WATER INSTITUTIONS HAVE BEEN FORGED THROUGH A COMPLEX set of historical processes in contemporary India. Contemporary water institutions have been shaped and constrained by patterns of institutional practice that were emblematic of the politics and political economy of both the colonial state and the early decades of the developmental state in independent India. In particular, the formation of India’s water bureaucracy was shaped in significant ways by the institutional development of the Public Works Department that was established in colonial India. Like many of India’s bureaucratic structures, these institutional legacies were later recast within India’s newly independent state.¹ The institutional structures of India’s water bureaucracy were forged through colonial state developmental policies that were geared toward large-scale irrigation projects designed to maximize state revenue (Goswami 2004; Ludden 1979; Mollinga 2003; Mosse 2003). However, the colonial water bureaucracy was also marked by distinctive structures, interests, and practices that were more varied than the centralized colonial state’s singular interest in revenue extraction. While land remained the foundation for the exercise of state power (and the collection of revenue), water became a fraught terrain in which colonial state power was exercised, institutional battles within the colonial state apparatus were fought, and civil (and later nationalist) resistance arose. This terrain was framed by the colonial state’s debates, policies, and conceptions of “public
works.” Public infrastructure, in particular, became the site for the exercise of state power through a central arm of the colonial state, the Public Works Department. The Public Works Department’s advocacy of water infrastructure and model of irrigation development in turn shaped colonial state power in fundamental ways.

The complex political and economic configurations of the colonial state are vividly encapsulated in Lieutenant Arthur Cotton’s depiction of “public works” as the foundational infrastructure of the colonial state. Thus, he argued,

It may be said, that Public Works are very secondary matters, and that after providing for the protection of the country, Civil and Judicial affairs are after all the great things to be attended to. The question of Public Works is however in reality a fundamental point; for upon it and upon it mainly depends the capability of the country to supply funds for every purpose both Military and Civil. Without Public Works, the country must remain sunk in poverty and ignorance, for funds cannot possibly be produced from the country itself to provide for what is necessary to elevate and improve the state of the people; whereas, with Public Works, the most abundant funds can be obtained for any purpose. (1854, 61).

Cotton, one of the earliest and most vocal advocates of public works, was particularly invested in state investment in large-scale irrigation works. His conception of such works as integral to every military and civil purpose reflected a complex understanding of the political and economic power of infrastructural investment by the colonial state. Public works of irrigation, in this vision, were at the heart of all aspects of state power. As a source of revenue, they provided the foundational financial underpinnings of colonial state power. As a means for the presumed social improvement of “the people,” they provided a critical basis for state ideological justification for colonial rule; for instance, such works were a symbol of technological prowess and improvement that embodied the ideological rationale for the state’s civilizing project that would rescue a country otherwise “sunk in poverty and ignorance.”

While these facets are familiar dimensions of colonial state power, Cotton’s vigorous advancement of public works as the foundation of the judicial, civil, and military dimensions of state power also provides a window to a
deeper understanding of an emerging nexus between bureaucratic power and infrastructural politics in the colonial period. In this story, Cotton’s characterization of the power of public works is not simply an empirical description of the workings of colonial state power but a project of institutional advocacy in a stratified and contested bureaucratic apparatus within the colonial state. Cotton’s forceful argument about the power of infrastructural projects of public works was in fact designed to consolidate and expand the institutional power of the newly formed Department of Public Works within the broader bureaucratic field of the colonial state apparatus.

The Public Works Department (PWD) grew into one of the central colonial state institutions that oversaw state investment and management of all infrastructural investments, including the key sectors of railways, roads, ports, and irrigation. However, Cotton’s institutional advocacy was more targeted than this general portfolio of colonial state infrastructural power. As an irrigation engineer, his career was marked by an ardent and persistent campaign to promote water-based infrastructure designed both to increase agricultural productivity and to protect the interests of the irrigation bureaucracy within the Public Works Department. At one level, the colonial state’s expanding investment in and imposition of new models of irrigation significantly shaped methods of agricultural water usage. However, the process of reshaping water usage was not merely a reflection of the dominant discursive norms emerging in fields such as engineering or of the centralized interests of the colonial state in expanding its sources of revenue through increased agricultural productivity. Rather, the increasingly powerful and independent institutional interests of the water bureaucracy within the Public Works Department became a critical factor in shaping the control and distribution of water resources.

The case of the Madras Presidency is particularly salient because it was the crucible for Cotton’s advocacy for colonial models of irrigation that drew on his engineering training. Cotton’s work in the Madras Presidency provided the basis for his broader institutional advocacy for the Public Works Department’s irrigation bureaucracy and became a template for other parts of the Indian subcontinent. Such micro politics of the PWD’s colonial institutional power produced complex legacies that continue to shape postcolonial governance over water resources. The historical institutional legacies of the colonial state encompass both the broad patterns that shaped the political economy of the colonial institutional infrastructure of the PWD and the less
visible micro practices of local bureaucratic organizational approaches, cultures, and practices. For instance, the PWD’s role within water-sharing disputes and negotiations between the Madras Presidency and neighboring princely states has shaped postcolonial water-sharing arrangements in southern India. Meanwhile, the legacy of this institutional advocacy continues on in the postcolonial context of Tamil Nadu. As the only state where the PWD has retained control over the governance of irrigation water, this focus on the Madras Presidency and on the state of Tamil Nadu that emerged from this presidency allows for a sustained qualitative analysis that can trace the historical continuities and changes in this institutional framework from the colonial era to the current postliberalization period.

The historical weight of the PWD’s colonial-era institutional practices was reinscribed in complex ways within the bureaucratic structures in postcolonial India. However, while India’s postcolonial state was shaped in significant ways by these historical patterns, this newly independent state was also tasked with breaking from many of the legacies of the colonial state. The politics of water was at the center of the developmental state that shaped the trajectory of India’s political economy path. Whether through Nehru’s oft-cited metaphorical characterization of dams as the “temples of modern India” or through the agricultural policies of the Green Revolution, the harnessing of water resources rested at the heart of India’s modernist vision of the developmental state. This vision rested on the state’s drive to harness water for large-scale developmental projects, such as large dams, and produced a sustained and intensified use of water resources through modernized and expanded irrigation infrastructure and the exploitation of groundwater resources. However, beneath the image of this singular, overarching “modernist state” lay the complex and powerful water bureaucracy that directed, implemented, and reinforced this model of water governance.

The interventionist and extractive dimensions of the water bureaucracy were reshaped and intensified by the developmental goals of the postindependence state. While the centralizing impetus of the colonial state was reoriented toward new developmental goals, this was accompanied by weak and delayed regulatory mechanisms. India’s constitutional framework placed the governance of water within a decentralized framework that gave local state governments primary authority over water resources and infrastructure. The central government’s emphasis on the instrumental, extractive use of water without establishing national regulatory institutional frameworks
expanded the space for local state governmental authority. National regulatory institutional weaknesses and gaps were filled by local state governments. This in turn intensified bureaucratic centralization at the local level. While the goals of the state were significantly different from colonial governmental interests, the centralizing, extractive nature of local state water institutions was both consolidated and intensified by the interventionist developmental state in independent India. This consolidation of state intervention was shaped as much by the centralization of state control at the local level as it was by familiar images of India’s planned developmental state.

Public Works and the Emerging Water Bureaucracy in the Madras Presidency

Large infrastructure projects represented central and visible elements of state power in colonial India. Such works, ranging from building construction to communications to irrigation projects, were both the means that the colonial state used to consolidate and exercise power and the symbolic embodiment of colonial rule (Goswami 2004, 47). However, a closer examination of irrigation works illustrates that this cohesive framing of the material-symbolic power of the colonial state, in practice, concealed a messier, contested institutional history. Public works of irrigation did not emerge as an inevitable technology of state power. Rather, the emergence of such technologies of colonial state power was the product of institutional interests, bureaucratic lobbying, and intrainstitutional bureaucratic competition. While public works of irrigation eventually became a key component of the political economy of the colonial state, it was the product of a set of microinstitutional dynamics that emerged within the Madras Presidency. The construction of major public works of irrigation in the Madras Presidency in turn shaped broader colonial discourses and policies in the management of water resources in the Indian subcontinent.

Early advocates of public works of irrigation based their arguments on the central ground of state interests—the ability to generate expanding revenue from land. As early as 1856, proponents of colonial state investment in irrigation pointed to the early economic profitability and productivity of such works initiated by the Madras government. As one such advocate argued, “The irrigation works constructed by the Government in the Madras presidency—which may be taken as a type of the general character of
MAP 1.1. The Madras Presidency in Colonial India, showing the administrative territory under British colonial rule in southern India. Adapted from public source material: Edgar Thurston, *The Madras Presidency with Mysore, Coorg and Associated States* (Cambridge: Cambridge University Press, 1913).
irrigation works suitable for India—have so much added to the revenue of the locality in which they are situated, as to have brought back the Government a return equal to a dividend of 70 per cent per annum upon the capital invested in them” (Bourne 1856, 9). The relationship between irrigation works and revenue collection became a naturalized tenet of colonial state policy. However, this belief that later undergirded the state’s primary focus on irrigation as a source of revenue collection (Ludden 1979; Mosse 2003) was not a natural or self-evident truism but a product of the persistent and arduous institutional advocacy from state bureaucrats within the Public Works Department (PWD).

