies program.

Professor Kim Soo Saeng was another first-generation sanitary engineer who contributed to the department of sanitary engineering at Dong-A University in Busan. Kim Soo Saeng was also the first vice-president when Kim Dong Min founded and became the first president of one of the professional societies for sanitary engineers. Professor Kim Dong Min remembered Professor Kim Soo Saeng as an important partner for discipline and comrade.[41]

Many university departments, including Seoul City University, Dong-A University, and Pukyong Univeristy, made an important decision at the beginning of the new decade in 1980. They changed the title of their departments into the Department of environmental engineering. This change reflected similar changes in North America and Europe.[42]

In addition to writing journal articles and government reports, first-generation sanitary engineers devoted their time to the publication of textbooks. Kim Soo Saeng published a translation of a famous book on sewage treatment in 1982. The book was originally written by the famous German sanitary engineer, Karl Imhoff, and his son, Klaus R. Imhoff. With Sin Gu Cheol, Kim Soo Saeng translated this book into

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[39] Roh Soon Hee 노순희, "Seoul Siripdaehak sungjanggwajeong: 1918-1973 Yaksa 서울시립대학 성장과정: 1918-1973 약사 (The Growth Process of Seoul City University)," *The Urban Saemaul Movement Research Review* 연구논총 9 (1991), 149-174.

[40] Yu Myeong-Jin 유명진, "Hwan-gyeong-gonghakgwa gyoyugui hyeonhwanggwa dangmyeon munje 환경공학과 교육의 현황과 당면 문제 (Current Status of Environmental Engineering Education and Challenges)," *Higher Education* 대학교육 33 (1988), 105-110.

[41] Kim Dong Min, personal communication with the author (2019. 8. 5).

[42] Kim Chang-won 김창원, "Hwan-gyeong-gonghak gyoyugui hyeonhwanggwa baljeon gwaje 환경공학 교육의 현황과 발전 과제 (Current status of environmental engineering education and development tasks)," *Higher Education* 대학교육 89 (1997), 78-83.

Korean.[43] The publisher was *Saneopgonghaeyeonguso* (Institute of Industrial Pollution) whose owner was also treasurer of the professional society. Kim Soo Saeng and Sin Gu Cheol donated the money they earned from the book to the society, whichwas quite common practice among the first-generation.

In the preface of the 1982 translation, Kim Soo Saeng first pointed out that "there are quite a number of wastewater treatment facilities installed and now operating in Korea." Then Kim Soo Saeng raised his concerns about "the lack of basic technical capacities," and contended that problems had been raised in economy and stable operation of the plants. To understand how these problems have been addressed by the sanitary engineers in academia and in the field, let's move on to the next section.

Fragmented Profession of Engineers and Managers for the Environment

Was environmental engineering new? Or was it rebranding an old field, sanitary engineering? If I assume the formation of the community of engineers who define themselves as engineers for the environment was one critical moment of the transition, what made this possible, I argue, partially depends on the education of a new generation of environmental engineers. What outside factors helped promote environmental engineering as a new discipline? How did government officers measure the increasing need for engineering specialists for environmental protection? When new law and regulations were introduced, the industry also responded by hiring more environmental engineers.

Some scholars contended that environmental engineering was not quite new and therefore a fancy new name for sanitary engineering. To tell the difference between the rebranding of an old field and the birth of a new field, we need to look at the institutionalization of the new field as an elongated process where a new field came out of, initially supplements, and finally replaces an old one that subsequently became obsolete. Let's look at the community of sanitary and environmental engineers more closely.

