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Hydrocracies, Engineers and Power: Questioning Masculinities in Water*

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ABSTRACT

Beginning with colonial times and continuing to the present, irrigation engineering has been and is an important site for the construction of gendered power and hegemonic masculinities. The strong connection between masculinities and professional irrigation cultures provides one possible explanation of why hydraulic bureaucracies are so resistant to change: it makes behaviours and codes of conduct that are learned seem natural. Taking inspiration from masculinity studies and from feminist studies of technology and organizations, this article proposes two possible lines of inquiry for critically disentangling how the irrigation profession becomes or is made masculine. The first is the feminist historical analysis of water bureaucracies, and the second is a critical ethnography of contemporary irrigation organizations. Such studies are needed both to create more space for women engineers in government water agencies and to contribute to unravelling important cultural aspects of water politics.

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Introduction

Mentioning ‘women’ (or gender) in a professional irrigation context is much less of an anomaly than it used to be some 15–20 years ago. Numerous texts have been published about gender and water, and a large number of studies have been conducted on the theme.1 Water policy documents likewise often mention women or gender, and most donor funded irrigation projects have gender components. Often at the initiative of (some would say under pressure of) donors, public irrigation departments and ministries in some countries (including for instance Bangladesh and Nepal) have developed (or are developing) specific policies on gender. Gender has also become an important feature in water campaigning in recent years, with women figuring prominently in anti-dam and anti-privatization movements across the globe. International networking around gender and

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1 See Ahmed, Flowing Upstream, 2005; Bennett et al., Opposing Currents, 2005; Coles and Wallace, Gender, Water and Development, 2005; and Lahiri-Dutt, Fluid Bonds, 2006.

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water likewise gained momentum, with for instance the Women for Water Partnership and the Gender and Water Alliance.

In spite of (or maybe thanks to), the fact that gender and women have now earned a legitimate place on water research and policy agendas, the professional irrigation world very much continues to be a ‘men’s world’. This manifests itself along at least three different dimensions. These are linked, although not in direct causal ways. The first is that rights to irrigation water and infrastructure; rights to irrigated land and rights to participate in irrigation decision-making, almost everywhere in the world, are predominantly vested in men. Female irrigators and farmers have significantly fewer possibilities to own irrigated land and water than male irrigators and farmers do. Although women often are important providers of labour to irrigated agriculture and to canal maintenance and cleaning, they often do not themselves directly control the fruits of their work and this work is also typically valued and rewarded less than men’s irrigation work. Membership of irrigators’ associations likewise tends to be reserved to men, with participation in public meetings often seen as an activity that is belongs to the domain of men. As a result, women often do not have a formal voice in decision-making and do not have the same possibilities for influencing choices about the mobilization of resources for maintenance or about water distribution as men do.

The second dimension of the masculinity of irrigation is that the professional irrigation domain is heavily male dominated. This is most obvious in the fact that most irrigation professionals (experts, engineers, managers, planners and policymakers) are men. However, and maybe less directly obvious, it also shows in the fact that the professional involvement with irrigation, be it as an engineer, manager or planner, is very much identified and perceived as a male activity, or as an activity belonging to the domain of men. Lynch, as one of the few to reflect on the genderedness of the irrigation profession, argued that the characteristics and culture of the ‘bureaucratic tradition’ to which irrigation institutions and policies are tied is one that strongly associates decision-making and power with masculinity. As she argues, the hegemonic strength of this tradition has long been maintained, and to some extent continues to be maintained, through the socialization of generations of engineers and bureaucrats. It finds legitimization in the powers and financial resources of irrigation bureaucracies (or *hydrocracies*). Through the ‘bureaucratic tradition’, masculinity and the professional irrigation identity have come to mutually constitute and define each other at symbolic and metaphorical levels.

The third dimension along which irrigation is a man’s world, is that irrigation narratives and knowledges have long de-valorized women’s contributions or rendered thinking and speaking about women irrelevant. Most contemporary irrigation texts are no longer overtly sexist, for instance in preaching in favour of a specific gender division of labour based on a naturalization of gender differences or by automatically connecting women with the bodily work of reproduction and domestic labour. Yet, most current discursive interpretations of irrigation realities do typically emphasize and attach greater value to those activities and experiences that are associated with men. More in general, there exists a particular epistemic tradition in knowing irrigation that is deeply inhospitable to the analysis of social relations and gender.

