

## Engineering the Dutch Empire

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# Engineering the Dutch Empire

Irrigation, the Colonial State and Ideology in Java 1832-1942

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# Preface

You, the king, are like a great mountain and your subjects are the trees upon it. It is the balance of harmony between the highest and the lowest that maintains prosperity and happiness (from an old Javan epic, cited by Van Setten van der Meer 1979: 98).

## I

This book has a long history. My interest in irrigation drifted in the universe of grand theories on the rise of civilization in river valleys until I came into contact with Harry Lintsen who, in 1989, was made Professor of the History of Technology at Delft University of Technology. It was in consultation with him that I embarked on dissertation research into the development of colonial technology, later specializing in colonial irrigation engineering. It all started with a “case study” but later, because of the sheer volume of the material, it was to become the only sample of colonial technological development in my research (I then went on to focus on a number of cases).

The background to all of this was a project involving research into the history of technological development in the Netherlands. It was Harry Lintsen who headed this project. He was later succeeded by Johan Schot (Lintsen 1992-1995; then Schot 1998-2003). It was thought that a colonial dimension should be added to this research. Gradually my research lost the character of being an historic study pur sang as it started to become more and more of a quest for background information on present-day problems in the field of irrigation in Indonesia. Thanks to my academic supervisor, Frans Hüsken, who unfortunately died far too young, in 2010, much attention was given to the context of irrigation development (especially the state formation aspect) but technology continued to occupy an important place in the study as a whole.

My historical and fieldwork research resulted, in 1997, in a dissertation, entitled *De zegenrijke heeren der wateren. Irrigatie en staat op Java, 1832-1942* (“The Auspicious Lords of the Waters. Irrigation and the Colonial State in Java, 1832-1942”). Since Dutch is not a widely used language it seemed fairly obvious that my thesis should be translated into English and so that soon happened. That process also gave me the opportunity to rectify certain imperfections (including those discovered by a number of reviewers), to delete repetition and to reduce the length of certain passages on theoretical and general backgrounds. What I had been unable to do in 1997 but had been able to do then is this: I have managed to improve upon the text after first having distanced myself from it for a while. However, the manuscript was shelved, waiting for a time when I could make the final touches. There were other challenges too, both substantive and organizational, including a series of follow-up research and book projects initiated by Jan Kop on irrigation and public works in Indonesia.

Ultimately, however, I found the time, the patience and the inspiration to finish this book by editing and revising the text that was already there. Where possible and where necessary, I have used the above-mentioned and other follow-up work to give updates, empirically and theoretically, sometimes replacing parts of the text with references. Since 1997 the scientific community in the domain of irrigation and technology in Indonesia has not been idle either. It has included Maurits Ertsen’s dissertation (2005), written as a follow-up to

my thesis and under my co-supervision. All the newly published research also enabled me to update the text, include new references and delete some of the more outdated ones.

Last but not least, I took the opportunity to organize my data and arguments in a slightly different way taking a new structuring perspective. The book still describes and analyses the ups and downs of irrigation engineers in the Dutch East Indies from a colonial state formation viewpoint, as did my dissertation. In addition, however, there is a new message: it shows and argues, to a greater extent than did my thesis, the engineering character of the whole Dutch colonial project in the Indonesian archipelago, not only technologically but also ideologically though always from the irrigation angle.

The added value of this study remains its empirical character. Despite all the scientific progress, colonial irrigation in Indonesia is still an underexposed topic in the international scientific literature and by presenting, discussing and analysing a treasure trove of Dutch data this publication aims to rectify matters. Hopefully, it will also stimulate the discussion on technology and colonialism, a subject of research and interpretation infused with sensitivity and swayed by issues of the day.

One of the inspirational sources for the title of my dissertation, which requires a punctuation mark which we do not have to denote irony, was the novel *Heren van de thee* (“Lords of the Tea”) by Hella Haasse. But there was another source, tapped by my research: the sometimes overconfident but always impressive actions of the colonial engineers.

The Caesarean motto *veni, vidi, vici* would seem to aptly describe the attitude that the Dutch had to Indies irrigation. When the Dutch arrived on the scene, Javanese irrigation technology had a centuries-old history which meant that the techniques employed had become very refined. As inhabitants of a country partly below sea-level and with the Meuse and Rhine deltas the Dutch did, of course, have a long history of experience with water resources development and management but they were unfamiliar with irrigation. In their own country the preoccupation had always been predominantly with flooding, with the battle against water. In the Indies it was more of a battle to obtain water. The climatological circumstances (hot and, during the west monsoon season, much wetter than in the Netherlands), the geographical aspect (large plains similar to the Dutch deltas but also with jungle areas and volcanic hills) and the ecological conditions (rice cultivation) on the other side of the world were quite different from in the Netherlands. Nonetheless, on becoming acquainted with Javanese irrigation methods, the Dutch soon felt inspired to come up with improvements.

For the Javanese people there was something divine about running water and so such water was attributed to the gods. For them the Solo, the biggest river of Java, was the *Bengawan*: the auspicious Lord of the Waters (Van Naerssen 1938: A. 65, cf. Van Setten van der Meer 1979). Dutch irrigation engineers arrived from over the seas to subject these water gods to their regimes. In terms of their own religious beliefs, they went about completing creation in the Indies. In so doing, the engineers were following in the footsteps of the sovereigns of the old Indo-Javanese domains and their ambitious projects. Ironically, as we shall see, it was precisely the Solo that was going to prove too powerful for the engineers!