Professional engineering societies in Korea responded in their own ways. Civil

[43] Sin Gu Cheol 신구철 and Kim Soo Saeng 김수생, trans., Hasudo Pyesucheori Haendeubuk 하수도 폐수처리 핸드북 (Handbook for Sewage and Wastewater Treatment) (*Saneopgonghaeyeonguso*, 1984). This is a translation of Karl Imhoff and Klaus R. Imhoff, *Taschenbuch der Stadtentwässerung* (München: Oldenbourg, 1976). Sin Gu Cheol received Bachelors in civil engineering (1954) and studied sanitary engineering in Kyoto University, and earned Dr. Ing. in Stuttgart in Germany. He worked for Kocks, Yonsei University, and Stuttgart University. Kim Soo Saeng received bachelors in mathematics from Busan University (1961), another bachelors in civil engineering from Dong-A university (1968) and received this Dr. Ing. at RWTH Aachen University (1981).

engineers and chemical engineers respectively created special groups within their societies to address environmental issues. Although it is not well remembered nowadays, these efforts set up the background for subsequent changes.

In fact, previous efforts to organize sanitary engineers away from other more established ones existed before. The Korean Society of Sanitary Engineers (KSSE) was established but stayed dormant around this time.[44] In 1978 the Korean Society of Environmental Engineers (KSEE) was established in the month of March. Reflecting on this day at the 10th anniversary, the first president Kim Dong-Min argued that it was an exhilarating moment where all the people around the table wanted to remember something life-changing was happening on the day. In their statement the founding members of the society announced on the day like the following.

> "[T]he government is about to establish new act for environmental conservation … there are delays in progress for a lack of core group for integrative and systematic academic activities, higher social status, and mutual cooperation …"[45]

The early trailblazers clearly grasped the crisis of the environment paralleled the lack of social recognition of the professionals for environmental conservation. Therefore, the next steps for them included all the regular activities for the professionalization of the field as well as creating a bigger momentum for the profession at large.

In 1981, KSEE failed in its attempt to establish the Union of Korean Societies of the Environment. If created, the Union could have functioned as an umbrella organization for all the fields including environmental engineering, environmental law, environmental/ public health, environmental biology, environmental physics, and environmental meteorology. One failure was followed by another success. The KSEE leadership secured an office space inside the buildings of the National Environmental Protection Institute (NEPI). The President of the NEPI was Rho Chae-

[44] A government official who was active in the foundation of this society became not so helpful in closing one for the other followers to create another society. Kim Dong-Min found this government officer and checked with the government agency which governs this society to close the old one to open this new one. For further information, see Kim Dong Min 김동민, "Han-gukhwan-gyeong-gonghakgye-ui hoego: Daehanhwan-gyeong-gonghakhoe chang-rip 10 junyeon-eul majihamyeonseo 한국환경공학계의 회고: 대한환경공학회 창립 10주년을 맞이하면서 (Reflection on Korean Environmental Engineering Community: On the 10 year anniversary of Korean Society of Environmental Engineers)," *Journal of Korean Society of Environmental Engineers* 대한환경공학회지 10:3 (1998), 1-5.

[45] Kim Dong Min 김동민, "Seollipbaegyeong mit baljachwi 설립배경 및 발자취 (Background for Establishment and Footprints)," in KSEE, *Daehanhwan-gyeong-gonghakhoe 25nyeonsa* 대한환경공학회 25년사 (25 year Anniversary of Korean Society of Environmental Engineers) (2003), 37-45; Kim Dong Min (1998), *op. cit*., 1-5.

Shik.[46] This episode exemplifies the level of communication that can be initiated by the engineers who were active in academia. With their academic and government collaborators, KSEE were able to reach out and expanded their assets.

Then what about the field experts in environmental issues in Korea? Let's look at the corporate side of the scene. With new legislations on pollution control facilities, more pollution managers were hired by various corporations who were not mandated to have experts who have licenses on water quality control, air quality control, or waste control. Lee Yong Wun was one of the early pollution managers who started working for corporations including Samlip General Foods. Lee Yong Wun became frustrated with his experience working as an engineer for individual companies and founded an association for "environmental managers" in the Guro district of Seoul in 1984. This led him to be connected with Park Chang Geun, an environment journalist. After a few years of collaborative work, Lee Yong Wun founded a national association for environmental managers (now Korean Environmental Engineering Federation , KEEF) in 1986.[47]

