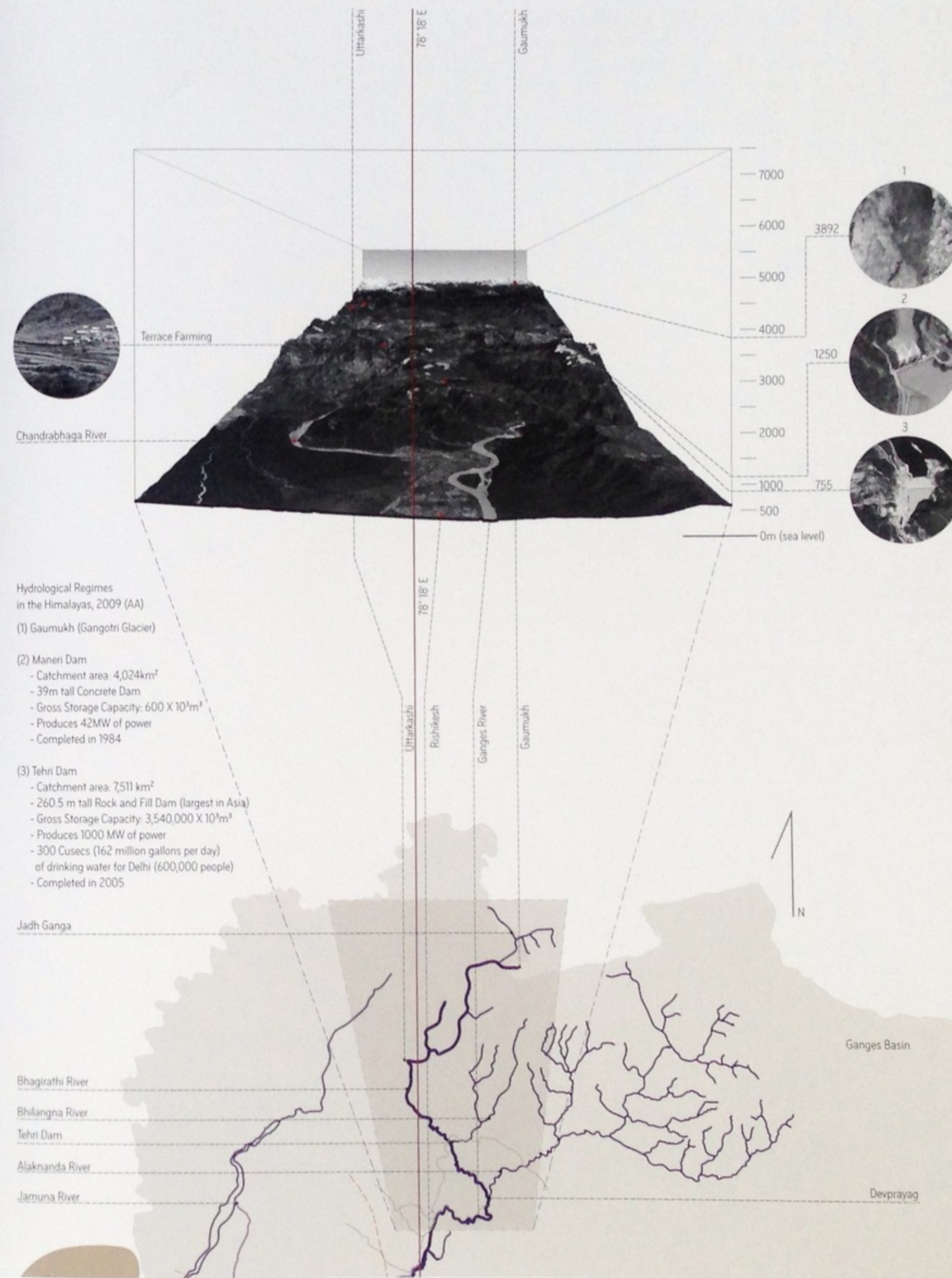




Maneri Dam Along the Bhagirathi River, 2006.

With fewer trees, taller moraines, and wider outwash fans, the torrential water flowing through a rocky bed produces a distinct background noise in the final few kilometers to Gaumukh, punctured by rocks falling and chunks of ice breaking off the glacier snout. Those chunks of ice that break off and don't settle into a bed of ice-crystals at its base float further downstream, creating an archipelago of miniature icebergs. Glacial flour—fine sediment produced by the glacier grinding its rocky bed—gushes from the snout. Ice cold and thick with sediment, this grey, milky water grows in volume and velocity as other brooks and outwashes join it. By the time the stream reaches Gangotri, it has attained a perilous volume and velocity. It gushes through mountainous valleys—passing Uttarkashi, Devprayag, Rishikesh—all along the way gaining in speed and energy.