Governor General Dalhousie authorized the formation of the Public Works Department, the major bureaucratic institution that was to oversee such works in 1854. Works that were previously under the purview of the British Military Board were now transferred to this new institution. In the context of these institutional changes, proponents of irrigation works represented an emerging and increasingly powerful bureaucratic lobby within the Public Works Department. Proponents of water-based infrastructure and investment actively competed with bureaucrats in favor of railways. In this endeavor, the newly emerging colonial water bureaucracy specifically made claims tied to the public good. Arguing that “the railway companies are powerful and rich,” John Bourne insisted that it was investment in water for both irrigation and navigation that was in the best interest of the colonial government (1856, 28). The competition over the choice between railways and water was an intrainstitutional debate within the PWD on which forms of infrastructural investment would be most profitable and in the interest of the state. The emerging water bureaucrats insisted, for instance, that “a bad water-communication will carry more cheaply than a good railway” (Bourne 1856, 28).

While the water bureaucrats would, of course, prove unsuccessful in displacing the power of the railways in India, they were able to construct a powerful foundation for their institutional authority when it came to the promotion of large-scale irrigation works. This case rested on the creation of a conception of public interest that wove together the economic and political interests of the state, the welfare of “the people” of India, and the technical expertise and authority of the emerging water bureaucracy. Consider, for instance, how such connections are created through the elaborate arguments of Arthur Cotton, the leading proponent of this vision. Cotton’s case
for public works rested on a complicated approach to the question of revenue. At one level, his writings in the mid-nineteenth century represented an acidic attack on the British government’s narrow focus on revenue collection. As he put it, “They still cling to the old idea, that if only the subject of collecting the Revenue, be attended to, everything else will follow as a matter of course” (1854, 10). Cotton’s reframing of the question of revenue was not aimed at reducing or refraining from the collection of revenue from the people but was intended to ask instead “how to enable them to pay it?” (12). This reframing of the question formed the basis of the new model of public works of irrigation that shaped colonial polices toward the development of “the people” of India. The “welfare” of the people in effect became bound up with the state’s interests in revenue collection. The foundation for this new relationship between welfare and revenue was state investment in public works of irrigation. To this end, Cotton marshaled evidence designed to prove this relationship. Drawing on the model of the district of Tanjore in the Madras Presidency, he argued that in this case steady investment had produced “unvarying success, raising Revenue from 30 to 50 lacks (£500,000) a year” (19). This example, for Cotton, was representative of “so many proofs of the immense losses resulting from the neglect of Public Works and the enormous profit derived from the execution of them” (19).

If Cotton’s arguments were centered on revenue and welfare, his impassioned case for public works was also inextricably linked with a set of underlying institutional interests. Most of his arguments were focused on trenchant criticisms of the British civil service, which he argued was focused solely on “the Revenue Settlement” and the “mode of collecting” (47). Cotton’s arguments soon became entrenched knowledge. By 1860, the Madras Irrigation and Canal Company pointed to evidence of “large returns realized by the Government” and noted that the “immense political and social importance, and the highly remunerative character of Works of Irrigation in India, are now so well understood, that it is unnecessary in a prospectus to advance proofs” (EIICC 1860). This prospectus for private investment, prepared under the orders of the colonial government with Cotton as “the highest authority in such matters” (7), expressed confidence that such private investment would “of necessity, yield considerable returns” (10).

This new model of financially productive public works that claimed to serve both the interests of the state and the welfare of the people was the foundation for a new state bureaucratic apparatus. Cotton was focused not
simply on increasing state investment but on the creation of a new institutional structure for this avenue of capital investment. In this institutional model, the Public Works Department would “keep a complete and distinct set of accounts of its own, and everything spent by it should be divided under two heads, 1st current expenditure on superintendence and necessary repairs . . . [and 2nd,] new works including improvements . . . to obtain a tolerable estimate of the actual total returns of all new works” (67). The new department was aimed at correcting the existing situation, where “Public Works have been almost entirely neglected throughout India” (272) in large part, according to Cotton, because of a lethargic process where requests for expenditure were channeled through a long institutional channel of authorization that ran through the collector, the Board of Revenue, the Local Council, the Supreme Council, and finally the approval of two more boards within England (274). The new Public Works Department would, in effect, regulate the relationship between the colonial state, revenue, and the needs of the populace and provide a new irrigation bureaucracy in the Madras Presidency by the 1870s (Ludden 1979, 358). This process of institutionalization produced a model of the “public” interest that rested on the connection between capital investment, state interests, and the socioeconomic well-being of the people.

The power of the emerging water bureaucracy’s institutional lobbying can be discerned by moving away from the presumption that the expansion of irrigation works was a natural outcome of the state’s modernist conceptions of the economy. Consider, for instance, the salience of a model of public works emerging in the Madras Presidency becoming a generalized technology of state power. Within the framework of the colonial state, the Madras Presidency itself was a tertiary rung below the colonial governance structure in London and Calcutta. To the upper tiers of the colonial state, the Madras Presidency was merely a source of income and “appeared a bottomless purse which could be looted whenever need arose” (Washbrook 1976, 24). In his rich analysis of the institutional complexities of colonial rule, historian David Washbrook further argues that given that the upper tiers of the colonial state could both veto legislation and demand revenue, the power of the Madras Presidency rested with local bureaucratic authority exercised in realms such as “the assessment of land revenue, the distribution of government jobs and contracts and the construction of irrigation works” (25). Within this context, the institutional lobbying of water bureaucrats within the
Madras Presidency represented an attempt to push against the political constraints of the hierarchical and stratified structure of the colonial state. As evidence of the success of this strategy, we see that this model of public water infrastructure soon extended beyond the Madras Presidency. The colonial state’s model of flood control in Orissa in eastern India was developed based on Cotton’s advocacy of an elaborate canal system for mass river transport that would compete with the railways (D’Souza 2006, 133). The dominant institutional models of water management that emerged from the Madras Presidency overrode independent investigation into the causes of flooding (D’Souza 2006). This dominant colonial PWD model of water management thus had significant effects on the governance and management of water resources well beyond southern India.

In the case of the Madras Presidency, the expanding power of the water bureaucracy created significant shifts in the political and economic life of agrarian communities. For instance, the emergence of this regional bureaucracy reconstituted community-state relationships in complex ways (Mosse 2003). This reconstitution was not simply a product of a simple form of state centralization and the fact that water resources were linked to the overarching economic and political power of the state. Rather, shifts under colonial rule produced deeper changes in the nature of political accountability and authority of the state. Consider, for instance, the changes in management of the vast network of tanks in colonial Tamil areas of the Madras Presidency that ensued from the steady bureaucratization of water resources. Irrigation (in what would later become the state of Tamil Nadu) had been based on an engineering model of water tanks. River water was diverted into tanks through channels that had been dug, and in cases where water needed to be diverted between villages, a system of cascading tanks would divert excess water. The gradual erosion of proprietary control of zamindars over tanks under colonialism produced the systemic deterioration of the tank system. The colonial model of revenue collection transformed preexisting logics of royal patronage so that, as anthropologist David Mosse has argued, “it was not (as it had been) a means to create autonomous nodes of investment in irrigation, but rather a device to generate cash flows to the zamindars’ offices in the form of banker’s credit or commandeered temple funds without the obligation to invest in public goods” (2003, 79). Such processes were compounded by the increased insecurity over land tenure in the context of changes in the colonial economy that further reduced incentives for local
investment in tank maintenance (Mosse 2003). Public works of irrigation thus became intricate networks for the exercise of bureaucratic power, politics, and patronage (Vasavi 1999). Bureaucratic corruption became widespread as the power of irrigation bureaucrats expanded, and it later produced populist resistance to the PWD (Washbrook 1976, 180).

These historical legacies of colonial institutional practices have had enduring effects in the postcolonial period. In the case of the emerging water bureaucracy in the Madras Presidency, the new colonial Public Works Department was being formed by a set of dispositions that shaped institutional practices in durable ways. The result was the creation of a distinct set of institutional customs that influenced the agency and outlook of this new bureaucratic authority. The early institutional lobbying for the PWD, the political claims for financial autonomy, the distinctive emerging institutional discourses on the meaning of the “publicness” of public works of irrigation, the internal competition with the railways and revenue wings of the state, and the expansion of local bureaucratic power all created the components of a distinct form of the bureaucratic agency and culture that later continued to shape the management of water resources in postcolonial India. The institutional field of the water bureaucracy in colonial India had emerged as a discrete entity that was focused on its own self-reproduction and political and economic power through the pursuit of public works of irrigation.