The positioning of these environmental managers was tricky from the start. Were they more like engineers in the new meaning of college graduates? Or are they technicians who were often perceived pejoratively with lesser authority? In fact, it is somewhere in between. What these environmental managers did was essential for the everyday activities of the plants. They not only participated in the maintenance of the pollution abatement facilities but also participated in the planning role in a limited sense. Some graduated from a two-year College with an associate degree and technician license. Others graduated from a four-year university with next-level license. These changes need to be further explained in the changes of the legislation regarding the level of technical expertise in Korea.[48]

One episode in the early history of KEEF is worthwhile of taking a close look. One was the successful mobilization of environmental managers on the occasion of

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[46] Rho Chae-Shik argued that he began his career with environmental radioactive materials since 1953 and expanded his interest to overall environmental issues from 1973. Rho Chae-Shik 노재식 "Yangcheoljibungjim geonneobang 양철지붕집 건너방 (A Room of a Tin-roof House)," in Lee Changgun 이창건 et al., *Geuttae Geurigo Jigeum* 그때 그리고 지금 (Then and Now) (Seoul: *Geulmadang*, 2019), 88-103.

[47] In between 1984 and 1986 Lee Yong Wun has allegedly been involved in creating another organization of experts who were called pollution managers [공해관리기사]. I was not able to find further information.

[48] Kim Tae-Ho 김태호, "Galchaewa mang-gak, geu dwiranui saneop jeonsadeul: gukjegineung-gyeong-gidaehoewa 1970-1980nyeondaeui gineungillyeok 갈채와 망각, 그 뒤란의 '산업 전사'들: '국제기능경기대회'와 1970-80년대의 기능인력 (Forgotten 'Industrial Warriors': South Korea's Rapid Industrialization and the International Vocational Training Competition), *Critical Studies on Modern Korean History* 역사문제연구 20: 2 (2016), 103-148. For more discussion about the tension between craft and science, see Daniel Schneider, *Hybrid Nature: Sewage Treatment and the Contradictions of the Industrial Ecosystem* (Cambridge: The MIT Press, 2011).

the arrest of Park Wunsoek. He was accused of the charge of the leakage of contaminated water from the plants that he worked for. Mr. Park and his colleagues pleaded that it was the plant manager who needed to be responsible, not the environmental managers. But neither the plant manager nor the company owner took responsibility for the charge saying that the field level decisions were made by the environmental managers. The association became involved by finding a lawyer for Mr. Park and started a campaign to raise money to support him for a lawsuit on the criminal charge. The outcome was positive at the end. Mr. Park was released on bail.

According to an analysis by a professor of public administration, Kim Byung-Chin, the environmental managers at the time often confused their professional interests with their employer's interests. Kim argued that KEEF seemed to not always function for the collective benefit of the members of the Association. After reviewing two recent statements of the Association and related activities in 1986 and 1987, Kim showed that one statement in 1986 was more for the interest of the corporations which did not always align with the interests of the environmental managers. Fortunately, the 1987 statement, Kim thought, represented the manager's collective interests well.[49]

Efforts to find better words to represent themselves and to raise their social status continued. Changing their title from environmental managers to environmental engineers happened in 2002. The reason behind this change included ways to attract more people from the field who identified more with the term engineer than the term manager. Until the early 1990s, environmental managers were the better ways of addressing them than "effluent facilities managers." As the legislation until then still used effluent facilities managers as the legal terms for them, the environmental managers kept using "environmental managers" as an alternative to set them apart from the other "operators" of the facilities or machines. Citing other professionals in occupational safety, and energy sectors, the President of KEEF claimed that the legal terms needed to be changed.[50]

In 1990, at the turn of a new decade after the Seoul Olympics, environmental engineering as a field was still an enterprise unfinished. Academicians did achieve what they aimed for. They built new departments and raised the next generation. Field engineers began their own organizations and started building connections with

[49] Kim Byung-Chin 김병진, "Gyujejeongchaege daehan pigyujejaui daeeunghaengtaee gwanhan yeongu: Hwangyeonggwalliinui gaebyeoljeok, jipdanjeok haengtaereul jungsimeuro 규제정책에 대한 피규제자의 대응행태에 관한 연구: 환경관리인의 개별적, 집단적 행태를 중심으로 (A Study on the Response Behavior of the Regulated to the Regulatory Policy: A Case Study of Individual and Collective Behavior of Environmental Managers)," *Korean Public Administration Review* 한국행정학보 22: 1 (1988), 49-75.