Before arriving at Haridwar, the water's descent is transformed into electricity first at the Maneri Dam, producing 42MW, and later at the Tehri Dam, which produces 1000MW of electricity and diverts water to urban dwellers in New Delhi. Along the way, terraced fields subdivide steep slopes. Villages and hamlets hug the contours of paved roads active with pilgrims and tourists in the months between winter and the southwest monsoon. Temples mark tirthas between these infrastructures. One can date the age of these dams and barrages, but it is difficult to ascertain the age of temples and ghats. Pilgrims rarely ask how old a structure is and, when asked, they will speak to you about why this site is revered. Never mind its age.



NORTHERN DIVISION
SUPER-PASSAGES

Ranipur Rao (torrent) crossing above
Ganges Canal, 2008.

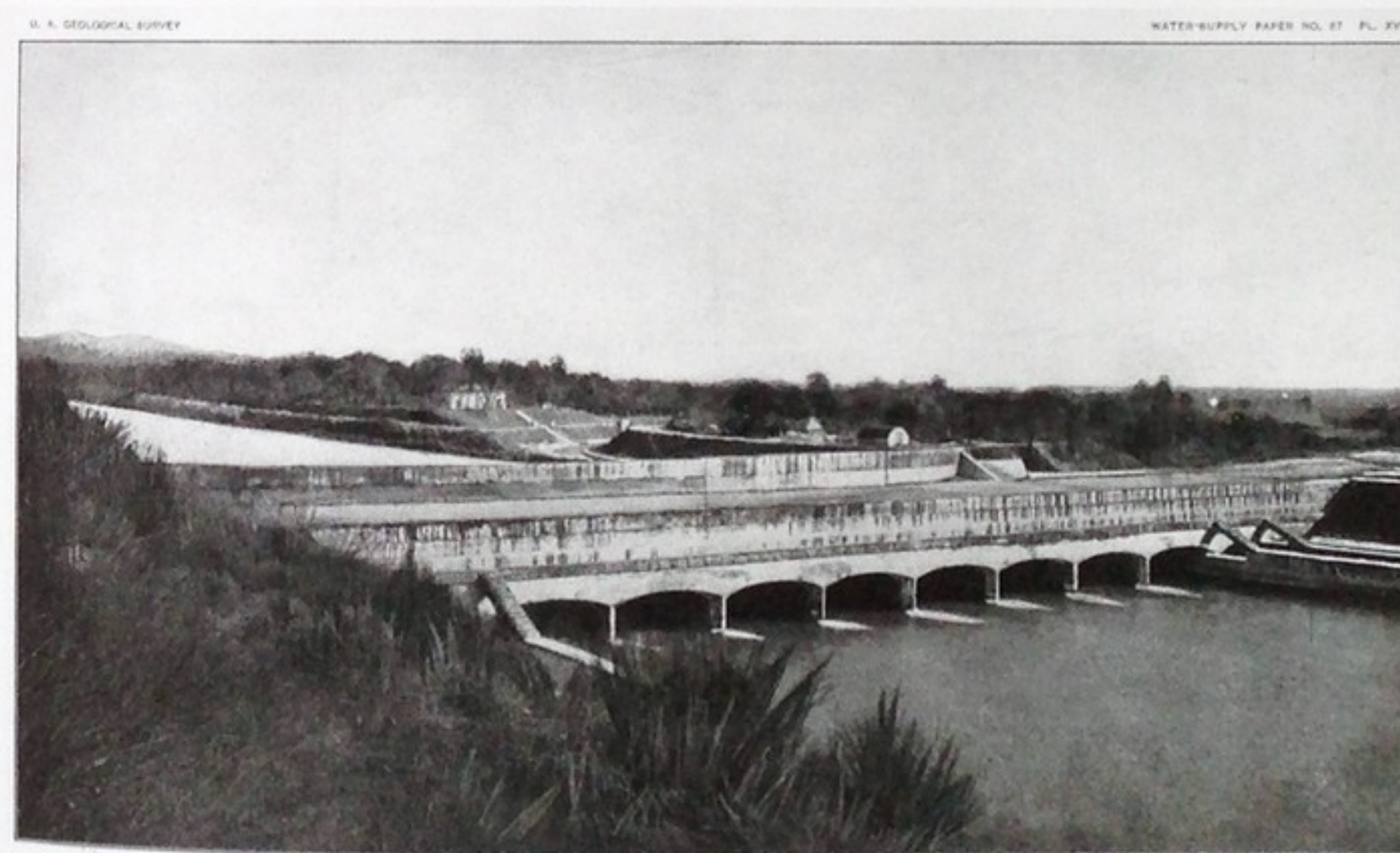


Panorama of Ranipur
Rao Super-Passage, 2008.