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Most studies and writings on gender and water to date have focused on the first dimension. The normal tendency of gender-and-water studies is, in other words, to 'study down': documenting gendered patterns of water work and gendered divisions of rights and responsibilities as a first step to recognizing and establishing women's importance as water-actors, and gaining legitimacy for their demands for water rights and powers. Such studies focused on understanding 'what happens in the field', and have greatly contributed to making women visible and showing the genderedness of local water realities. However, the project of making women visible seemed based on the assumption that men are visible and well represented. I use this article to question this assumption. The people mostly referred to in irrigation texts and policies are men. Yet, this seldom made explicit. The fact that they are men is simply assumed, or is implied not to matter for their irrigation behaviour, because that behaviour is derived from some universal human nature that is either gender-neutral; pre-gendered (human) or the norm. The same is true for the fact that most producers of irrigation texts are men, and for the related fact that most water expertise and authority is attached to men. That most water managers and engineers, in most water management organizations and irrigation agencies in most countries are men, is something that has been noted and lamented; it underlies calls for more women in water decision-making, engineering education and professions. Yet, the conditions, processes and consequences of men’s historical and contemporary domination of the irrigation profession have received little scrutiny. How and why do water control, status and expertise become linked to men (and masculinity)? How do such links work to legitimize the exercise of power? These are questions that are seldom asked, a silence that reflects that the association, or even conflation, of men with organizational power, authority, expertise and prestige in water is taken for granted and self-evident.

In this article, I therefore propose a reversal of the research gaze, from female water users to male water engineers. I argue that it is high time to also start analysing the other two dimensions of the masculinity in the water sector, and that the critical study of the linkages between water control (powers and politics) and men/masculinities constitutes an urgent and interesting project both of feminist water studies and of studies that try to understand the cultural politics of water. This argument is based on the strong suspicion that the (discursive and real) invisibility of men and masculinity in irrigation has important political dimensions in the sense that it is one of the ways in which power presents itself as self-evident and ‘natural’. In other words, I hypothesize that the masculinity of irrigation helps establishing a Foucaultian type of power, the source and workings of which themselves remain hidden, in analogy with the watcher in the Panopticon prison whose controlling techniques importantly depended on his own invisibility. Indeed, the mistake made by many gender and water studies was that they equalled men’s centrality with their visibility. Yet, being at the centre is not the same as being visible: being at the centre can serve to hide, obfuscate, confuse, obscure.

The suggestion of directing the research gaze towards those who hold power and expertise in water is in itself not new. Chambers proposed it as far back as 1988. More recently,
the observation that ‘critical perspectives in water studies have tended to take the water users’ side, and concentrate on the study of localized water management practices and resistance to projects of state bureaucracies’ provoked a similar plea.\(^\text{10}\) So far, however, little work has been done on hydrocracies and engineers, and even less has looked at masculinity as a crucial element in it (Laurie\(^\text{11}\) is one exception). Studying masculinities in a professional water context does not mean only focusing on men; it also implies examining the institutions, cultures, and practices that sustain (gender) inequality (within and between genders) along with other forms of domination such as race and class. It involves questioning symbolic as well as material dimensions of power, and means working on, and recognizing, the connections between the personal and the professional, the politics of institutions, and the global system.\(^\text{12}\)

In what follows, I first discuss some theoretical notions that I find useful for studying the linkages between men, masculinities and water powers. I continue by suggesting and discussing two potentially interesting areas for ‘masculinities and water’ research: feminist histories of hydrocracies and feminist ethnographies of contemporary hydrocracies (or feminist studies of engineering as a profession).\(^\text{13}\) Both provide promising entry points for beginning to unravel how engineering and engineering organizations have been constructed, and continue to be constructed, as masculine. I illustrate my argument with examples from South Asia.

### Masculinities

My approach is to engage masculinities through the prism of feminist theory, writing feminist theory using masculinities as an analytic dimension.\(^\text{14}\) I consider gendered social orders as rooted in notions of male and female, masculine and feminine. Such notions are often perceived as fixed categories distinguished by a series of putatively natural, hierarchically ranked oppositions. Although the particular content of the pairs is specific to culture and history, their oppositional hierarchical character is prevalent throughout the world, with men and masculinity, however defined, in a privileged position.\(^\text{15}\) A fundamental premise of my approach is that gender is socially constructed or even performative.\(^\text{16}\) This produces the methodologically and psychologically troubling insight that there is no a-historical or transcendent truth about gender: what gender ‘really’ is can never be established, for what it means to be a man or a woman is always deeply contextual. In Butler’s terms, ‘man’ and ‘woman’ are sites of permanent openness and resignifiability.\(^\text{17}\) Yet, and as Fraser and Nicholson\(^\text{18}\) suggest:

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\(^{13}\) See Zwarteveen, “Men, Masculinities and Water Powers,” 2008, where I elaborate another interesting topic for masculinity studies in water: the feminist analysis of water expertise (the third dimension) in which I link the difficulty of seeing women and gender in water to a particular epistemic tradition in knowing water that is deeply inhospitable to the analysis of social relations and gender.