Though long dubbed “The Auspicious Lords of the Waters”, this study now requires a new title that does justice to its unique character. The shift in perspective from engineers simply constructing works to ideology-based engineering in a broader sense, also establishes a better connection with the later Republic of Indonesia, which not only inherited Dutch engineering works, but also the spirit in which they were built.

## II

The present monograph concludes a series of volumes on irrigation and public works in Indonesia between 1800 and 2015. It started with my above-mentioned dissertation *De zegenrijke heeren der wateren. Irrigatie en staat op Java, 1832-1942* (Delft 1997) and was followed by a series of follow-up publications, sometimes written together with others. In several scientific papers I have summarized and specified my findings (e.g. Ravesteijn 2002a, 2006 and 2007a) and presented additional data (e.g. Ravesteijn 2000, 2002a and 2002c, Ertsen and Ravesteijn 2008). I also extended some of the theoretical arguments (e.g. Ravesteijn 2002b, 2007b and 2010, Ravesteijn, Hermans and Van der Vleuten 2002).

In addition, and in close cooperation with Jan Kop, I wrote and edited four follow-up books, extending the scope to public works: *Bouwen in de archipel. Burgerlijke Openbare Werken in Nederlands-Indië en Indonesië 1800-2000* (“Building in the Archipelago. Civil Public Works in the Dutch East Indies and Indonesia 1800-2000”, Zutphen 2004), *For Profit and Prosperity: The Contribution made by Dutch Engineers to Public Works in Indonesia 1800-2000* (Zaltbommel/Leiden 2008, translation of *Bouwen in de archipel*), *Irrigation Revisited: An Anthology of Indonesian-Dutch Cooperation 1965-2014* (co-edited by Kasper Kop, Delft/Jakarta 2015) and *Tapak Tilas Irigasi: Bunga Rampai Kerja Sama Indonesia-Belanda 1965-2014* (Jakarta 2017, translation of *Irrigation Revisited*). With this study I have come full circle, a virtuous circle of knowledge and insight, driven by 25 years of research into the ups and downs of civil engineers in the Dutch East Indies. It was the English translation of my dissertation that formed the basis for the present publication, but the manuscript has been revised and updated in the light of follow-up research and new insights as well as information obtained from newly published studies.

The historical research as well as the writing of my dissertation has been made possible and has been sustained by the stimulating help and encouragement of many individuals in the Netherlands and in Indonesia. I would like to thank my thesis supervisors, especially Frans Hüsken (1945-2010), who in the many relaxed discussions that we had was perpetually able to refuel my interest and provide me with valuable knowledge. I am equally thankful to Arnold Walravens, Henk Voets and Erik Andriessen for their supervision. Much thanks goes to those who have supplied commentary on parts of the manuscript or on previous chapters or parts: Paul Ankum, Rob Brouwer, Marilyn van Dalen, Jan van den Ende, Maurits Ertsen, Marie-Louise ten Horn-van Nispen, Lucas Horst, Bert de Jager, Frida de Jong and Ton Robben. Once again I would like to thank Lucas Horst for making available to me his Van Blommestein file, which I also used for certain follow-up publications. Finally I would like to thank all of those who made time for informative discussions with me. In the Netherlands some of these people were, alongside some of those already mentioned, H.J. Schoemaker, Nico Schulte Nordholt and Jan Wuisman.

In Indonesia, where I conducted both archival research and fieldwork in the 1990s, I would like to thank the staff of the *DHV* engineering bureau (now part of Royal HaskoningDHV) who were informative or of help in other ways. In that connection I think especially of the engineers Jan Sonneveld and Budi Subroto. My thanks goes also to Jaap Erkelens of the *KITLV* (the Royal Netherlands Institute of Southeast Asian and Caribbean Studies) in Jakarta who helped me greatly by putting me in contact with employees at the Department of Public Works. I am grateful also to the academics at the universities I visited who supplied me with much information, notably Richard Hutapea of the Satya Wacana University in Salatiga and Loekman Soetrisno of the Gadjah Mada University in Yogyakarta. I am furthermore most grateful to the many people – in particular the experts from the Department of Public Works (in Jakarta and elsewhere) and from the Provincial Public Works Departments – who took care of me during my travels, showed me around, informed me and

were of help in other ways. It would be impossible to name them all. However, there are several people who should be singled out. I am especially thankful to the engineer Soenarno and the engineer Roedjito who had the authority and readiness to support me, to Tjandra Mualim who proved to be a great travel organizer, to the engineer R. Didiek who reorganised his work for a few days to fit in with my travel scheme, to Djauhari Sumintardja who put me in contact with Soenarno and to the engineers Karwito and Mudjuanto who accompanied me on the road for a full week.

Furthermore, I am indebted to Harry Lintsen, who enabled me to do my dissertation work, though we disagreed on the approach, and to Peter Idenburg who as dean of the Faculty of Technology, Policy and Management made the translation financially possible. Diane Butterman-Dorey took responsibility for the translation work. I look back with satisfaction on our period of co-operation and I am grateful to her for all her efforts. She bears no responsibility for a great deal of the later rewriting of the text, including the new notes and sections, which might explain the Denglish here and there. I thank her, however, for checking the Prologue and the other short texts at the beginning of this book.