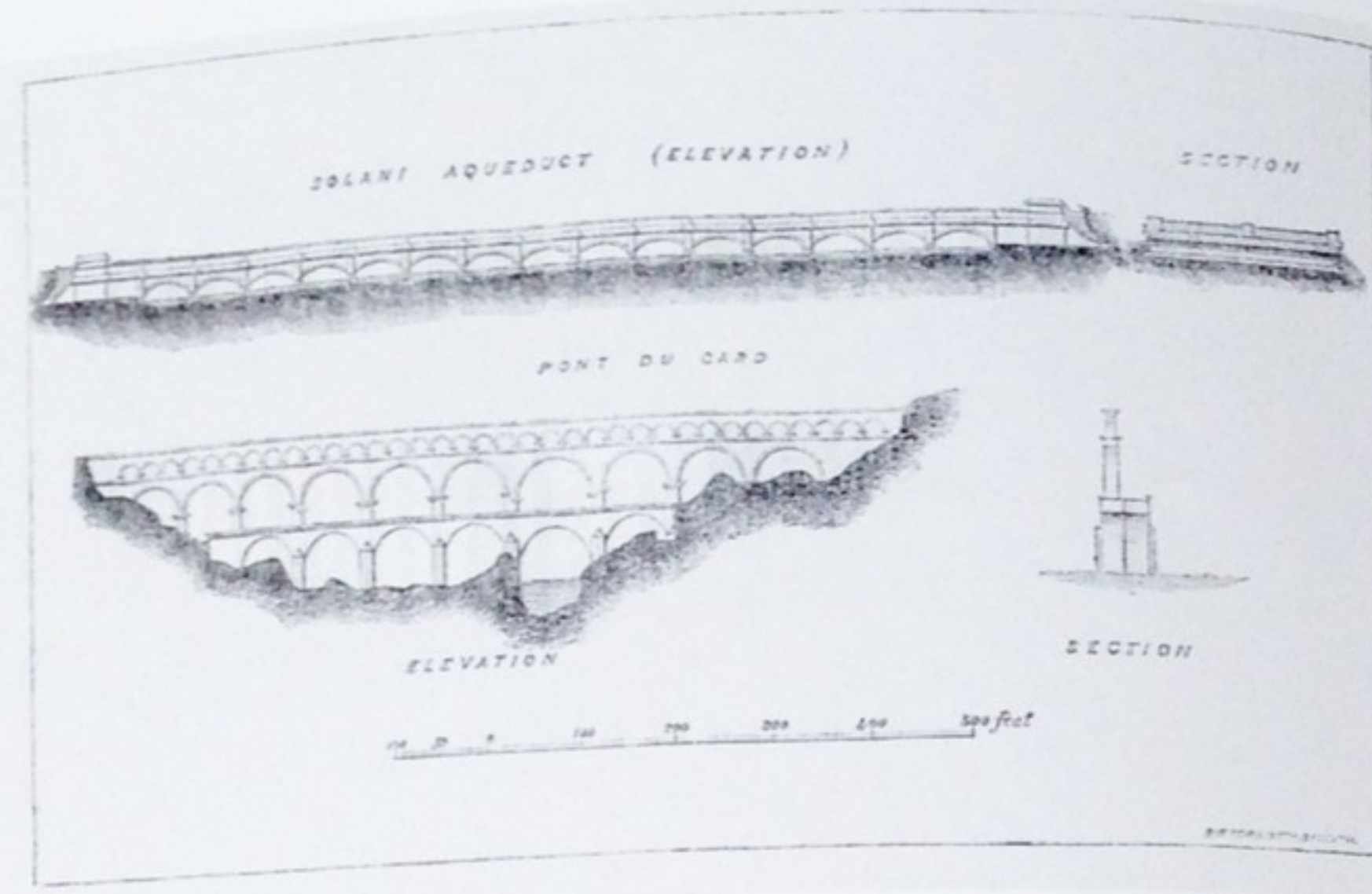
Ranipur Super-Passage, Ganges Canal passing
beneath Ranipur Rao (torrent), 2008.