Bureaucratic Agency, Culture, and the Interests of the Colonial Water Bureaucracy

The emerging water bureaucracy in the Madras Presidency was defined by a distinctive bureaucratic culture that became deeply embedded in the state’s approach to governance over water resources. A defining element of this bureaucratic culture was the emergence of a fractured institutional structure that produced strong interinstitutional rivalries between competing bureaucracies. We have already seen that the irrigation wing of the PWD jostled in competition with the powerful railway wing from the inception of the PWD. While the proponents of works of irrigation successfully carved out their institutional territory and shaped colonial policies in significant ways, the mode of bureaucratic competition inherent in this early contestation remained a significant feature of the water bureaucracy, particularly
as the irrigation wing of the PWD gained more authority. A key element of these interinstitutional struggles stemmed from the relationship between the PWD and the Revenue Department—one of the major arms of colonial state power, given the centrality of revenue collection for colonial rule. Prior to the PWD’s autonomy, the administration of public works in the Madras Presidency was fragmented under the Revenue Department, the superintendent of roads, and the Military Board (MP 1852). In the case of irrigation, this meant that English collectors “assumed the charge of works of irrigation with that of collecting revenue” (MP 1852). The reorganization of this administration, in response to the institutional lobbying put forth by Cotton and other advocates of the water bureaucracy, placed the PWD in charge of works of irrigation. The result was the beginning of a long history of inter-institutional competition over the control and governance of water resources and water-related infrastructure.

One of the central bureaucratic cleavages was between the technically oriented bureaucrats in the PWD, who were tasked with the design of new irrigation works, and the administratively oriented collectors within the Revenue Department. As early as 1856, internal correspondence reveals problems with the communication between civil engineers of the PWD and the Revenue Department (Grant 1857). In such cases, engineers at the district level would develop proposals for irrigation works without including the perspective of revenue collectors. The chief engineer and head of the PWD reproached such officers for the “neglect” of “the not unfrequent omission of all reference to the Revenue authorities in the several projects of new works, recently submitted for entry in the Budget of 1856–57” (Maskell 1856, 28). The underlying fissures reflected new divisions between the respective executive and administrative functions of the two departments. In the new institutional division of labor within the colonial apparatus, the engineering cadres of the PWD were marked by their ability to bring “science and professional experience to bear upon the performance of works requiring skill and practice.” Meanwhile, the collectors of the Revenue Department were to “henceforth assume the more befitting and appropriate position of general administrators of the province, and . . . become the immediate referees of Government respecting the success and effects of the public works carried on by the Professional Department” (248). The complicated relationship between the two departments was underlined by the fact that while the aim of the establishment of the PWD was to create an autonomous institution,
estimates for new works and improvements of existing works were to be countersigned by the Revenue Department collector (147). The entangled nature of this emerging relationship between the two organizations reflected the teething pains of working out the increasing political power of claims to professional expertise and the primacy of the aims of revenue collection of the colonial state. Early documents of the newly formed Public Works Department reveal the initial attempts at smoothing out the working relationship with the Revenue Department. However, the very call for “unity” between the engineers and the collectors made by the head of the PWD underscores the cleavages between the two organizations (29).

The colonial state attempted to manage this relationship between the two institutions through the creation of rules of engagement that set in place the lengthy tracks of paper-based practices of communication and reporting and that are now a notorious sign of India’s bureaucracy. The Board of Revenue was, for instance, to “direct Heads of districts to submit yearly with the settlement report, a report upon the progress of improvement in their districts, embodying in it the purport of the monthly lists to be furnished by the Civil Engineers” (45). Collectors were responsible for tracking spending on public works “and its effect on the revenue of Government and the welfare of the people” (46). By the turn of the century, the state was still wrestling with the division of labor between the PWD and Revenue Department. A report on the colonial government’s Tank Restoration Scheme in the Madras Presidency argued that the restoration of small tanks that were irrigating under two hundred acres “be placed under the control of the Revenue and not the Public Works department” (MP 1902, 131). Such tensions were not a mere form of territorial jockeying between bureaucrats. They were an integral element of problems with the colonial model of irrigation development that had profound effects on rural society in India.

The Report of the Indian Irrigation Commission highlighted the problems of such fractured administration in its investigation of the persistent outbreaks of famine (PWD 1903). In response to a question about the unsatisfactory condition of famine relief works, the acting chief engineer of irrigation (Col. Smart) made the recommendation that “a Revenue and a Public Works officer should be placed on special duty to jointly revise the programmes and, in consultation with the local officers, to ascertain local wants in the way of village tanks and wells and other works” (143). Well into the interrogation, a committee member returned to this recommendation and
asked, “Why cannot the famine relief programmes in the district be jointly revised by a local district and Public Works officer?” (148). The response that follows illustrates the institutional dysfunctions that undergirded the colonial state:

[Col. Smart]. “You have to find out new works; how is that possible?
Q. Surely the local Revenue and Public Works officers can find them out; then what is the good of putting on special officers?
[Col. Smart]. “They have too much to do. The Collector is immersed in office work and never goes out in company with the Executive Engineer. That is one of the wants of the system.” (149)

This brief exchange illustrates some of the central institutional limitations of the state’s bureaucratic approach to water, agriculture, and the outbreak of famine. The centralized colonial state, depicted here in the form of the Irrigation Commission, remained far from the everyday institutional quandaries and quarrels between the institutions tasked with managing the two key state objectives—the continuing drive to preserve agricultural productivity through irrigation and the extractive objective of revenue collection.

The chief engineer’s response to the questioning embodies the institutional framework that had become embedded in the colonial water bureaucracy. From the perspective of the PWD, the solution to the famine lay in its technical expertise. On the one hand, this meant that “new works” were the automatic and self-evident response. One the other hand, this meant addressing the revenue office’s dissociation from the practical technical problems of irrigation works. The chief engineer’s negative characterization of the “office work” of colonial administrative officials such as the collector reflects the significance of technical expertise and fieldwork that the irrigation bureaucracy claimed as a basis for its authority and superiority. The colonial administration of the PWD in India illustrates a set of underlying tensions between the practical and political imperatives of the colonial administrative apparatus and an expanding field of professional knowledge. Such tensions are often overlooked by intellectual frameworks that emphasize the ways in which professional expertise became a crucial foundation for British colonial administration (Mitchell 2002). The postcolonial narrative on the nexus between colonial state power and
professional expertise often appears as a natural or inevitable trajectory for state power. What is missed in this story is the active institutional lobbying of bureaucratic organizations to develop and preserve this mode of state power.

Professionalism, Expertise, and the Institutional Power of the Public Works Department

As is customary with bureaucracies, one of the PWD’s central objectives was to consolidate its institutional power through its own organizational strength. The Public Works Department’s deployment of languages of professionalism and expertise were not simply designed to expand the reach of the colonial state over Indian society but to expand the organization’s power within the institutional structure of the colonial state. Senior bureaucrats in the department engaged in persistent lobbying for an expansion of a professionalized staff and a corresponding expansion of educational training for prospective recruits. In the initial years, the organization’s staff drew on military engineers, with only a few civil engineers sent from England, and early works were focused on military projects, such as the provision of water supplies for British troop barracks (PWD 1868, 1). Once the colonial state had, in the phrasing of Viceroy John Lawrence, “finally accepted” the centrality of irrigation works for its political and economic interests, the PWD began to gain strength as an autonomous organization of civil engineers with its own professional bureaucratic interests (20). The PWD began to see a steady and significant growth in its staff (see table 1.1). By 1896, the colonial government (secretary of state) had authorized an expansion of the permanent engineering staff from 730 to 838 (PWD 1898, 1). While railways remained dominant within the PWD, given that the state had accepted irrigation as an “obligation placed upon the Government” (27), the irrigation bureaucracy became a central part of the PWD’s administrative apparatus. As part of this expansion, a separate branch of the PWD with a special focus on irrigation administration was set up in each of the provinces under British rule (20).

An analysis of this expanding institutional power of the Public Works Department cannot adequately be captured by a self-evident explanation of the centralized colonial state’s acceptance of the power of professional expertise. Archival records show that local administrative structures had
to persistently press both for an increase in the engineering staff and for employment compensation. If the PWD had made its case for public works as a critical component of state power, it did not inevitably receive resources for the successful implementation of such works. Civil engineers, for instance, were, in the early years of the department’s history, paid less than were military engineers as well as military officers without a claim to professional expertise. Members of the PWD wrote in a petition to the viceroy that they, “although civil engineers professionally trained, and in a department where a training in civil engineering is above all things requisite, are, as a rule, whilst performing exactly similar duties, and holding positions identical in responsibility, allowed less pay than is given to military officers in the department, who (with the exception of military engineers) have not had the advantage of such training” (PWD 1869, 8).