In finishing this book I am thankful to Jeroen van den Hoven, Ibo van de Poel and Sabine Roeser for their supportive attitude. Jan Kop has been an inspirational research and writing partner for many years. Though now an Emeritus Professor, he has put a lot of energy into our research collaboration. With his input and perspective Jan has taught me much not only about civil engineering in the Dutch East Indies, but also about the ins and outs of life in colonial society, or rather, in what was then a significant part of the Netherlands. He was the great stimulator in the last stages of the making of this book who did not stop encouraging me to complete “our trilogy” on civil engineering in the Dutch East Indies for an international public. Jan also critically checked the updated Epilogue, which resulted in many improvements, though I was not able to meet all his expectations. My genuine and sincere thanks go to him!

I thank KITLV/Royal Netherlands Institute of Southeast Asian and Caribbean Studies in Leiden, the Netherlands, for kindly giving me permission to use a number of photos from their collection (which now falls under the Leiden University Libraries). These photos were earlier made available to me for a lecture at the instigation of *KITLV* (in particular Gerrit Knaap) in conjunction with the so-called *Wetenweek* (“Learning week”) on October 21, 2005.

Marja Offers was there from the very beginning of this long-lasting research and writing project. Her support goes far beyond encouraging me. She is my partner for better or for worse and I seize this opportunity to express my thanks to her for that.

Wim Ravesteijn  
Delft, autumn 2017

## Note to the reader

The Indonesian archipelago (comprising some 13,000 islands) constituted the key part of the Dutch colonial empire. It was and still is referred to as the (Dutch or Netherlands) Indies or East Indies, not to be confused with the Dutch West Indies on the other side of the globe. In this book, I prefer to speak of “the Dutch East Indies”, shortened to “the Indies”. Java is the main island and the region on which I shall focus. The Outlying Regions or Outer Islands, including Sumatra and Celebes (now Sulawesi), constituted the other parts of the “Emerald Belt”, the name that the Dutch proudly gave to their colonial possessions in the East. I adhere to the country name “Indonesia” for the independent republic.

Instead of “East Indian” or “Indian”, I also use “Indies” as an adjective (without an apostrophe), when referring for instance to the (Dutch) Indies Department of Civil Public Works, “The Indies Guide” (*De Indische Gids*, a Dutch colonial bulletin) and (Dutch) Indies engineers.

The Dutch language is avoided as much as possible in the running text. All Dutch quotations have been translated. Readers interested in the Dutch versions are hereby referred to my earlier-published dissertation. Dutch titles of important Dutch writings have been maintained and are followed by the English translation given (only the first time) in quotation marks and in brackets. Thereafter the English translations are used. The same applies to Dutch journals and similar such sources: the running text contains the original titles together with their English translations; from then on just the translations are used. However, the Dutch titles are retained in the references (with a translation, if used for the first time). See the **Sources** for a list of journals and their translations (and for the abbreviations used in the literature list) and see the Introductory note for similar Dutch sources (as well as all the abbreviations). The yearly report of the Indies Department of Civil Public Works, for example, appears in the text as the “Civil Public Works Report”, but in the source references I use *Verlag BOW* (*BOW* is the abbreviation for *het Departement van Burgerlijke Openbare Werken*, or the Department of Civil Public Works). In references to other Dutch sources, the original text has also been honoured with a one-off translation. All of this is repeated in each chapter. Finally, the original Dutch wording is occasionally given in brackets. Note: references to archival sources are only given in English.

Supporting maps and other figures from Dutch sources have been provided with translations of key terms only when deemed strictly necessary.

Confusion might arise in relation to the multitude and diversity of government bodies in the Dutch Indies; the many “departments”. Just to clarify matters: there is an administrative line and a technical line. The terms generally used in this book are given in bold print. **The colonial government** (*het gouvernement*), based in Batavia (now Jakarta), constituted the top of the administrative pyramid in the Indies, with the **Dutch government** and the Dutch **Minister of the Colonies** bearing ultimate responsibility. In the course of time, the power balance shifted between the two, but, of course, the motherland remained the most powerful. The colonial government is also referred to as the **Indies government** (especially in the late colonial period, when the term “colony” has been deleted from all official jargon) or the **colonial** or **Indies administration**, the latter involving the whole administrative apparatus. The head of the colonial government was the **Governor-General**, which further consisted of the **Directors** heading the **Directorates** and later various central **Departments**. Examples: the Department of Civil Public Works, the Department of Civil Service and the Department of Agriculture. Shortened forms are used for these departments, e.g. **Civil Public Works**, though not for the Civil Service Department, to avoid confusion with the inland administration.