SUPER-PASSAGES

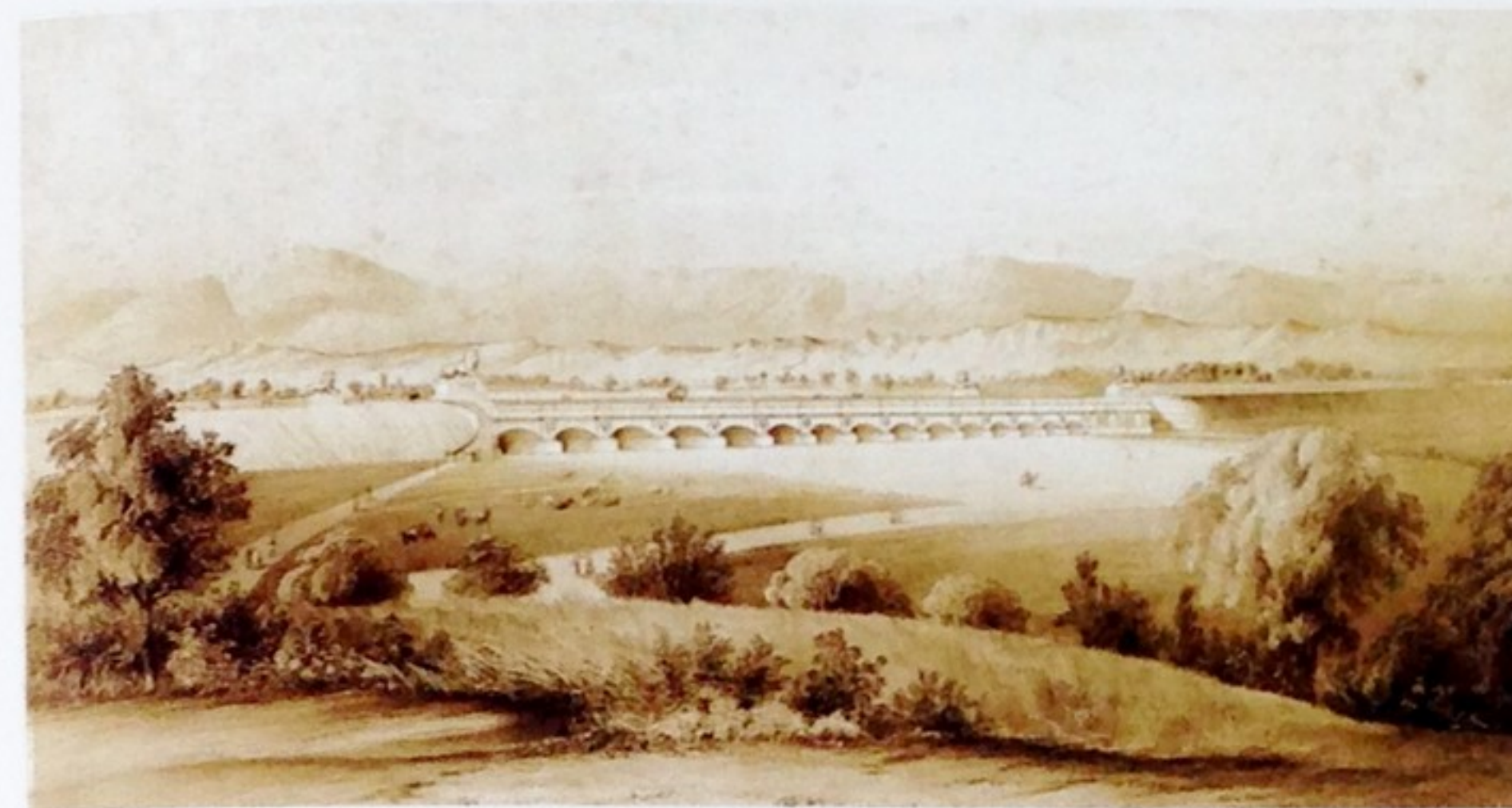


RANIPUR SUPERPASSAGE, GANGES CANAL.

Herbert M. Wilson, "Plate XVII. Ranipur Superpas-
sage, Ganges Canal" *Irrigation in India*. Washing-
ton, D.C.: Government Printing Office, 1892. (AA).



George Rowdon Burnell, "Solani Aqueduct and Pont du Gard." *The Rudiments of Hydraulic Engineering* (London: John Weale, 1859) (Harvard University)



SOLANI AQUEDUCT.