\(^{15}\) Ely and Meyerson, “Theories of Gender,” 2000.


The lack of a common content of the social distinction between ‘woman’ and ‘man’ does not mean that there are no connections between the diverse meanings of ‘woman’ and ‘man’ that do exist. Instead of thinking that either there must be a common meaning [... ] across contexts or that there merely exists a disparate assortment of such meanings with no connections; we can instead understand the meaning of the male/female distinction across cultures in another way. We can see it as encompassing a complex web of distinctions evidencing threads of overlap within a field of discontinuities.

With Whitehead,19 I define masculinity as those practices and ways of being that serve to validate the masculine subject’s sense of itself as male/boy/man. The study of masculinities – or perhaps a feminist sociology of masculinity – then requires a relational approach that locates gender within broader dimensions of power and social difference, and recognizes its symbolic as well as its material aspects. Because gender is socially constructed, and because it cuts across other differences (not least class and race), there are numerous femininities and masculinities. Gender operates at the level of structures (i.e. kinship, property, labour divisions); identities; and symbols;20 this is why there is a distinction between individually practiced gender identity and collectively held gender stereotypes or norms. Connell and Messerschmidt’s21 notion of hegemonic masculinity is one way of capturing this distinction. Hegemonic masculinity ‘embodies the currently most honoured way of being a man, it requires all other men to position themselves in relation to it, and it ideologically legitimates the subordination of women to men’.22 There could be a struggle for hegemony between old and new forms of masculinity. Laurie provides an example of such a struggle in the context of water and shows how different understandings of modernity were associated with different masculinities in the Bolivian water wars.23

A feminist analysis sets out not just to describe and name different manifestations of gender, but also to critically unravel their effects in terms of power and the creation of social hierarchies. However, the linkages between gender (or masculinities) and power are not straightforward or one-dimensional. How hegemonic masculinity is maintained or challenged is probably best captured by a Foucaultian analysis, in which power is not necessarily possessed or exercised by agents, but ‘subject-less’. It functions because of the presence and proliferation of norms (in this case about appropriate male and female behaviour), including both the dominant and the subordinated in normalizing webs.

To apply these theoretical notions to the study of water and masculinities, I also draw on work done on gendered organizations24 and on feminist technology studies.25 Important in this scholarship is a conceptualization of technology and (engineering) organizations as cultures, and the idea that gender and technology (or gender and bureaucratic organizations) mutually shape each other. This allows going beyond explaining the numerical dominance

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19 Whitehead, Men and Masculinities, 2002.
22 Connell, Masculinities, 1995, p. 832.
of men in irrigation bureaucracies and as water experts just in terms of in/exclusion. The mutual shaping idea importantly implies that neither the meaning(s) of gender nor those of organizations, science or technologies can be taken for granted (or ‘blackboxed’). Gender is partly configured through existing organizational structures and cultures, and through particular ways of doing science and engineering. And vice versa: the very definition of what constitutes a good bureaucracy or a good engineer (or a good manager, or good science) is itself deeply shaped by prevailing gendered identities, hierarchies and power relations. In other words, engineering and technology are both source and consequence of gender relations, and this mutual shaping happens through both material and discursive mechanisms.

Making irrigation masculine

The title of this section paraphrases the title of a book by Ruth Oldenziel, *Making Technology Masculine*. The book is a fascinating account of the gendered history of technology in the USA and provides a nice illustration of the mutual shaping of technology and society. In it, Oldenziel indeed shows how technology was *made* masculine (and white, for that matter). Through conscious efforts to positively distinguish themselves and gain status and respect as a professional group, mechanical and civil engineers during the late-nineteenth century in the USA succeeded in delimiting the definition of technology as consisting of those activities in which they engaged. In doing so, they reduced the significance of existing technologies: the artefacts and forms of knowledge associated with women and black people. This resulted in the rise of engineers as an elite with exclusive rights to technical expertise. And, crucially, it involved the simultaneous creation of a male professional identity, based on educational qualifications and the promise of managerial positions, sharply distinguished from shop-floor engineering and blue-collar workers. This engineer also became a more general model for a particular version of masculinity, characterized by the cultivation of bodily prowess and individual achievement. This gradual definition of what technology (and engineering) was about also redefined femininities as intrinsically incompatible with engineering and technology.