[50] Jang Jun Young 장준영, "Hwan-gyeong gwalliinui beopjeongmyeongching 'baechulsiseol-gwalliin'buteo gochyeojyeoya handa! 환경관리인의 법적명칭 '배출시설관리인'부터 고쳐져야 한다! (Legal Term for the Environmental Managers, 'Effluent Facilities Managers' Need to be Changed!)," Environmental Managers 환경관리인 68 (1992), 70-71.

the academics. Challenges came with the new environmental regulations. The association founded by Lee Yong Wun had to raise funds to help an environmental manager who got in trouble for not abiding by the laws.

Conclusion

Prestige was what every engineer in Korea strived for. As Han and Downey suggested, amongst the rapid industrialization and urbanization of Korea the state-making and technology-making happened alongside each other.[51] Sanitary engineering and wastewater treatment did begin by addressing the issues that everyone in Seoul needed but did not want to talk about, taking care of their own waste, biological or physical. Using borrowed money and brain from so-called advanced countries, first-generation engineers grabbed opportunities to publicize the rationale for a new line of engineering, environmental engineering, and to institutionalize the academic program and new job series on the environment in the public sector starting with the Seoul city government. Their strategies included appropriating knowledge and infrastructure and co-producing profession and identity.

Through establishing academic programs, forming professional societies and associations, and creating a new environmental track in public service, academics, field practitioners, and government officials crafted new identities of an independent profession as service to the community. This idea of service was not always helpful in the professionalization of the field. As the new environmental laws required more environmental engineers to be hired, more and more engineers worked in the factories where they became in charge of wastewater management. While providing expert service for the company, their interest to serve the community sometimes became tangential with their obligation to serve the company.

Early sanitary and environmental engineers delineated the boundaries between sanitation and public works in order to find room for environmental engineering and public service for environmental protection. Responses from civil engineering profession and municipal public works bureaucrats were challenging. With new curriculum and public demonstration, environmental engineers reproduced the new generation of engineers who went on to work in the public and corporate sectors as well as in academia and non-governmental and non-profit sectors.

By treating Seoul's dirty water and dealing with solid waste with borrowed money and brain from Japan, U.S.A., or U.K., Seoul's engineers and bureaucrats successfully demonstrated the power of the environmental engineering knowledge and practice. Engineers for Seoul announced the formation of the new profession at the intersection of modernizing ways to get rid of waste from human activities and improving the living environment of Seoul.

[51] Kyonghee Han and Gary Lee Downey, *Engineers for Korea* (Morgan & Claypool Publishers, 2014).

Abstract

This paper focuses on how early Korean sanitary engineers used new sewage treatment plants as an opportunity to redefine sanitation as an engineering practice and to refashion themselves as prestigious engineers. Through academic programs, professional societies, and public service, academics and government officials established new identities of an independent profession as a service to the community. I first track down how sanitation and public health have evolved in 1960s urban Seoul. I argue that early sanitary engineers of Seoul City University differentiated themselves both from civil engineering profession and from municipal public works with new curriculum. I look at the professionalization of sanitary engineers and their branding as environmental engineers with their Korean Society for Environmental Engineers and Korean Environmental Engineering Federation. I conclude with ideas to understand the strategies employed by early sanitary engineers in Seoul such as appropriating knowledge and infrastructure and co-producing profession and identity.

Keywords: sewage treatment; sanitary engineering; environmental engineering; sanitation; professionalization; Seoul