Claims for monetary compensation were also accompanied by cultural grievances about the ritual practices of institutional status, with engineers complaining that “on any public occasion, when officers of the several services are assembled together, the civil engineer has no recognized status whatever, whilst the military officer, his junior in the department, takes precedence according to his military rank with the officers of the civil, medical and ecclesiastical services” (10). By the beginning of the twentieth century, records of the Madras Presidency administration still noted that the PWD “is undermanned and requires the immediate introduction of capable officers of all grades. Considerably higher salaries will have to be offered to secure the services of officers of the desired qualifications” (MP 1907, iv). Expertise, in practice, was not uniformly valued by the colonial state, nor was the investment in the administrative cadres representing the new values of colonial modernity easily forthcoming from the upper echelons of the colonial state.

### Table 1.1. PWD engineering staff in colonial India

<table>
<thead>
<tr>
<th>Year</th>
<th>PWD engineering staff</th>
</tr>
</thead>
<tbody>
<tr>
<td>1864</td>
<td>555</td>
</tr>
<tr>
<td>1868</td>
<td>783</td>
</tr>
<tr>
<td>1889</td>
<td>730</td>
</tr>
<tr>
<td>1896</td>
<td>838</td>
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</tbody>
</table>

*Source: Tabulated from *Summary of the Principal Measures Carried out by the Public Works Department* (Calcutta: Public Works Department Press, 1868 and 1898).*
The PWD’s efforts to expand its organization through its claims of expertise also rested on a set of racialized colonial discourses. The professional cadres’ claims for resources of newly emerging fields such as civil engineering were based on a logic structured by racialized distinctions between English and “native” expertise. Consider, for instance, the civil engineers’ claims for increased pay. British civil engineers petitioned against employment classifications that placed them in “the general uncovenanted service, with clerks and other subordinates,” arguing that “it has been fully established that the engineer branch must consist chiefly of Europeans, and a distinction which subjects European civil engineers in the Department of Public Works to rules originally framed to meet the requirements of a subordinate native service . . . [was] a great hardship” (10). Professional expertise in this conception was not a self-evident field but the product of racialized institutional norms. While the prevalence of racialized discourses at the heart of the colonial state is not surprising, the point of significance lies with the ways in which technical and professional expertise was reconstructed through racialized distinctions. This distinction was not simply about contrasting colonial modern engineering expertise with local indigenous practices. Rather, expertise was structured through organizational practices that constructed Indian engineering and practical expertise as inferior.

Consider an early exposition on the field of irrigation-related civil engineering that was produced through the Public Works Department. As one report put it, “It is, I believe, too common an idea in England, that the natives of India are without an engineering history, that there are no works extant of their engineering skill, and that they owe to us all that they possess in that department: such is not the case. India has an engineering history; not written in splendid palaces and lofty structures, yet still marked by works whose usefulness may vie with the works of any other nation—works on which her life depends” (Tyrrell 1873, 1).

Writing specifically about irrigation works in South India, the report admitted that “the original idea of the annicut or bank or wall across a river is nevertheless a native idea; and so are tanks or the storage of water. . . . As the natives did, we did. We made annicuts on the low plains and took off channels for irrigation” (19). However, the report quickly went on to note that “the ancient engineering works of India in the south are, with the exception of tanks, neither very numerous nor well executed” (2). The spectacle and
power of large works of irrigation were both central to the economic vision and the theater of state power embodied in such works in contrast to the colonial view of Indian engineering as “petty works” (Cotton 1854, 265). What is of interest in this colonial narrative is the momentary recognition of an existing history of technical engineering expertise. The report would go on to make a vigorous case for the professionalization of the field of engineering through organizational reforms within the PWD and the expansion of education aimed at “the development and advancement of the intellectual and practical knowledge of the natives” (15). This expansion would indeed take place and form the basis of a modern professionalized model of engineering and science.

The weight of the racialized logic of the colonial narrative concealed this existence of an engineering history prior to British rule. Consider the passing reference to the system of tanks in South India. The elaborate system of tanks that has been the central foundation for irrigation was constructed by the end of the eighteenth century (Mosse 2003). To write this technical history out of a discussion of expertise and colonial modernity is to produce an artificial dichotomy between local customary village practices on the one hand and centralized state practices on the other. Images of the traditional autonomous village were in fact themselves a product of colonial ideologies (Ludden 1992; Mosse 1999). The tank system in the region was always a key arena for the exercise of state power. The imposition of colonial rule, as Mosse has put it, had “more to do with changing systems of state than the erosion of village tradition” (2003, 11). In this context, the rise of the disciplinary formation of engineering expertise was also not a novel development. What was distinctive was the way in which the institutionalization of the field sought to erase existing histories of engineering and relocate the practical and intellectual knowledge of civil engineering within the institutions of the colonial state. The displacement of Indian staff by Europeans in the PWD was not a product of the technical field of engineering but the result of specific organizational policies that were shaped by racialized understandings of labor and skill. The disciplinary formation of the field of engineering in India (through the educational institutions that were set up by the colonial state) was a product of this set of bureaucratic practices designed to both protect the interests of European civilian staff within the PWD and expand the power of this bureaucratic wing within the broader apparatus of the colonial state. Expertise and knowledge formation were the means through which bureaucratic
The Water Bureaucracy, the Public Interest, and the Tributaries of State Power

The colonial water bureaucracy was founded on the principle of developing a centralized mode of state control. The first report on the newly emerging system of public works of irrigation transparently stated that the administrative organization over water resources and infrastructure in the Madras Presidency was designed “to place the whole course of every river, as far as practicable under one control” (GC 1856, 5). This centralized, technocratic vision of river and water control that the PWD used to consolidate its institutional power within the colonial state provided a firm foundation for the organization to serve as an expansive arm of colonial state power. However, this centralization happened through the local bureaucratic structures of the department. The irrigation bureaucracy of the PWD soon succeeded in steadily expanding its authority and power within the state apparatus. On the ground, the organization gradually increased its effective authority through the control over both water and land. The distribution of water for large works of irrigation, for instance, was placed under its control (GM 1858, 33). While the sanction of works permitted collectors to undertake some repairs, repairs of irrigation works could not take place without the authority of the PWD, thus continuing to expand the PWD’s power in relation to the more decentralized administrative apparatus of the Revenue Department.³

At the heart of this mode of state power was a discursive frame that increasingly conflated the interests of the state with the interests of public welfare in India. The “publicness” of “public works” was a central rhetorical
device that allowed for the state’s self-interested control and appropriation of water resources in the name of society and the public good. This modality of state power transformed public infrastructure into a material-discursive realm that melded together the realms of state and society in colonial India. Water infrastructure was the central site for a deep and invasive method for the colonial institution of the PWD to permeate Indian society while claiming to serve the public interest.

Such invocations of the public interest also provoked moments when the state had to account for its rhetorical claims. The deleterious effects of famine compelled the colonial state to take into account the ways in which irrigation works were addressing the subsistence needs of the population it ruled over. The Famine Commissions, for instance, called for a shift from irrigation works focused on productivity to a focus on famine and the subsistence needs of the people. This led to the development of a new category of “protective works” that were distinct from the extractive “productive works” of irrigation designed to serve the state’s revenue-collecting objectives. However, a closer look at the underlying framing of such protective works illustrates that they remained within a monetized framework linked to the state’s primary objective of revenue extraction. The category of “protective works” was specifically designated to focus on famine protection by reducing the threshold for revenue returns (protective works required a 3 percent rate of return; HD 1905, 6). As a report on the protective works in the Madras Presidency noted in the case of the “Krishna” Delta system, “It is, I believe, universally admitted that the duty of water, in this district, as elsewhere, is much lower than it should be and that it is capable of being considerably increased. The efficiency of the regulating and distributory works has much to do with the economy of water, but still more does it depend on the personnel of the controlling staff” (MP 1902, 6).

Yet the investigation for the state’s Irrigation Commission during the same time period yielded at least one case in which an official responded that water charges were discouraging villagers from growing a second rice crop (PWD 1903, 155). Thus, despite the colonial government’s claims that its irrigation policies were designed to serve both the revenue interests of the state and the welfare of the public, such microinstances reveal the ways in which the monetization of water would overshadow the claims of welfare, in this case by discouraging crops that could aid in the state’s goals of famine protection. The focus of the administration’s criticism of the “personnel” in
increasing water charges further illustrates that despite the centralized state’s professed concerns regarding public welfare expressed in sites such as the Famine Commissions, in practice, it expected the “personnel” of the PWD to execute the state’s primary objective of revenue collection.

The monetization of water was in fact a central foundation of the PWD’s approach to the governance of water. The first attempts at monetizing water in the Indian context were set in motion by the PWD. As early as the mid-nineteenth century, reports of the PWD began to conceptualize the “calculation of the value of water” through the currency of “money valuation” (Cotton 1854, 170). Writing about the comparable availability and value of land and water, Cotton argued for a colonial state policy in which, given the limited availability of land at the time, “The water therefore should be sold, and little more than a nominal rent charged on the land” (185). While changing land markets under colonial rule altered this initial assertion about land rents, what is of significance in these early writings is the establishment of the early foundations of the commodification of water. Cotton’s report for the PWD is interspersed with elaborate calculations that seek to measure and prove the monetary value of water. In this vision, the objective was no less than the grand assertion that in doing so “the total amount of treasure in the country, in the shape of water, may thus be calculated” (213). This monetized conception of water factored directly into the calculations that the East India Irrigation and Canal Company made in their assessment of the profitability of investing in water-related infrastructure. The company listed the main sources of profit as “The Sale of Water to the Government for the Irrigation of Land” (EIICC 1860, 10). As the company’s prospectus noted, “Indeed, it is difficult to conceive how the sale of an article so absolutely essential to life and progress as water is everywhere, but more particularly in India, can be otherwise than productive of large profits” (10).