It is not difficult to see how a similar analytical approach could be of interest for understanding the association between irrigation and masculinity as the outcome of a gradual historical process. In South Asia, studies of the (colonial) history of engineering indeed suggest how the very definition of engineering was, at least from the colonial period onwards, based on racial and gender exclusions and hierarchies. A first clear mechanism that worked to establish British engineers and their expertise as superior to other water knowledges was their dismissal of ‘pre-modern’ irrigation technologies. Colonial irrigation engineers, at least in their writings, made little reference to the long Indian history of designing and constructing elaborate irrigation systems. Sophisticated irrigation projects were already being designed and constructed under Mogul rule. Indian communities practiced a wide range of irrigation techniques, long before the arrival and interventions of the British: ‘temporary earth dams, tanks, wells and canals. There were inundation canals in northwestern India,

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step-wells and stone-built underground reservoirs in Rajasthan and Gujarat, and anicuts in southern India.\textsuperscript{30} The prevailing view until far into the twentieth century was that these pre-British irrigation systems were ‘rudimentary or primitive’;\textsuperscript{31} they were also qualified as irrational and inefficient. Yet, and paradoxically, the water wisdoms embedded in these systems formed an important source of inspiration for ‘modern’ engineering expertise. This was also because the early colonial engineers had very little prior knowledge or experience with the design and construction of irrigation works.\textsuperscript{32} Indeed, many early British irrigation interventions consisted of restoring existing irrigation works, many of which were in disrepair.

Little is known of pre-colonial or pre-modern engineering knowledges,\textsuperscript{33} even though these feature prominently in critiques of ‘modern’ science, figuring as iconic alternatives that supposedly are more equitable and environmentally sound. Giving a feminist twist to this debate, Shiva\textsuperscript{34} for instance argued that: ‘Nature’s work and women’s work in water conservation has usually been ignored by the masculinist paradigm of water management which has replaced community control by privatisation, and water-prudent staple food crops by water thirsty cash crops.’ Yet, unlike what such critical accounts often claim, pre-colonial (and ‘pre-modern’) knowledges and technologies were not necessarily more equitable. Shah,\textsuperscript{35} in an interesting analysis of the history of tank irrigation based on folktales and songs, for instance suggests that the design and the construction of tanks were based on the availability of coerced labour, the expropriation of surplus by elites, and forced displacement. She concludes:

Tanks as artefacts were socially embedded in societies and economies that were organized for warfare, sustained sharp social hierarchies, and were often violent to women and people from lower castes. Clearly, the tank as a sociotechnical artefact was integral to the forms of inequality and violence of the pre-modern social order in South India.\textsuperscript{36}

It was precisely the overall lack of expertise and knowledge about engineering amongst the British colonizers in India in the nineteenth century that prompted the establishment of the first engineering institute of the British Empire in India in 1847. This was Roorkee College, later renamed Thomason College. Its educational system was hierarchical, offering different courses for different ‘classes’ of students: Engineers, Upper Subordinate and Lower Subordinate. Who could follow which class was clearly specified: the Engineers class was just for Europeans, the Upper Subordinate class was for both Europeans and Indians, and the Lower Subordinate class was just for Indians.\textsuperscript{37} Hence, initially only Europeans could study there to become engineers. This discrimination was partly inspired by fear of (new) movements for independence and partly based on prejudice about ‘Indians’, who were seen and defined as less suitable for engineering jobs or for high positions in the Public Works Department. At the same time – because of the association with craftsmanship, the higher appreciation of liberal arts in comparison to engineering sciences, and the fact that

\textsuperscript{30} Sharma, “Elusive Rains,” 2008, p. 44.
\textsuperscript{33} Sharma, “Elusive Rains,” 2008.
\textsuperscript{34} Shiva, \textit{Staying Alive}, 1989.
entrance into the profession was based on merit (and examination) rather than lineage – engineers themselves were at the lower end of the ‘white’ hierarchy.

This in itself may partly explain why engineers had an interest in actively constructing an image of themselves as (a particular version of) ‘real’ men, as the process of associating with masculinity is an established strategy to gain prestige and status. More generally, and as historians of Victorian and Edwardian Britain have noted, the colonial power invested heavily in cults of manliness and masculinity, an investment which articulated in specific ways with British imperialism. One famous study on the psychology of colonialism, shows a language of homology between the sexual and the political in colonial culture and suggests that the British imperial ideology in India was ‘hypermasculine’ through maintaining a rigid dichotomy between the masculine and the feminine that was part of the gender ideologies of the post-Enlightenment West. The ideals of Victorian manliness, athleticism and militarism featured centrally in British and Anglo-Indian society, showing especially in accounts of the colonial Indian bureaucracy and the Indian Army. I have not come across studies that specifically look at engineering and engineers, but it is plausible that the engineering colleges and the Public Works Department provided important sites for the construction of a specific version of masculinity, one that was perhaps more rowdy, physical and practical than the prevailing entrepreneurial or intellectual ‘Oxford liberal arts’ ones.