The Civil Service (*het Binnenlands Bestuur*) or the inland administration, consisted of regional departments, called **Residencies**, which were made up of local departments or **Regencies**, divided into **Districts** (and **Sub-Districts**). The **regional heads of administration** were termed the **Residents**; **Assistant-Residents** were known as the heads of the Regencies, together with the indigenous **Regents** (the latter being termed the “younger brothers” of the Residents). Districts had their indigenous **Chiefs** (*Wedonos*), Sub-Districts their **Assistant-Wedonos**. Decentralization and emancipation in the late colonial period brought a new generation of government bodies, including the **People’s Council** (*Volksraad*) in Batavia and the **Provinces** (headed by **Governors**). Java had three such Provinces consisting of various Residencies. The term “region” is used in a general sense.

The technical line relates to irrigation and public works and the relevant organisations. On the whole this had to do with the Indies **Public Works Organisation** (in Dutch: *de Indische Waterstaat*; comparable to the Dutch State Public Works Organisation: *Rijkswaterstaat*), shortened to **Public Works** (see below). Most importantly: the **Department of Civil Public Works** in Batavia, consisting of various **Divisions** (with their **Heads**), included, for example, the **Technical Division**. This evolved from the **Bureau of Public Works**, and its predecessors into the **Department of Transport and Public Works**. Later, the Provinces got their own **Provincial Public Works Department** (with a **Head**). Regional **Public Works Divisions** (*Waterstaatsafdelingen*) and **Irrigation Divisions** (*Irrigatieafdelingen*) were also established (both with their respective **Heads**) and were divided into **Sections** (not to be confused with the “sections” [with rice fields] of an irrigation area). Earlier Public Works Divisions were also denoted as **Inspectorates** (headed by an **Inspector**). For management purposes, local **Irrigation Commissions** were set up. Finally, there were projects, consisting of irrigation works (e.g. the Pemali Works) and the relevant (**Irrigation**) **Services**, headed by an engineer (the **Director** of the Service concerned or the **Head of the [Irrigation] Works**) and falling under the Civil Public Works Department or, later, the relevant Provincial Public Works Department. “Irrigation service” or “public works service” are used as general terms, the latter also to denote Public Works (see below).

Civil Service employees are referred to as **administrators** (more in the case of the higher ranks) or (in general) **civil servants**. Employees of other administrative bodies are referred to as **officials**. **Public Works engineers** who were employed by the Civil Public Works Department (or Public Works in general), were officials as well. However, they are referred to in their technical capacity, as engineers (“public works engineers” [*waterstaatsingenieurs*] exist as well, but they are generally referred to as **civil engineers**).

For reasons of clarity and consistency, I have been generous with capital letters for state institutions and official positions. Though this might sometimes be contrary to contemporary language conventions or rules, it does correspond with what I encountered in many Dutch colonial sources. Capital letters are used for the names of government bodies (e.g. Department of Civil Public Works and Provinces) and – if possible – their shortened forms (e.g. Agriculture). “Public Works” is used in a general sense, like “Public Works Organisation” (see above). While comprising, in later times, the Provincial Public Works Departments as well as the central Public Works Department, it previously consisted of the Bureau of Public Works and its predecessors. Capitals are also used for government positions (e.g. Inspector, Director, Clerk and *Mandur*). I have written “works” with a capital in the case of specific irrigation works (e.g. the Pemali Works), though I have not extended this to apply each time various works (without a name) are mentioned.

In colonial bureaucracy, “engineer” was used to denote a technical function. There were Trainee Engineers, First, Second and Third Class Engineers or Chief Engineers. However, the term also came to be used as a title (abbreviated in Dutch to “ir”) for technical professionals with higher or academic technical schooling (notably in relation to the

engineering training facilities in Delft and later also in Wageningen: agricultural engineers, and Bandung). In this study the term “engineer” is applied in both senses of the word. Generally, “engineer” is written with a small letter, except if used to indicate a specific position.

Dutch, Indonesian and other non-English words are given in italics. For Indies and Indonesian words and geographical names, I have used the current Indonesian spelling, even in colonial quotes.

Dutch or Dutch colonial weights and measures have been used. The Dutch guilder (*f*) was replaced by the euro (€) in 2002 at an exchange rate of 1 euro equalling 2.20 guilders or, conversely, *f* 1.00 equalling € 0.45. In colonial times *bouws* and *pikols* were used, equalling 0.7 hectare and 61.76 kilo respectively.

## Prologue: the lens matters!

You the king are like a great mountain and your subjects are the trees upon it. It is the balance of harmony between the highest and the lowest that maintains prosperity and happiness (from an old Javan epic, cited by Van Setten van der Meer 1979: 98).

Much of what happens in the Indies is not all that easy to understand (former Minister of the Colonies, Sprenger van Eyk, cited by Van Bosse 1901: 361).

The famous Dutch novelist Hella Haasse (1918-2011) is said to have characterized Dutch colonial interference as being akin to “scratching on a rock”. She spoke from experience because she was born in Jakarta, the capital of the Dutch East Indies (then Batavia) and died in Amsterdam, the capital of the Netherlands. Her claim might have applied to the Outer Islands of Indonesia but not to Java, the main island of the Indonesian archipelago. This book shows that Dutch irrigation interference in Java went much further than simply scratching the surface; it was closer to rock-carving and systematically redrawing the map!