The emerging conception of water as a form of capitalized resource remained foundational for the colonial state’s conception of the “publicness” of water and water-related infrastructure. The institutional framework of the PWD, in effect, solidified the conflation of the “publicness” of water infrastructure with the interests of the state. For instance, from its inception, the department asserted its authority over water resources. The state was opposed to the digging of private wells (Cotton 1854, 264) and the construction of private tanks and sought to place constraints on such endeavors by
ordering personnel to ensure that “the position of it shall not compromise existing rights, either of Government or of private persons” (Grant 1857, 131).

The inextricable relationship between water and land, underlying this example, provided numerous channels for the PWD to exert and expand its authority. Colonial records show that the department was able to exercise its power in ways that crossed the boundaries of its own institutional pur-view. As early as 1855, internal reviews showed that the state had concerns about cases in which “channels have been taken [by the PWD] through Zamindary lands, without the permission of the owner, and without any compensation” (177). While such internal reviews ultimately did little to check the practical power of the department, they provide important examples of the PWD’s interventionist mode of state power. This centralized form of state power was exercised through local institutional practices of bureaucrats.

The expanding bureaucratic tributaries of the PWD’s power also formed the basis for the formal legal architecture of the colonial state’s governance over water. A series of irrigation acts in the nineteenth century codified the colonial state’s project of harnessing water for production (Cullet 2009). The state control of water resources that was being consolidated through the construction of public works and the collection of water charges and revenue later culminated in official legal control through the Madhya Pradesh Irrigation Act (1931). This act formalized the state control that had become entrenched through the practical authority of the PWD. The underlying control over land through irrigation infrastructure that was emerging through the PWD also led to the beginning of a regime of property rights that was centered on the control of water resources (Cullet 2009).

By the time of such formal codification of the legal rights of the colonial state over water resources, in the early decades of the twentieth century, the irrigation wing of the PWD had been firmly established as a central arm of the state apparatus. This power of the PWD subsequently expanded beyond the formal territorial boundaries of the colonial state in the Indian subcontinent. This is well illustrated in the role of the PWD in water disputes and negotiations between the colonial government of the Madras Presidency and the neighboring princely states in South India. Tensions over water sharing grew by the 1930s, as increased water infrastructure began to intensify competing demands on water resources of the Krishna Delta and the Cauvery River resources. PWD officials became key interlocutors of the colonial state
as officials of the civil service turned to them for guidance on such matters (PWDI 1938). A key area of contention was the construction of infrastructure that made claims on shared water resources between the colonial state of Madras and the princely states of Mysore and Hyderabad.

Consider, for instance, the growing tensions over water resources and infrastructure between Madras and Mysore. Such tensions began with the change in Mysore’s status with the Rendition Act of 1881, which reversed British annexation of the princely state. During the period of British rule over Mysore, the “Chief Engineer of Mysore submitted a comprehensive scheme of developing irrigation from the waters of all of the rivers of the state” (SB 1935, 3). The engineer attested that there would be no damage to the interests of the Madras Presidency and proposed to construct a large reservoir at Lakkavalli for protection against drought (3). However, after the rendition, as one PWD letter noted, “The adjudication of rights over waters and the protection of different interests assumed great importance” (SB 1935, 3). In 1892, an agreement was signed between the princely state of Mysore and the colonial government of Madras that sought to preserve British colonial interests (SB 1935, 3). According to the terms of this agreement, Mysore agreed to certain restrictions that specified that the princely state would not construct new works of irrigation or reservoirs without the consent of the Madras government on fifteen rivers as well as forty-five streams and drainage areas (3). In return, the colonial government agreed to the construction of the Lakkavalli Reservoir and promised to consent to new irrigation works that did not impact its interests. Given the large number of rivers flowing from Mysore into Madras, this agreement became a crucial means for the Madras government to protect its interests. As the PWD correspondence noted, “By these provisions Mysore gave up her claim to use water within her territory as she pleased and Madras acquired a very valuable right, which she has frequently exercised to control irrigation schemes in Mysore territory” (4). The PWD was a crucial actor in this expansion of colonial state power over water resources, as the department provided the detailed calculations and technical arguments that colonial administrators used as the evidentiary basis for pressing its interests. In the process, the collection of data and technical expertise allowed the PWD to further consolidate its institutional power within the state apparatus.

The dominant position of the colonial state over the Mysore princely state encoded this relationship of power within this agreement. As the centrality of public works of irrigation for the political and economic interests of the
colonial state grew, such water-based infrastructure became a site for the continued pursuit of state interests. By 1905, the Madras government had developed plans for a new reservoir that put it in competition with Mysore’s Lakkavali Reservoir. Citing the public welfare of “several million of his Majesty’s subjects [who would] be imperiled through famine and privation,” the government reversed its agreement on Mysore’s reservoir (5). The result was a prolonged negotiation between the two states that exemplified an expanding set of conflicts between the Madras government and its neighboring princely states. In the case of the princely state of Hyderabad, similar conflicts over irrigation infrastructure began to arise. As a letter from the Political Department of the Hyderabad state noted, the “equitable distribution” of shared water resources with Madras was a significant source of contention, with Hyderabad contending that the Madras state had expanded irrigation in violation of agreements between the two states. The Hyderabad government protested “the steady expansion of irrigation in Madras territory without regard to the summer flow available in the river” and argued that “Hyderabad holds that rights do not merely arise out of *de facto* appropriation. . . . The cardinal rule underlying the relations of one state to another is equality of right.”

The intensification of state claims over water resources set in motion an array of interstate negotiations, arbitration processes, and tribunals between the colonial presidencies and princely states in southern India. The colonial state was prohibited from simply imposing its will on the princely states despite its political and economic dominance (Mollinga 2003, 103). The British state instead tried to assert its dominance by attempting to control the terms of the arbitration. However, this also produced tensions within the colonial state, as the Madras and Bombay Presidencies each sought to protect their own interests. By the 1930s, the Madras state sought a single set of arbitration proceedings that addressed all interstate disputes that included the Bombay Presidency, Hyderabad, and Mysore (PWDI 1938). However, both the Bombay PWD and the Hyderabad Presidency sought to disentangle themselves from the protracted disputes between Madras and Mysore. The process of negotiation produced a certain level of compromise between the various state entities. While a conference between the four states took place, it was accompanied by two sets of bilateral negotiations between Madras and Hyderabad and Mysore. The negotiations ultimately produced an agreement in which the Madras state made some concessions in return for
moving ahead with its desired projects, such as the harnessing of the Tungabhadra waters for irrigation that it had been pursuing for decades. Their concessions included the allotment of waters from the Lakkavalli Reservoir and what the Madras state considered “a very substantial concession” to Madras in the form of the reduction of a royalty payment for electric generation from Cauvery River waters (at Sivasamudram).  

While the Madras Presidency’s political negotiations through formal arbitration reveal the complexities of interstate relations despite the dominance of the colonial state, they also point to the deeper ways in which the construction of public works nevertheless provided a crucial means for the exercise of colonial state power. Such negotiations took place in the context of the decades of the PWD’s infrastructural work that had already placed Madras in a position of dominance in the use and control of water resources. The centrality of the PWD as a means of colonial state power was further intensified in the course of such interstate negotiations. At one level, engineering assessments formed a foundational component of the evidence that the Madras state used in its political negotiations. At a deeper level, engineering experts also laid out the political principles of water sharing that favored the interests of the colonial administration. Consider, for instance, one of the central principles of water sharing that the chief engineer delineated: “The quantity of water to which a state is entitled is limited to the quantity she needs for concrete schemes which she proposes to put in hand but unutilized waters should not be allotted to any particular state but should be kept free to meet demands for the concrete schemes of a Sister State. In other words, the available waters should be used to the greatest good of the greatest number” (PWDH 1937, 36).  