Interestingly, the expression and justification of hierarchies between European and Indian men also partly happened through a kind of ‘manliness scaling’, with ‘Asiatics’ being for instance considered less tough than ‘Europeans’ and therefore less suited for engineering work. The more general ‘masculinity hierarchy’ had the stereotype of the effeminate Bengali man at the lower end and the white brave European at the higher end. The famous colonialist ethnography of ‘martial’ and ‘non-martial’ races in India for the purposes of recruiting Indians into the army further suggests the importance of more or less masculinity in creating and justifying wider social hierarchies. The effects of such masculinity rankings on past and current male subjectivities or sense of self remain largely unexplored. Contestations over different forms of masculinity are likely to have been an intrinsic part of independence struggles, as for instance illustrated in M.K. Gandhi’s refusal to accept the inherent superiority of a British masculinity that was increasingly equated with rationality, materialism and physical strength, in favour of a more Indian masculinity.

The ‘making’ of irrigation and the engineering profession as masculine has been deeply shaped by the intimate connections between engineering and the army. Until the 1850s, executive responsibility for public works in British India rested with the Military Board, after which civil departments took over. The British military also had a major influence on the formation and organization of the four Indian engineering colleges. Most instructors came from the army: the Royal Engineers and their East India Company military counterpart, notably the Royal (Bengal) Engineers. Indeed, military and civil engineering were

42 Nandy, The Intimate Enemy, 1983.
43 Much of the information about the linkages between the military and engineering is based on Black, “The Military Influence,” 2009.
interchangeable, with a prominent role for the so-called sapper officers. Also, the hydro-
cracy of that time, the Public Works Department, was inhabited by sapper officers. In fact,
the Public Works Department was a metamorphic organization, subtly designed to rapidly
transform into a military department should the need arise. This integrated civil/military
role evolved rapidly during the post-1860 era, as the Europeans resident in India feared
another internal conflict. Indeed, most European civil engineers in the Indian Public Works
Department, just like other male Europeans in India, belonged to the part-time all-Europe
Auxiliary Forces of India, which existed until 1947. Likewise, all the European students at
Thomason College were compulsorily enrolled with Thomason Company of the Auxiliary
Forces of India, but the majority of the Indian students were recruited into the Allahabad
University Training Corps. The department, although technically a civilian organization,
continued to rely on military engineering during its life until 1947.

The success in establishing close associations between ‘being an engineer’ and ‘being
a (real) man’ can perhaps be attributed to the historical importance of irrigation in bring-
ing about development and progress. Irrigation not only yielded rents and revenues, but
was also crucial in the larger schemes of empire and state building. As in other countries,
water resources development by the state in India has been (and perhaps continues to be)
an important political strategy for controlling space, water and people, and an important
part of everyday forms of state formation. Irrigation figured prominently in an ambili-
uous civilization mission and in larger dreams of modernization, of making deserts bloom,
and bringing prosperity to all through huge infrastructural works. The importance of this
‘hydraulic mission’ and the large amounts of public funds dedicated to it provided a strong
boost to the power and status of engineers, helping them to become part of the ruling elite.
It must also have helped reinforce the idea of (and belief in) their manliness.

Thanks to the hydraulic mission, water engineering and the construction of large engi-
neering works offered an assured route to a specific version of masculine heroism. Stories
of engineers in colonial times, men like Sir Arthur Cotton, Sir William Willcocks, and Sir
George Scott-Moncrieff, picture them as true pioneering champions whose designs and
constructions were celebrated as triumphs. Their (auto) biographies reveal an evangeli-
cal, personal and lifelong pre-occupation with military-like efficiency, ruthless practices and
autocratic control. Many of these engineers maintain a glorious existence in the memories
of today’s irrigation engineers, but also in statues (Cotton even has a museum) raised in
their honour at the intakes of the irrigation systems they originally designed. For Indians
also however, and in spite of ideas amongst the British of their lesser suitability and manli-
ness, engineering was a road to heroic success. Ram Ganga (1857–1927) is a clear example.
Ganga, a Roorkee engineering graduate (1873), was recruited by the Punjab Public Works
Department. Amongst his pioneering civil engineering works was the irrigation of desert
terrain to create land for a granary in Montgomery district (now Pakistan). He was a phi-
lanthropist and gave away millions for public benefit. Mital even suggests that Ganga
was perhaps the greatest man Roorkee has produced so far. The continued attractiveness

48 Interestingly, the biographies of two colonial engineers (General Sir Alexander Taylor (1826–1912) and of Sir Arthur Cotton
(1849–1904)) were written by their daughters, Alicia Cameron Taylor and Lady Elisabeth Hope, respectively.
of such stories about engineering heroes suggests that irrigation constitutes an important site for the construction of images of modern masculinity and masculine heroism in wider society.