Haasse’s qualification is repeated in Mrázek’s *Engineers of Happy Land*, where he speaks of “flies upon the milk”, quoting the Dutch journalist Willem Walraven who made that claim in the 1930’s when the numbers of Dutch people in the colony (Mrázek 2002: 9) were limited. Elsewhere Mrázek (p. 35) quotes – apparently with consent – the nationalist Sjafoedddin Prawiranegara who asserted something similar when he predicted that Indonesian blood “will flow, and ... creep, like the roots of alang-alang, the coarse tall grass”. I much appreciate Haasse’s work on the Indies, especially *De heren van de thee* (“The Lords of the Tea”). I have more difficulty with Mrázek’s implicit and suggestive history writing (compare Dixon 2003), but I cannot deny that he provides interesting and informative narratives on the basis of great knowledge and insight, especially with regard to the engineering of technological constructions and networks including roads, electricity provision, telephone and architectural structures.

Indeed, if one visits and travels through Indonesia one is impressed by its post-colonial achievements, for instance in the field of architecture in Jakarta. One may think especially of the landmark buildings along the well-known Jalan M.H. Thamrin-Sudirman and in other big cities where modern architecture eclipses most monumental buildings of colonial times. With regard to water control, Indonesia has been a pioneer in rubber dam building, one such dam being in Surabaya. The country definitely has a modern and dynamic appeal. Visitors are overwhelmed by the lively trade and industry and by its people who ambitiously move forward while forging ahead on the ladder of development and progress. In addition to all the modern works, big plans are perpetually being made and executed in the interests of the nation’s further advancement. The partly implemented Palapa Ring project will greatly improve connectivity throughout the country. With the Great Garuda Plan where the idea is to close off the Bay of Jakarta and establish a new iconic business centre, Jakarta looks ahead to



a bright future.<sup>1</sup> Still, I find it hard to follow the viewpoints of the above-mentioned writers when it comes to the significance of the networks of roads and other public works constructed in colonial times which actually and factually formed the basis of the Indonesian state. If, after having read this book, the reader still thinks that in the field of irrigation, especially in Java, the Dutch contribution was of minor significance that would amaze me. It would furthermore indicate that this study has failed to serve its purpose and fulfil its ambition! How can such big differences in opinions arise?

Since the time of the agricultural revolution in the Middle East and the world population's embarkation on the path known as civilisation, irrigation has been a well-known and important phenomenon. Round 1900 irrigation had become such a topic of fascination that the canals on Mars which had just been discovered were even associated with higher levels of civilisation; indeed with a civilisation which, according to Percival Lowell, was even perceived as being superior to that of societies here on earth (Wanders 1971: 145). The discovery of canals on Mars turned out to be an optical illusion, neither visible through stronger or weaker telescope lenses, but maybe there was more to it. The awareness of a strong link between irrigation and civilisation might have inspired the work of engineers like William Willcocks, who built the Aswan dam (1899-1902), the very first big dam in the world (Courtland Penfield 1899). This connection was later elaborated in, for instance, the work of Gordon Childe (1951 and 1963), and gave rise to the Hydraulic Hypothesis of Karl Wittfogel (1957), who saw in large-scale irrigation the basis for the "total power" of eastern despots. This view could well have acted as an additional trigger for the notion that there were canals on Mars. Could we interpret the downplay of Dutch colonial irrigation interference in the same way? Is it an illusion, optical or otherwise?

If one zooms in on irrigation works, the Dutch effort cannot be ignored or trivialized at all. Dutch Indies irrigation works can be found everywhere in Java, especially in the coastal plains. Whatever town or village one visits on this main island of the Indonesian archipelago, especially in the coastal plains area, the results of Dutch compulsive activity in the field of irrigation are never far away. For instance, one need only think of the weir in the Pemali river (see **Figures 1 and 2**).

This showcase of colonial irrigation engineering is situated in the hinterland of Tegal (see **Figure 3**), its long horizontal lines forming an unnatural but powerful presence in an undulating landscape set against a backdrop of mountains, sharply defined on a hot day in the east monsoon season. In the course of an average day during the west monsoon season, however, dark clouds gather above the mountains in readiness for the next downfall. During the east monsoon period the water level is low in the river with trickles of clear (because free of silt) water pouring down over the several meters high dam. In the rainy season, however, the river swells dangerously and brown-coloured water plummets down over the full width of the river like a wall of water. A man bathing in the water, people washing clothes, a buffalo in the nearby field of stubble, children passing by, a proa packed full with passengers negotiating the waterfall: the scene at the foot of the weir has probably not changed for a hundred and twenty five years. Together with numerous other structural works and a very branched network of canals, the Pemali dam is responsible for ensuring that the *sawas* (wet rice fields) with a collective surface area of thousands of hectares are provided with "life-giving" water, thus contributing significantly to good and certain rice harvests.

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<sup>1</sup> Both projects have been topics of master thesis research work – the latter also PhD research – conducted by Indonesian students at Delft University of Technology in which I was also involved as a supervisor. Other relevant master's theses and projects I was engaged in include the development of geothermal energy in Indonesia, the extraction of biogas from waste in Java and the modelling of water resources management in the Surabaya river basin.