This delineation of water-sharing principles illustrates the architecture of the colonial state’s control of water resources. By foregrounding the links between the right to water resources and “concrete schemes,” the chief engineer reinforced the specific institutional interests of the PWD as the chief organization in charge of such schemes. In doing so, the engineer in turn reinforced the broader state interests of the presidency. The early and expanding economic dominance of the Madras Presidency in advancing public works of irrigation gave the state an effective advantage on the ground and strengthened its authority. Infrastructural state power was once again put forth in the name of public welfare by ostensibly serving “the greatest good of the greatest number.” In the process, the fusion of the institutional power
of the PWD’s water bureaucracy, the interests of the colonial state apparatus, and the state-defined conception of the “publicness” of public works was once again cemented.\textsuperscript{13}

While the colonial state continually sought to use water infrastructure as the material-symbolic embodiment of its claims of serving the public interest, the extractive nature of its governance over water resources also provoked civil resistance within the Madras Presidency. There were growing civil protests against rising taxes that the state levied for lands benefiting from irrigation works (Stoddart 2011). If the new land/water nexus was a basis for expanding state power, it also became the source of new forms of political mobilization and associational organizations in the nineteenth century. Such forms of protests ranged from petitions against higher taxes on land to proposed increases in water rates (Stoddart 2011, 10) to the “widespread relinquishing of irrigation water in many delta villages” (Stoddart 2011, 12). By the early decades of the twentieth century, such localized protests eventually fed into more systemic forms of nationalist resistance. In the Guntur District of the Madras Presidency, “Local Congress leaders linked yet another revenue no-tax-payment campaign with Gandhi’s mission, the district becoming both the presidency’s ‘hot spot’ and one of the leading national sites, the citizenry refusing to pay land and water taxes. Local grievances dovetailed perfectly with national aspirations. The importance for national politics of the preceding land and water campaigns was obvious” (Stoddart 2011, 24). The reach of the colonial water bureaucracy thus produced a corresponding network of resistances that became nationalized in the twentieth century. The public interests of such infrastructural works became the site for a continual space of contestation.

By the mid-twentieth century, India’s newly independent nation-state would inherit this contested “public” nature of water infrastructure and governance. On the one hand, the institutional structures of the water bureaucracy—ranging from its organizational practices and traditions to its regime of knowledge and expertise to the formalized legal frameworks—became a part of India’s new postcolonial state. On the other hand, the contestation over the land-water nexus that fed into the nationalist movement meant that the new nation-state was also shaped by a competing set of social and economic priorities and visions. The statist model of public works of irrigation, the reach of bureaucratic authority, and the contested welfare of the public was fully solidified by the mid-1940s. It is in the context of this weighty
historical institutional context that India’s developmental state’s approach to water resources was forged.

India’s Developmental State and the Governance of Water

In the first decades of independence, India’s regime of water governance was shaped by a complex configuration of the underlying political and economic structures that had been consolidated under centuries of colonialism and the new priorities and policies of the postcolonial state. The historical formation of India’s postcolonial water state can be understood through a focus on three central areas—the nature of the federal regime of governance over water resources, the policies and priorities of the developmental state, and the practices of local water bureaucracies. While it is now commonplace to depict the early decades of the political economy of the Indian state through the image of a highly centralized, autonomous state, this image is unsettled by the state’s mode of governance over water. What emerges instead is a multifarious set of characteristics that combines the command-oriented developmental state with a weaker and undeveloped set of federal structures designed to manage water resources. This antipodal nature of the state was in turn enmeshed in the political-economic structures produced by colonial rule. The centralizing nature of the newly independent command-oriented state was shaped by the complex relationship between the power of the central government and the centralizing nature of state authority within local state governments. Centralized state power associated with India’s planned developmental state was marked by significant national regulatory institutional gaps. Both the mode of centralized planning and these national institutional gaps in turn intensified local forms of centralization within state governments.

The federal structure for governance of water resources was marked by a set of distinctive features that make it a rich case for an understanding of these dynamics of state authority. The state’s approach to water governance contained within it a number of ambiguous and contradictory facets that were distinct from the kind of centralized federalism (Sharma and Swenden 2017) that characterized the Indian state in other arenas of politics and the economy. The formal constitutional framework lists water as a subject that is in the purview of the authority of both states and the central government (MWR 2018). While state authority over water has generally resided with local
state governments, authority under the Union List allowed the state to specifically carve out an exception for the central government to exert its authority over interstate rivers when such authority serves the “public interest.”14 This exception was codified into the Inter-state River Water Disputes Act, 1956, in accordance with Article 262 of the Constitution. The resulting federalized structure for water governance contained an inbuilt institutional weakness in the authority of the central government (Iyer 2002). First, the role of the central government in overseeing interstate resources was focused on the management of conflicts rather than on a more productive role of facilitating interstate cooperation (D’Souza 2009). In recognition of this institutional failure, the Ministry of Water Resources eventually recommended a replacement of the River Board mechanism, noting that the “Central Government can constitute a River Board under the provision of the River Boards Act, 1956 with the concurrence of the State Governments. The Central Government has however not been able to constitute any River Board under this Act so far. The role of the River Boards as envisaged in the said Act is only advisory in nature. The National Commission for Integrated Water Resources Development Plan has recommended the enactment of a new Act called the ‘Integrated and Participatory Management Act’ in place of existing River Boards Act, 1956” (MWR 2002, 65).

The Indian state’s institutional architecture was historically oriented toward the mediation and resolution of disputes once they had arisen; there was no policy framework that proactively promoted models of planning and development that could build and strengthen interstate cooperation over water resources (D’Souza 2009, 89). The consequences of this institutional vacuum at the level of the central government were that state governments were left to harness local water resources until water scarcity provoked conflicts with competing state governments. The central government was then compelled to intervene once the conflicts had already accelerated and in many cases been politicized. This pattern has continued in the postcolonial period.

This distinctive federal structure that shaped governance of water provides rich terrain for a rethinking of how centralized state power has been exercised in contemporary India. Given that the subject of water was placed in a decentralized framework since the early years of independence, an analysis of the dynamics of water governance allows for an analysis of the centralization of state power that is not simply conflated with the authority of
the central government. In the case of water, processes of centralization have, in practice, been shaped by the power of both the central government and bureaucratic organizations within local state governments. Consider the realm of the regional governance of water. The institutional gaps at the national level exacerbated the unregulated appropriation of shared water resources that in turn intensified and produced significant interstate water disputes in the first decades of independence. However, while such disputes have laid bare the institutional inadequacies of the central government’s regulatory functions, they also point to the more subtle forms of centralized state control over water resources at the local level. Local state governments and their water bureaucracies have increasingly sought to intensify control of water resources, both as they have competed with neighboring states for resources and as they have served as the central arbiters of the distribution of resources between competing demands for water.

Such nuanced and often less visible patterns of local state authority were accompanied by more familiar forms of centralized state control over water. The planned economy of India’s postindependence state rested on the intensive extraction of water resources in pursuit of India’s developmental goals. India’s developmental state in the twentieth century approached water resources through a purely instrumentalist policy framework. Water needed to be harnessed in pursuit of the state’s goals of achieving food security and accelerating industrialization. Large dams were not just the symbols of the Nehruvian modernist vision but the material infrastructure that embodied the state’s approach to water, irrigation, and agricultural development. The combination of the absence of a national institutional framework for the management of water and the new developmental objectives of the postcolonial state meant that water management was driven by the development and implementation of public works (Raina 2015, 339). However, as with the case of interstate water disputes, while the state was the central actor in shaping the uses of water through its centralized investment and development policies, this centralized authority was not exercised in conjunction with adequate national regulatory frameworks. Such incapacities were deepened by a fragmentation of institutional governance, as the regulation of surface water and groundwater were under the purview of two separate institutions, the CWC (Central Water Commission) and the CGWB (Central Ground Water Board). In addition, in the 1970s, there was a rapid expansion of inefficient groundwater irrigation systems (Dubash 2002; Frankel 2015). The result
was the creation of deep-seated problems that have become hallmarks of the challenges that continue to shape the governance of water in contemporary India.

Consider, for instance, the ways in which the state entrenched an extractive model of groundwater used for irrigation. From 1950 to 1997, “nearly 4/5ths of public expenditure was for irrigation,” but while 70 percent of the state’s expenditure “was for surface irrigation purposes, groundwater provided the largest share of irrigation water” (Dubash 2002, 4). The expansion of groundwater extraction started in 1965, and by the 1980s, the rate of expansion of groundwater irrigation outpaced that of surface water (Biswas and Hartley 2017). This model of intensified groundwater extraction was also supported by international development agencies, such as the United Nations Development Programme. In the case of Tamil Nadu, the number of diesel and electrical pump sets used to pump groundwater increased from 527,530 in 1970 to 1,719,817 in 2001 (GTN 2003, 131). Such processes have had significant implications for agrarian communities (Dubash 2002; Ghuman and Sharma 2018). This extractive approach to groundwater has continued to shape the governance of water in Tamil Nadu in the context of urbanization, with serious implications for the effective long-term management of the state’s resources in times of water scarcity.