Training as an irrigation engineer thus also offered a favoured route to progress and status to ‘local’ boys; it was bound to bring them professional success and prestige. In Gilmartin’s analysis:

It was the ethos of disinterested service to science that empowered the self-image of many engineers as engaged in a moral enterprise, ‘content’, as one engineer put it, ‘to let their achievements speak for themselves’ even as they strongly identified with the power of the state.

Gilmartin continues:

The public commitment to scientific control over nature which was linked to service to the state worked for British and Indians alike. For Ram Das Tandon, an Indian who graduated from Roorkee in 1898 and joined the Punjab Irrigation Department, the process of becoming an engineer at the college was like passing through a transformative ‘dream’, defining an entirely new ‘public’ identity.

The progress and modernity promoted through the development of new and modern irrigation systems was thus accompanied with the promotion of new and ‘modern’ versions of masculinity: those that symbolized being in control, rational and self-confident, and implied joining the ranks of those in power. Training to become an irrigation engineer at the service of the state meant learning not just to speak the mathematical language of scientific engineering, but also to assume the prestigious, and undeniably masculine, identity that came with engineering work. In fact, analyses such as Gilmartin’s suggest how irrigation modernization involved clashes between old ‘feudal’ masculinities and new ‘modern, professional’ masculinities, clashes between ‘modern’ engineers who based their demands for more water powers, and arguments for technocracy, on scientific rationality and ‘traditional’ leaders who based their water powers on history and local knowledge.

[For many engineers the necessity of undercutting the position of these men [the traditional canal sarpanches] was at the very heart of ‘scientific’ management. Writing in 1909, E.S. Bellasis, the Superintending Engineer of the Derajat Circle, attacked the old system [. . .]. The root cause of ‘popular’ complaint at irrigation reforms, he said, lay in the power to control water that ‘big men’ had previously exercised all along the inundation canals of southwestern Punjab.

Throughout the twentieth century, masculinist professional irrigation languages and identities became increasingly globalized and universal: irrigation engineers in Egypt, India, France, Australia, the United States, and the rest of the world started to view water in the same mathematical terms, and the hydraulics of irrigation channels and the mechanics of dam construction were also the same whether applied in California or the Indus Basin. The foundation of the International Commission on Irrigation and Drainage in 1950 is a clear mark of the internationalization of irrigation knowledge, and its congresses not only helped consolidate a particular epistemic tradition, but were also instrumental in establishing a global brotherhood of irrigation engineers, inculcating an

esprit de corps amongst professionals, and carving out a distinct, and distinctly masculine, engineering identity.

In sum, this first analysis of South Asia suggests that a feminist reading of the history of engineers and hydrocracy provides an interesting approach to flesh out how the profession has been shaped through and by racial and gender hierarchies and exclusions. Its important political effect is that it helps show that there is nothing ‘natural’ or ‘normal’ about the association between (white) masculinity and engineering: this association is a specific (only partly deliberate and conscious) historical and social construction that serves to lend the profession status and prestige.

**Hydrocracies as ‘masculine’ organizations**

In a previous article about masculinities and irrigation, I suggested that there might be a reduction (for various reasons) in the (perceived) power and importance of irrigation engineers in creating national prosperity, resulting in a decline in their status and prestige and in a felt need to re-define their professional identity. I hypothesized that this might compel the hydraulic bureaucracy to open its doors to female engineers and to people from other disciplines. However, three studies refute this optimistic hypothesis, at least for South Asia. What these studies show is first of all that engineering continues to be by far the dominant discipline of those working in state irrigation agencies. An analysis of the Department of Irrigation (DOI) in Nepal, for instance, shows that there is a continued emphasis on the construction of new irrigation systems as the main **raison d’être** of the department. DOI formulates its organizational mission as consisting of the construction of viable (in terms of return on investment), sustainable (managed by users) and efficient (in terms of cropping intensity) irrigation systems. The main criterion used by DOI to assess its own performance is the achieved increase in irrigated area. And although DOI does hire some sociologists (less than 1% of the staff), these are not offered the same chances of promotion and salary increase as engineers. Irrigation agencies in Bangladesh, Maharashtra, Andhra Pradesh, Pakistan and Sri Lanka likewise continue to be predominantly inhabited by engineers. In Maharashtra, social scientists are hired only on temporary contracts. This persistent engineering dominance is remarkable, given the efforts of the last decade or so (by international development cooperation and funding agencies) to ‘reform’ irrigation bureaucracies and policies. From as far back as the 1970s and the 1980s, irrigation bureaucracies have been the target of much criticism. In response, a lot of (donor) money and efforts have been invested in ‘transforming’ these bureaucracies, making them less construction and more management oriented, more transparent and more accountable to farmers. Yet, whatever such reform efforts have achieved, they have apparently not succeeded in challenging the strong engineering orientation of the hydrocracy.