## Prologue



Figure 1: The weir in the Pemali river in the west monsoon period (photo WR)



Figure 2: The weir in the Pemali river in the east monsoon period (photo WR)

## Prologue

The Pemali weir was completed in 1897; the entire irrigation network in 1903. The engineer A.G. Lamminga (see **Figure 4.2**) is closely linked to these and other works in the region. Born in Friesland in 1855, in the north of the Netherlands, trained at the Polytechnic School in Delft (now Delft University of Technology), he made his name through his engineering activities in the coastal plains of North Java. Through his Pemali-Comal Works, Lamminga was responsible for providing a long stretch of land on the northern coast of Central Java with modern irrigation facilities, including water management regulation. He succeeded where others had failed. In the process, Lamminga gained for himself the status of founder of modern irrigation technology in the Indies. In 1930 a monument was unveiled to this “creative genius” in Tegal, the central town in the area. The whole idea of erecting a commemorative memorial came from the engineers who “had started their Indies career under or who had been educated at the school” of that same creative genius (Lamminga monument 1930: 121). Lamminga was the great example for all the engineers who came after him; he was one of their heroes. His works remain, though his statue has gone. In the place where it once stood another monument can be found that was erected in 1969 in honour of one of the heroes of the republic, Jos. Soedarso, a naval officer.



Figure 3: Map of Java and Madura (cf. **Appendix A**)

Lamminga left more than mere traces. After his return from the Dutch East Indies he was appointed Professor at the Technical College in Delft, which supplanted the school. There he became involved in establishing the Hydraulic Laboratory (now Deltares). Present-day civil engineering students in Delft and other scholars engaged in irrigation or water issues in Indonesia or in other developing countries can now apply for travel and other grants from the Lamminga Foundation that was set up after his death in 1920.

Zooming out on irrigation works always leads to the same result. When one flies over Java the patchwork of rice-fields or *sawas* separated and supported by an intricate web of irrigation canals and works is clearly visible, especially the big weirs controlling the rivers. One may think, for instance, of the movable dam situated in the Cisadane river, created by the Dutch in the 1930s. This remarkable structure is not far from Jakarta, the capital of Indonesia, so that travellers who arrive or leave by plane can, if they are lucky, view it from the air in all its glory (see **Figure 4**). Situated as it is between houses and *sawas* I found this structure to be more impressive from the air than from the ground. In that way I was clearly able to see how this gigantic specimen of engineering, with its ten broad sluices, dominated the river. The

river had been reduced to a small stream with water flowing to the *sawas* via two inlet sluices situated on either side of the structure.

However, not everything that the Dutch undertook overseas worked out. For instance, the Solo Valley Works project, started at the end of the nineteenth century, was halted but, had it succeeded, it would undoubtedly have brought forth the most impressive monuments of colonial irrigation prowess (see **Figure 5**). The Solo river, which is known by the Javanese as the *Bengawan* or the “auspicious Lord of the Waters”, was too powerful for the colonial irrigation engineers who, in their constructing of massive structural works, could perhaps be likened to the Indo-Javanese monarchs of the past as they walked in the footsteps of the river gods.

Today the river still dominates the area and, despite its beautiful name, poverty is rife there. That particularly applies to the Bengawan Jero, a low-lying area in the Solo Valley (in the Surabaya hinterland). The situation has, however, slightly improved over the course of time. In colonial times some people there lived on their rafts in the rainy season that was dominated by the west monsoon. The raft dwellers are gone now, though the rain still fills the basin that forms the area to the brim, resulting in an extensive flowing plain of water. On their thresholds people remain dry (see **Figure 6**). During the dry east monsoon season the area’s dryness is conspicuous, yellow-brown *sawas* prevail. From time to time groups of people can be spotted there, men and women hidden under straw hats busy bringing in the harvest and threshing and winnowing the rice. Their industriousness contrasts sharply with the scorching heat. During the west monsoon season the situation changes dramatically: no labourers are to be seen in dry fields but rather people paddling about in hollowed-out tree trunks.

Elsewhere monumental works have indeed been produced but with poor results. A good example of this is the Sampean area around Situbondo in East Java. In Situbondo there is a small plaque in one of the quayside walls of the local weir that serves to remind one of the very first modern dam in the area that was built in 1832. Various dam constructions were to follow but each time they were seriously damaged by the great force of the river. It was only after much perseverance that the Sampean area was finally equipped with modern irrigation. In the process, the river was diverted and a new weir was constructed at a different point. As a result, the area has become an open air museum – or graveyard – for colonial irrigation technology (see **Figure 7**). In Situbondo, there are even the ruins of inlet sluices to be found between the town’s buildings, a dam that has been downgraded to a distribution construction (see **Figure 3.1**) and a riverbed that disintegrated due to colonial intervention.

The dams, canals, sluices, aqueducts, reservoirs and other structural irrigation works, created by Dutch East Indies engineers, comprise an inevitable component of the extensive and refined network of canals in today’s Java. This irrigation network is of vital importance. While Indonesia as a whole has some 255 million inhabitants, Java is at present populated by some 148 million people living in close proximity to each other (Demographics of Indonesia, 2016). Rice is the staple diet and roughly half of the island’s population is employed in agriculture, especially irrigated rice-cultivation. Irrigation, the artificial watering of agricultural crops is, like rice cultivation itself, something that has a long history going back at least 2000 years in Java. Despite all the things that have in the past gone wrong, the basis for the present system on the main island of the Dutch East Indies or in the Indonesian archipelago was laid in the colonial era, by civil engineers. Around 1940 1.3 of the 3.3 million hectares of agricultural land in Java (i.e. 40%) was in use for irrigated rice cultivation controlled by “technological irrigation”.