The absence of effective centralized regulatory frameworks also characterized other areas in the first decades of developmental planning. While centralized structures designed to govern have been in place since the formation of the Central Waterways, Irrigation and Navigation Commission (CWINC) in 1945 (Shah 2016, 69), a more focused approach to water did not evolve until the 1970s. The Central Water Commission, which evolved out of earlier structures, was formed in 1974, and as the Mihir Shah report has noted, while the Central Ground Water Board was established in 1971, “it was only in the latter part of the 1980s that groundwater assessment began to take shape in CGWB’s thinking” (2016b, 88). Broader water laws evolved later or in response to the effects of policies of development rather than as part of an integral part of the planned economy. For instance, national rural water drinking guidelines were not established until the 1970s, and the legislation for the prevention of water pollution was not passed until 1974. Governmental policies across the political spectrum ignored water quality concerns and increasingly focused on the needs of industry over farmers despite the
enactment of the 1974 Water Prevention and Control of Pollution Act (Saravan and Appasamy 1999, 177). Adequate central regulatory institutional frameworks were not a major feature of the kind of state centralization that was taking root in India's planned economy.

Delayed and inadequate regulatory frameworks in the postindependence period underlined the significance of the colonial legacies of water governance. The core legal framework of water governance after independence continued to largely draw from colonial-era laws. The result of this approach was that the new goals of the developmental state were overlaid onto the longstanding legal and institutional structures that had been developed by the colonial state. In the colonial era, the state had established its authority over water resources. In the case of the Madras Presidency, the Madras High Court had pronounced that the government had a sovereign rather than a proprietary right over the supply and distribution of irrigation water (Upadhyay 2009, 138). Later legal decisions by courts such as the Madras High Court and the Supreme Court in independent India would uphold the authority of the state to determine the regulation and use of water resources (Vaidyanathan and Jairaj 2009). As in the colonial period, in practice, the embodiment of this confirmation of the sovereign right of the state over water resources was the local water bureaucracy.

Such historical continuities from the colonial era also shaped local institutional practices. In the case of the Madras Presidency, departmental organizations such as the Revenue Department and the PWD retained their administrative power within the new state of Tamil Nadu in independent India. Such institutional continuity brought with it the deep-seated institutional patterns that had been established during the colonial period. The internal institutional fissures and fractures between competing departments, such as the Revenue and Public Works Departments, remained a consistent feature of postcolonial state administration. At one level, the detailed paper-intensive system of reporting that emerged in the navigation of these interinstitutional rivalries became a distinctive characteristic of the administrative state and a century later became the foundation for the infamous image of India's sluggish postcolonial bureaucracy. At a deeper level, the state's institutional fragmentation deepened the deterioration of Tamil Nadu's network of tanks (Mosse 2003, 46). This deterioration of the tank system was further compounded by the state's adoption of the central government's
developmental model that promoted groundwater extraction and larger public works, such as the extension of canal irrigation.

This reconstitution of colonial institutions meant that the powerful local bureaucratic organizations retained their authority over water resources but now executed this authority in conjunction with the developmental goals of the postcolonial state. The PWD in Tamil Nadu served as the central bureaucratic arm for the implementation of state developmental policies. According to government regulations, “The officers of the Public Works Department exercise complete control over the distribution of water in the larger works of irrigation” (GM 1958, 123). This realm of authority, as in the colonial period, also gave the PWD authority over land related to water-based infrastructure. Such authority encompassed a wide range of activities, including the ability to negotiate with landowners, to initiate land acquisition proceedings through the 1894 Land Acquisition Act, to lease lands for infrastructural projects, and to make grants for occupation by both private individuals and companies (GTN 1986, 64–66).

This purview of the PWD’s authority intensified the organization’s institutional investment in large works of irrigation—an orientation already circumscribed by the disciplinary practices of civil engineering that had become the sole source of training for employees of the water bureaucracy (Mosse 1999, 2003). The PWD, for instance, continued to use its authority over water distribution to regulate cropping patterns (Mollinga 2003, 63; Wade 1982, 299). Meanwhile, in the absence of policy guidelines from either the state or the central government on how to manage competing water demands for irrigation, drinking water, and industrial uses, such policy decisions were in effect practically made through the PWD’s decision-making on specific infrastructural works. For example, the PWD sought to mediate conflicts between the irrigation needs of farmers and the urban drinking water and supply needs of the municipality of Coimbatore and took over the control of water infrastructure in the process. In the face of conflicts over the municipality’s growing opposition to supplying irrigation water to farmers through a tunnel of the Siruvani Dam in 1951, “the government realized that if the PWD took over the maintenance of the tunnel, difficulties in diverting water for irrigation purposes could be solved. . . . [The] District Collector discussed the surplus water diversion at the district board meeting and the board had approved the inclusion of the scheme in the Second Five-Year Plan” (Saravanan and Appasamy 1999, 180).
This microinstance illustrates the centrality of local bureaucratic assertion in the management and control of water resources. It is this local form of state authority and the objectives of the PWD that are incorporated in the central government’s five-year plan. In contrast to conventional understandings of the top-down nature of the planning process in the early decades of independence, this example shows how the local water bureaucracy was able to consolidate its authority through the centralized planning process. In effect, the dynamics of centralizing state authority flow from the local level to the central government. This intensification of local bureaucratic control was also manifested in broader patterns of funding, as central planning also created a steady and substantial increase in the PWD’s irrigation budget (see Table 1.2). Thus, from 1967 to 1973 the PWD’s budget increased from Rs. 69.8 million to 109.9 million.

Such patterns and practices illuminate the contradictory nature of state authority that emerged in the era of the twentieth-century developmental state. The strong role of the central government in India’s planned economy was intertwined with significant regulatory gaps that in turn intensified local bureaucratic control over water resources. In other words, the government’s approach to water was shaped by a strong centralized approach and weak centralized regulatory frameworks. Centralization meant a command approach rather than strong regulation (L. Rudolph and S. Rudolph 1987). This distinction between the need for a strong central government regulatory framework and the need for centralized state authority is critical in unsettling the conflation between centralization and the spatial scale of authority by the

<table>
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<tr>
<th>Year</th>
<th>Expenditure on irrigation (original works) (rupees—millions)</th>
<th>Expenditure on irrigation (maintenance) (rupees—millions)</th>
<th>Total outlay (rupees—millions)</th>
<th>Percentage of PWD budget spent on irrigation (%)</th>
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<td>35.1</td>
<td>137.2</td>
<td>72.8</td>
</tr>
<tr>
<td>1969–70</td>
<td>70.1</td>
<td>35.3</td>
<td>155.5</td>
<td>67.8</td>
</tr>
<tr>
<td>1970–71</td>
<td>82.5</td>
<td>37.6</td>
<td>196.6</td>
<td>61.1</td>
</tr>
<tr>
<td>1971–72</td>
<td>85.8</td>
<td>40.6</td>
<td>213.5</td>
<td>59.2</td>
</tr>
<tr>
<td>1972–73</td>
<td>109.9</td>
<td>35.1</td>
<td>225.3</td>
<td>64.3</td>
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central government. Meanwhile, local water bureaucracies became the primary vehicles both for implementing the centralized form of state planning of the developmental state and for stepping in to fill the regulatory gaps of the central government. Local water bureaucratic institutions, such as the PWD, played a central role in executing developmental goals in ways that both maintained and extended their power. State centralization was shaped by a paradoxical process in which inadequate national regulatory mechanisms (such as those that could balance different demands for water and those that could regulate pollution) allowed centralized state control to take hold through institutions within local state governments.\(^{16}\)

This account of the water bureaucracy departs in significant ways from conventional accounts of the centralized federalism of twentieth-century postcolonial India. When it came to water governance, the commanding power of the state rested with local bureaucratic organizations, such as the PWD. This was reinforced by the weakness of centralized regulatory frameworks. The project of harnessing water was a means for the instrumentalist pursuit of economic goals. This instrumentalist approach, which transformed water into a vehicle for the state to achieve its development goals rather than a natural resource that required an autonomous and effective regulatory institutional framework for its preservation, meant that there was in fact little systematic national planning when it came to water policy, in contrast to the planned approach to the economy of the twentieth-century state. Indeed, India’s first national water policy was not adopted by the Ministry of Water Resources until 1987.\(^{17}\)

Such underlying patterns in the mode of state control over water were not limited to the model of large-scale public works of irrigation, which were at the heart of the postcolonial state’s approach to irrigation and development, but more deeply embedded in the patterns and practices of the state’s administrative apparatus. The organizational history of the Ministry of Water Resources itself reflects the fractured approach to water resources (MWR 2018). Water resources were primarily subsumed under irrigation, and the purview of irrigation was transferred between a series of governmental departments in the early decades of the postcolonial period. The subject of irrigation was first located in the Department of Works, Mines and Power then moved to the new Ministry of Natural Resources and Scientific Research in 1951, only to be recast into the Ministry of Irrigation and Power in 1952.\(^{18}\) The growing political and economic significance of irrigation works
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led to yet another reorganization with the establishment of the Department of Irrigation in 1974 under a newly independent Ministry of Agriculture, which directed the command-oriented approach of the developmental state. As I have noted earlier, the CWC and the CGWB were also established during the 1970s. It was not until 1985 that the Department of Irrigation was reconstituted as the new Ministry of Water Resources (MWR 2018). However, by the mid-1980s, the overexploitation of groundwater resources in the service of the state’s developmental aims, the intensification of states’ competition over resources in water-scarce regions, and the historical legacy of local state control over water resources meant that the new national institutional regulatory framework was being layered over a dense set of political and economic structures that were already directing the management of water resources.