Given the strong association of (especially civil and agricultural) engineering with masculinity, it is perhaps no surprise that government irrigation agencies in South Asia also

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58 Udas and Zwarteveen, “Can Water Professionals Meet Gender Goals?” 2010.
remain strongly male dominated. Women continue to constitute only between 2% and 4% of the engineering staff of government irrigation agencies in the countries mentioned above. And those few women working in the irrigation bureaucracy are mostly in the lower ranks. Interviews with them also suggest the continued existence of a gendered division of tasks, with more women working in the less prestigious administrative office jobs and more men being involved in the on-site construction and implementation tasks that yield more status and powers. Women engineers often feel that the work they do is (far) below their capacities. Many do desk work and are asked to do all kinds of administrative and secretarial tasks. Although some women themselves indicated finding it difficult to combine travel to field sites with domestic caring duties, many others felt that they were deliberately kept away from field sites by their male colleagues and superiors. Men justified this by simply saying that field work was not suitable for women.\textsuperscript{61} At the level of education also, it is clear that (civil and agricultural) engineering continues to be seen as more (or just) suitable for boys, with very few female students in engineering education throughout South Asia (with numbers being a bit higher in Sri Lanka).\textsuperscript{62} In Nepal, in the Nepal Engineering Council, for instance, there are 4524 registered engineers of which only 195 (or 4.56\%) are women (in December 2003).\textsuperscript{63} If women choose an engineering course, it is mostly architecture.\textsuperscript{64} In Faulkner’s terms,\textsuperscript{65} irrigation is a gender-authentic choice for boys and an inauthentic one for girls; this is why women always have to explain why they have chosen to study engineering.

Normal explanations for the numerical dominance of men in government irrigation agencies tend to take the masculinity of the profession for granted and use a rather static ‘exclusion narrative’ to identify ‘deficits’ in women (that explain why they are either reticent to choose an engineering career or less suitable) or ‘deficits’ in engineering education.\textsuperscript{66} Looking at hydrocracies from a feminist masculinities perspective would instead imply analysing how genders are performed within engineering communities of practice, also examining how particular femininities and masculinities become constituted through everyday interactions and social institutions.\textsuperscript{67} Although little such work has been done, the cited studies of irrigation bureaucracies in South Asia suggest that the irrigation profession and the professional status of those working in the field of irrigation continue to be delineated through a gender demarcation. Interviews with water professionals show very clearly how attributes and skills that are seen as typical characteristics of good irrigation professionals are also characteristics associated more with men than with women. Indeed, deep gendered dualisms are at the heart of engineers’ identities as engineers, as represented in Table 1.

The table suggests that the historical predominance of men in the engineering profession has shaped professional identities and cultures through a strong gendered dichotomy. This dichotomy has coalesced into a set of firmly established notions and practices which confirm that the work of irrigation is part of a public domain in which men and particular

\textsuperscript{61} Kulkarni et al., \textit{Situational Analysis}, 2009.
\textsuperscript{62} Kulkarni et al., \textit{Situational Analysis}, 2009.
\textsuperscript{63} Kulkarni et al., \textit{Situational Analysis}, 2009.
\textsuperscript{64} Kulkarni et al., \textit{Situational Analysis}, 2009.
\textsuperscript{67} Faulkner, “Nuts and Bolts,” 2007.
forms of masculinity associated with them seem to reign ‘naturally’. Workplace social practices thus tend to favour such men without question and often in subtle and insidious ways. They preserve male dominance by coding activity and assigning meaning as either superior (male, masculine) or inferior (female, feminine), while at the same time maintaining the plausibility of gender neutrality. The two columns in the table are thought of as mutually exclusive: one is either a man and an engineer, or a woman and therefore by definition not an engineer. Combining the two identities, therefore, is difficult, risky, or simply implies that one of them suffers. In any case, it requires (hard) work. Hence, if a female engineer is successful as an engineer, she risks being accused of ‘unwomanly’ behaviour. As one assistant engineer of the Bangladesh Water Board states: ‘if a woman is successful, she is told that she is egoistic and stretching herself too far’. Hence, women need to actively invest in constructing themselves as credible engineers, while remaining convincing as decent women. Unlike male engineers, women engineers have to do ‘gender work’; they have to carve out new gender identities as women engineers. Many of the collected stories of women engineers provide evidence of such gender work; they show how women skilfully negotiate and shape their gender and engineering identities, often illustrating that possessing so-called masculine abilities and skills does not (have to) imply a lack of femininity. For women, belonging and becoming respected as engineers within the organization is a challenge. The same is true, to some extent, for male engineers who want to emphasize the importance of capacities that are thought of as feminine: they have to show creatively how paying attention to, for instance, communication can be combined with ‘being a real man’ in order to be convincing.