Prologue



Figure 4: The weir in the Cisadane river (photo WR)



Figure 5: The site of the planned weir in the Solo river (photo WR)



Figure 6: Flooding in the Solo Valley (photo WR)



Figure 7: Ruins of irrigation work in the Sampean delta (photo WR)

## Prologue

What is the Indonesian perspective? It seems that the people themselves have less difficulty recognizing the full impact of the Dutch efforts, though – or maybe because of that – their turbulent post-colonial history has pushed the Dutch period with all its colonial misery into the background, perhaps even more so than in the Netherlands. People know where their food comes from. Rice is the staple diet and present-day irrigated rice production, enabled by Dutch engineering works and agricultural policies, feeds a significant part of the Indonesian population. The Indonesian engineers who accompanied me during my visits were well aware of this, sometimes they were as impressed by colonial works as I was: “We cannot make works as solid anymore”, one engineer said. Non-technical Indonesians are knowledgeable as well, at least in the countryside. I was told, for instance, that local people in the Solo Valley in East Java, had implored the Indonesian government to resume the failed Dutch Solo Works!

Another telling sign was the fact that after independence Dutch plans initially continued to dominate irrigation activities, expanding and rehabilitating colonial works though, at times, the Dutch themselves played a minor role. Sukarno embraced W.J. van Blommestein’s East Java welfare plans and ordered the construction of the Jatiluhur reservoir, though it was French engineers who undertook the job.

Like the canals supposedly seen on Mars, another matter may be significant as well, in this case pertaining to the lens of “political correctness”. It is no longer acceptable to write about the great achievements of the Dutch in their overseas territories as was customary in the past (Van Helsdingen and Hoogerberk 1941). Colonialism is simply no longer “decent” and emphasizing constructive contributions is labelled as justification and legitimization aimed at covering up evil aspects (Goss 2009). Much of this is understandable and often even, to a certain extent, true but if one goes too far one misses the point, as this study will illustrate in relation to irrigation. (For similar arguments on public works in general, see Ravesteijn and Kop 2004, 2008).

This monograph will investigate the nature and implications of Dutch irrigation intervention in Java while also particularly demonstrating why the Dutch undertook such a tour de force and how they set about the task. The works of the Pemali, Cisadane, Solo Valley and Sampean areas will be extensively examined and other works will be discussed too, but in rather less detail. The development of technological or modern irrigation (i.e. that realised by civil engineers) in colonial Java will not only be described but also analysed and plenty of attention will be devoted to the relationship all of this had to the process of colonial state formation in the Indies at a time when the engineering profession and, to a lesser degree, Indies Hydraulic Engineering was developing. Ideological aspects will be given ample attention. This book shows how the Dutch empire was engineered in the spirit of technological optimism and a solid faith in progress, in which engineers were a main actor, but worked alongside others. Lastly, postcolonial developments in and around the domain of irrigation will also be discussed.

This is a study that falls into the History of Technology field. My theoretical lens derives from the multi-disciplinary field of Science, Technology and Society (STS), in the framework of which the History of Technology as an academic discipline has taken shape and received content. STS is a field that not only brings together technology researchers with various backgrounds but also their views of technological development. All in all, that leads to insight into the differences and similarities between these factions and their outlooks as well as to cross-pollination. It also leads to the development of new “inter-disciplinary” approaches, which reflect ideas that are alive in the STS field of study as a whole. While traditional views on technology development assume and emphasize its autonomous character and its significance for social progress, STS shows the embeddedness of technology in society as well as the interrelationship between technological innovation and social processes of change and transformation, while simultaneously nuancing technology’s progressive impact.

## Prologue

This book aims to increase our understanding and knowledge of colonial irrigation from a broad and critical STS-perspective while remaining focussed on irrigation engineering in relation to political conditions and consequences.

The scientific literature on colonial irrigation is scarce and so this study fills that gap. In my research I made use of unpublished information preserved in archives alongside published sources and literature, often in Dutch. I also utilized interview material pertaining to encounters with engineers and other experts. Part of the data was collected in Indonesia during two field trips undertaken in the 1990s (in August and September 1993 and then in February, March and April 1995 in what were, respectively, the dry and wet seasons). For the listing and explanation of my primary and secondary sources, see the **Sources**. But there is more to rectify than deficiency since the writings on colonial irrigation that do exist reflect the already mentioned traditional biases (further explained in **Chapter 2**), as well as the new kinds of misconceptions discussed above.

Four main themes inform and organize this book: the development of modern irrigation, the process of colonial state formation, the rise of irrigation engineers and the accompanying ideological beliefs. Irrigation development is especially highlighted in the four case studies. In conjunction with colonial state formation I shall examine, amongst other things, colonial policy and the development of the administrative organisation. The “formation” of Public Works and the developing of the technological knowledge of the engineers are the points particularly reviewed in my examination of the rise of engineers. Ideological factors will be outlined in relation to state formation and the emerging engineering profession.