This overview of patterns of state authority illustrates that the nature of state centralization in postindependence India unsettles conventional center-state frameworks. It underlines the need to distinguish between regulatory frameworks of the central government and the centralized authority of the developmental state. Furthermore, the case of an organization such as the PWD illustrates the ways in which the planned developmental state produced complex forms of state power at the local level. While aspects of this state authority reflect conventional understandings of an interventionist central government, other dimensions point to weaknesses in the regulatory frameworks of the central government that expanded the space for centralization of control over water within local governments. The dynamics of centralization thus did not conform to spatial scales (where centralization corresponds to the largest scale of the central government), even within the heights of the command-oriented period of the developmental state. This significance of local state power is further evident in the more nuanced ways in which the local state permeated civil society in the twentieth century.

Developmental State Authority and Bureaucratic Class Formation

The embodiment of the state’s sovereign control over water through local bureaucracies endowed organizations such as the PWD with the kind of local state power that expanded the space for the forms of practices of patronage and corruption that are now seen as endemic to the Indian state. Intricate
layers of patronage and corruption were built into the construction and administration of irrigation works. Forms of illicit revenue derived from both farmers and contractors. Such extractive payments were built into relationships between engineers of the PWD and contractors, as well as between contractors and politicians. As Robert Wade has illustrated, for farmers, “the use of a rotational delivery rule [from canal irrigation] can provide a pretext for a highly discretionary, predatory behavior by irrigation staff towards farmers,” and in times of water scarcity the control of sluice gates could be used to protect from interference from downstream farmers or “vice versa for lower sluices: the officers can make sure the upstream sluices are not opened so that more is available for lower down” (1982, 299). These practices in turn deepened inequalities within rural areas, as well-off farmers or dominant rural groups with access to political power were able to exert pressure on local irrigation officers and staff (Vaidyanathan 1994, 42).

While the weight of such practices of patronage and corruption is real, the prevalence of bureaucratic corruption also stems from underlying historical practices of organizations, such as the PWD, that relied on local networks and clientelist relationships to complement the highly centralized structure of the colonial state. Political rhetoric and criticisms of bureaucratic corruption were produced through nationalist discourses and resistances (Gould 2011). Meanwhile, what would in the postcolonial period become constructed as the illicit revenue of corrupt bureaucracies was in fact built into the class formation of sections of the middle classes in twentieth-century India. Consider the following example from historian William Gould’s research on Uttar Pradesh.

A retired PWD Executive Engineer:

recalled how, by the 1960s, it had become quite commonplace, in arranging marriages, for the “extra percentages” derived from non-formal bureaucratic income contained within the bridegroom’s salary to be taken into account, and that he had seen many examples of it. T.S.R. Subramaniam, a retired IAS officer posted in UP, told the story of the wedding of a daughter of the executive engineer in the Public Works department in Ghazipur. His wife was closeted with the other women of the party and recounted that guests would come up to the mother of the bride and ask her about the salary of the prospective son-in-law who was also an assistant engineer in the same
The “extra” revenue of local bureaucratic officials was part of the historical social fabric of India’s middle classes, which were primarily dependent on state employment in the twentieth century.

Such processes point to perhaps the least understood dimension of India’s bureaucracy—a conception that focuses on the bureaucracy as the blurry ground that stands between “state” and “society.” The bureaucracy in effect represented a central site for the state formation of India’s middle classes. Both the late colonial and early postcolonial bureaucratic fields provided the foundational basis for middle-class formation. While moralistic views of corruption have often circulated as middle-class political discourses in both the nationalist and postindependence period, the extraction of revenue through patron-client relationships and practices of corruption was inextricably linked to the bureaucratic state’s class formation of sections of India’s middle classes.

This process of middle-class formation within the bureaucracy cannot, however, be adequately understood simply as a function of middle-class privilege and power within the developmentalist state. In the case of local bureaucracies, such as the PWD (in contrast to the elite bureaucrat forces, such as the IAS), middle-class employees often embodied contradictions within the state-class relationship of the developmental state. Take the case of the irrigation bureaucracy of the PWD. On the one hand, the scope for revenue extraction and the control over resources illustrates the wide scope in which local bureaucrats could wield state power, often in the service of their own private interests. On the other hand, the vast majority of employees also were in restrictive institutional environments that produced debilitating work environments. While the PWD in Tamil Nadu experienced a significant expansion of its workforce in the first decades of independence, employees often had little scope for upward mobility. For instance, by 1973, the PWD staff comprised 3 chief engineers, 19 superintending engineers, and 124 executive engineers at the higher rungs of the organization. Meanwhile, at the lower tier, the PWD had 665 assistant engineers and 2,050 section officers (including supervisors and junior engineers) (ARC 1973, 1–6;
Data include both buildings and irrigation wings of the department. As an Administrative Reforms Commission report noted, most engineers stagnated at the same level with little scope for promotional opportunities (ARC 1973, 27). The promotion of engineers to the rank of superintending officer generally occurred near the age of retirement (18–19). Chief engineers, as the report went on to note, would consequently stay in their position for six months and thus have “no chance to provide the department with any dynamic or imaginative leadership” (19). Beyond these formal considerations, employees would have to pay for posts as well as for transfers in the late twentieth century, even as there was a “steady decline in the real value of engineers’ salaries—by about half since 1965” (Wade 1982, 307). Illicit revenue in this context was a central class strategy that sections of the workforce used to preserve their middle-class status or gain access to avenues of upward mobility.

In addition to the financial and professional constraints of the formal terms of employment, middle-class bureaucrats often occupied a precarious position within the larger state structures of political patronage. While scholarly work on the politics of bureaucratic transfers has focused on the politicization of the elite tiers of the bureaucracy (such as the IAS), particularly in the post-Emergency period (L. Rudolph and S. Rudolph 1987), transfers in local bureaucracies were a means for engaging in extractive relationships within local state institutions. “Politicians and senior officers were able to obtain for themselves part of engineers’ additional income by auctioning the transfer, and imposing additional demands as a condition of the successful bidder’s not himself being transferred out before the normal term” (Wade 1982, 303–4). Processes of revenue extraction and patron-client relationships were thus not limited to the relationship between bureaucrats and the external public (whether citizens or contractors) but were part of the internal organizational framework of the bureaucracy.

Such local relationships were the material practices that forged the workings of the developmental state’s water bureaucracy. Far removed from the image of an all-powerful centralized command state, the water bureaucracy was a product of a messier set of processes shaped by underlying historical patterns of the colonial state, the new institutional frameworks and policy agendas of the developmental state, and a variegated set of activities within the local bureaucracies that were enmeshed within these broader political and economic contexts. The water bureaucracy was shaped by the historically
contingent dynamics of local state structures and practices that were in turn conditioned by but not reducible to the interests and agendas of planned development regimes of twentieth-century India.

The instrumentalist approach to water that characterized the twentieth-century state has produced lasting implications in contemporary India. In keeping with the model of the developmental state, agricultural irrigation has remained the major sector that has drawn on water sources. However, this sector has now begun to compete with increasing demands from urban India. Both the state’s instrumentalist approach to water and the complex forms of local centralized control of water continue to shape water governance in the postliberalization period even as the postliberalization period has produced new and distinctive challenges. This has led to an intensification of practices such as groundwater extraction that were key policies of the developmentalist state and the global United Nations Development Programme (UNDP)–oriented models that funded and supported such practices. Local water bureaucratic practices have contributed to the centralization of state authority alongside and in conjunction with mechanisms of central governmental control. The absence of central government regulatory frameworks also provided institutional gaps that facilitated the concentration of local state governmental power through organizations such as the PWD. Such instances illustrate the ways in which processes of decentralization in the postliberalization period provide a set of institutional mechanisms that shift but do not dislodge the concentrated nature of state power in India.

The underlying historically contingent political, economic, and institutional structures of the water bureaucracy are reworked in new ways by successive phases of reform that have been implemented in the context of changing global, national, and local ideational and policy frameworks on the governance of water. The historical continuities that this chapter has foregrounded should not be read as a conflation between the practices and patterns of colonial and postcolonial state rule. Rather, the purpose has been to examine the historical legacies of institutional practices, policies, and cultures that have had lasting implications for the governance of water in India. The legacies of the colonial state are often an understudied dimension of contemporary social scientific studies of reforms in twenty-first-century India. This does not imply that the developmental state has been a lesser factor in shaping contemporary India. On the contrary, the political,
economic, and institutional structures of the developmental state are deeply embedded in India. Historical processes provide the backdrop for an understanding of the contemporary liberalizing state and for delineating more precisely what has and has not changed in the context of India’s reforms. This context provides both the empirical and analytical space for an evaluation of policies and rhetorical languages of decentralization that purport to break from older models of state centralization and that are now commonplace features of contemporary India.