The ‘normalization’ of the woman engineer is a process that goes beyond numbers: it involves changing norms so that engineering becomes a gender-authentic option for both women and men. The few studies cited above reveal how spaces and opportunities for positive change can be identified in documenting the actual practices of men and women engineers, as these often reveal creativity and agency in negotiating their gender

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Table 1. Gendered dualisms and engineering identities.

<table>
<thead>
<tr>
<th>Men/engineers</th>
<th>Women/non-engineers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Site work/travel</td>
<td>Staying close to home</td>
</tr>
<tr>
<td>Calculations</td>
<td>Values, opinions</td>
</tr>
<tr>
<td>Technical</td>
<td>Social</td>
</tr>
<tr>
<td>Hard</td>
<td>Soft</td>
</tr>
<tr>
<td>Strong</td>
<td>Weak</td>
</tr>
<tr>
<td>Corrupt(ible)</td>
<td>Honest, decent</td>
</tr>
<tr>
<td>Rational</td>
<td>Emotional</td>
</tr>
<tr>
<td>Courageous, daring, tough</td>
<td>Cowardly, timid, lenient</td>
</tr>
<tr>
<td>Leading</td>
<td>Following</td>
</tr>
<tr>
<td>Action/construction</td>
<td>Communication</td>
</tr>
<tr>
<td>Selfish</td>
<td>Empathic</td>
</tr>
<tr>
<td>Macro</td>
<td>Micro</td>
</tr>
<tr>
<td>‘Hardware’</td>
<td>‘Software’</td>
</tr>
</tbody>
</table>

Source: Compiled on the basis of Kulkarni et al., *Situational Analysis* and Udas and Zwarteveen, “Can Water Professionals Meet Gender Goals?”

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69 Kulkarni et al., *Situational Analysis*, 2009, p. 35.
71 See Udas and Zwarteveen, “Can Water Professionals Meet Gender Goals?” 2010 for an example.
and professional identities. Identifying these social practices and documenting their effects on women’s and men’s experiences is the starting point for questioning gendered power in the irrigation profession.

Conclusions

In this article, I have suggested that hydraulic bureaucracies and water engineering form an important domain in and through which (specific) masculinities are played out and performed. At least during and since colonial times, irrigation engineering has become and continues to be an important site for the construction of gendered power and hegemonic masculinities, with the creation of heroic male projects and the building of empires having played (and perhaps continuing to play) an important role in shaping images of masculinity and masculine heroism in wider society. Today too, in water management and engineering, gender continues to be a key principle of cultural–valuational differentiation, with the authoritative construction of norms that privilege traits associated with masculinity, and the simultaneous pervasive devaluation and disparagement of things coded as feminine.72 This strong connection between masculinities and irrigation cultures and identities may provide an important explanation of why hydraulic bureaucracies are so resistant to change. The connection allows a naturalization of engineering identities by linking them to male bodies, making engineering and masculinity seem both inseparable and in opposition to femininity. A career in irrigation has offered and continues to offer men a safe and reliable route to becoming ‘real’ men, becoming someone who is respected and valued. The association with manhood, at symbolic and cultural levels, also provides engineers and the hydraulic bureaucracy with a distinct reputation: it helps maintain an image of importance and heroic prestige.

To date, gendered structures, identities, and symbolisms do not belong to what is considered to require explanation and discussion in water science and expertise. Mutually reinforcing processes of normalization and naturalization work to delegate these issues to the domain of the undisputed. However, showing that engineering identities and organizational cultures are not reflections of a ‘normal’, universal, and abstract ideal, but instead correspond to very particular ethnic, gender, and class-related models of whiteness, masculinity, and superiority73 – or showing that and how engineers and their work spaces are made masculine – is very much needed.

Indeed, the continued masculinity of irrigation is a problem that urgently requires critical investigation. Such investigation should go beyond static exclusion frames of analysis and make use of feminist studies of masculinities, technology, and organizations to conceive of water management and engineering as cultures, looking at how professional identities and genders are mutually shaped and performed within engineering communities of practice. The analysis should set out to challenge essentialist understandings of ‘femininity’ and ‘masculinity’, and understand genders as multiple, fluid, and relational.74 Such studies will both serve as a first step to create more space for women engineers in government water agencies and, importantly, contribute to unravelling important aspects of the cultural politics of water.

72 Fraser, Justice Interruptus, 1997.
Disclosure statement

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