**Parts I, II and III** correspond with three phases distinguished in the colonial state formation process (1830-1885, 1885-1920 and 1920-1942), explained in **Chapter 2**. Each consecutive pair of chapters has a fixed structure: a technological chapter with a case study and a “contextualising” chapter that focuses on the state (administration and policy), engineers (Public Works and the technological approach) and contains a concluding discussion in which the facts surrounding irrigation, the state and engineers in relation to each other are evaluated. The four cases form the backbone of the book, the contextualising chapters give the conditions and the final discussions are of a summarising and analytical nature (also providing supplementary information on results, knowledge and the professionalization of the engineers). In **Part II**, on modern irrigation activities in the transition period between the early colonial and the modern colonial state, two cases are presented and discussed. This part also has two contextualising chapters. The above-mentioned main questions are returned to in **Chapter 11**, that is, the **Conclusion**.

The first two chapters discuss irrigation from colonial, post-colonial and technological-historical perspectives and they sketch the main arguments of this study. **Chapter 1** gives the colonial view but it also questions this ode to modern irrigation. **Chapter 2** introduces Science, Technology and Society in the broad perspective of this book. Subsequently, it contextualizes the colonial view of irrigation, especially the ideology, showing how the sporadic modern studies partly confirm and partly differ from this view. After having noted how distorted and incomplete earlier images are, this chapter sets the stage for the present study. The **Conclusion** gives the answers to my research questions as formulated in the final section of **Chapter 2**, with special attention to the ideological overtones of the irrigation efforts. The **Epilogue** explains what happened in the irrigation areas of the four cases examined after independence while clarifying the various relevant backgrounds.



# 1

## **‘The Dutch have gone, their monuments have been left behind’**

### **Introduction: the colonial image of irrigation engineering**

While the engineer must necessarily be a man of vision, yet at no time can he afford to be a visionary. Without vision the people perish, without the dreams of the engineers modern civilization would be impossible (F.H. Newell, quoted in Thal Larsen 1932: 22).

The dams in the Pemali and the Cisadane rivers (See **Figures 1, 2 and 4** in the **Prologue**) are impressive feats of engineering and evident vestiges of colonial irrigation technology. Together with other irrigation works that Indonesia has inherited from its colonial overlords, they somehow support the words of the former Director of the Dutch Indies Department of Civil Public Works (spoken in 1922 during a festive gathering on the occasion of the 75<sup>th</sup> anniversary of the Royal Institute of Engineers) thus making what he said seem somewhat prophetic. This engineer, P.J. Ott de Vries, realised early on that modern irrigation works would be destined to outlive the colonial state:

“Well, if for any reason our nation should be inadvertently forced to leave the Indies for good then the Dutch people will have to thank Dutch engineers for the fact that even the Indians will claim that even though the Dutch have gone, they have left behind them their monuments” (Ott de Vries 1922: 744, compare Van Doorn 1994a: 121-122).

In this chapter I will begin by examining the impressions formed concerning irrigation in the Dutch period which should also serve as an introduction to colonial irrigation intervention. On the basis of certain literature produced by writers of that period I shall trace the outcome of irrigation activities, the matters to which results were attributed and show how these things were presented. Many of the elements touched on will be returned to more extensively later on in this study.

### **Colonial praise for modern irrigation**

#### **“Something Great Was Achieved There”**

In a speech given on the occasion of the fourteenth anniversary of the Agricultural College in Wageningen, in 1932, J.H. Thal Larsen who was then the College’s vice-chancellor painted a glorious picture of the state of affairs in the field of irrigation in the Dutch East Indies. While alluding to the situation in Demak where the above-mentioned dam at Glapan constituted an important improvement he commented (1932: 21) that famines were indeed a thing of the past:

“Famines of the sort seen in the *Demak* region in 1848 and 1872 are a thing of the past and that is, not least, due to the fact that agriculture has been protected from drought and flooding. All that has been achieved in this area will – coupled with the many other good structural works – constitute a durable and favourable impression of Dutch dominion in these regions, regardless of what those who do not wish to judge the deeds of their forefathers according to the spirit of the times might think: they will rather reflect the elevated beliefs of one’s own times”.



Figure 1.1: Indonesia superimposed onto a map of Europe (from: De Vries 1928)

Thal Larsen’s speech was no exception. In the final decades of Dutch rule in the extensive archipelago (see **Figure 1.1**) fancifully known as “the emerald isles” and many proud stories were told of what had been achieved under colonial administration. The best known of these being the collection that appeared in 1941, just before the time of the Japanese invasion entitled *Daar wèrd wat groots verricht* (“Something Great Was Achieved There”, edited by the lawyer, W.H. van Helsdingen – former chairman of the Indies People’s Council and the lawyer Dr. H. Hoogenberk). In that publication there were almost 40 experts who contemplated the consequences of “the great endeavours made by the Netherlands to bring peace and prosperity to its Empire overseas” (p. VI). Indeed, that turned out to be favourable because, according to these contributors, the Netherlands had fully realised the expectations voiced by Jan Pietersz. Coen during the early phases of Dutch hegemony in the archipelago (“Great things may be achieved in the Indies”) and thus had every reason to be proud. In the book appropriate attention was devoted to “Western technology”. The engineer H.C.P. de Vos, the first Professor of Hydraulic Engineering at the College of Technology in Bandung wrote in that connection a section on irrigation intervention.