Poley Cusley, "Solani Aqueduct." *Report of the Ganges Canal Works from their commencement until the opening of the canal in 1854*. Allahabad: Smith, Elder and Co., 1865 (Princeton University)

AQUEDUCT

AQUEDUCT

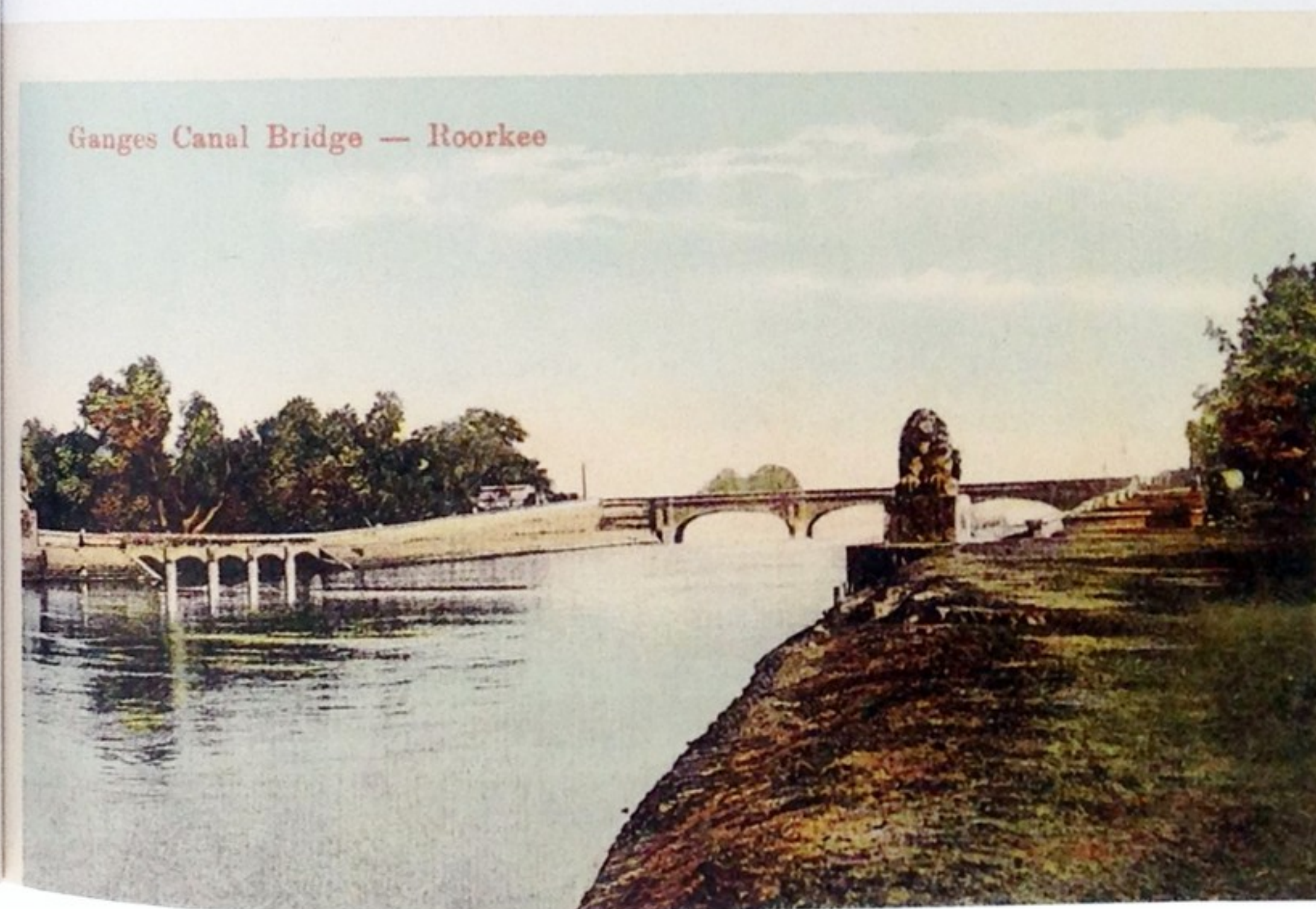
As noted earlier, it was with good reason that the inauguration of the Ganges Canal took place at mile 19 (30.6 km) at the Solani Aqueduct. Designed to carry 6,500 cusecs across the most dynamic of the seasonal torrents—the Solani River—the bed of the lined canal runs above the level of the surrounding land for 2.25 miles (3.6 km). At a width of 172 feet (52.4 m) and height of 24 feet (7.3 m), the Solani Aqueduct stretches 1,770 feet (539.5 m) across the Solani River. Just past the point where the aqueduct ends and the canal continues, two sitting lions, sculpted to be seen at a great distance, mark the point where the canal at long last enters its intended irrigable area.

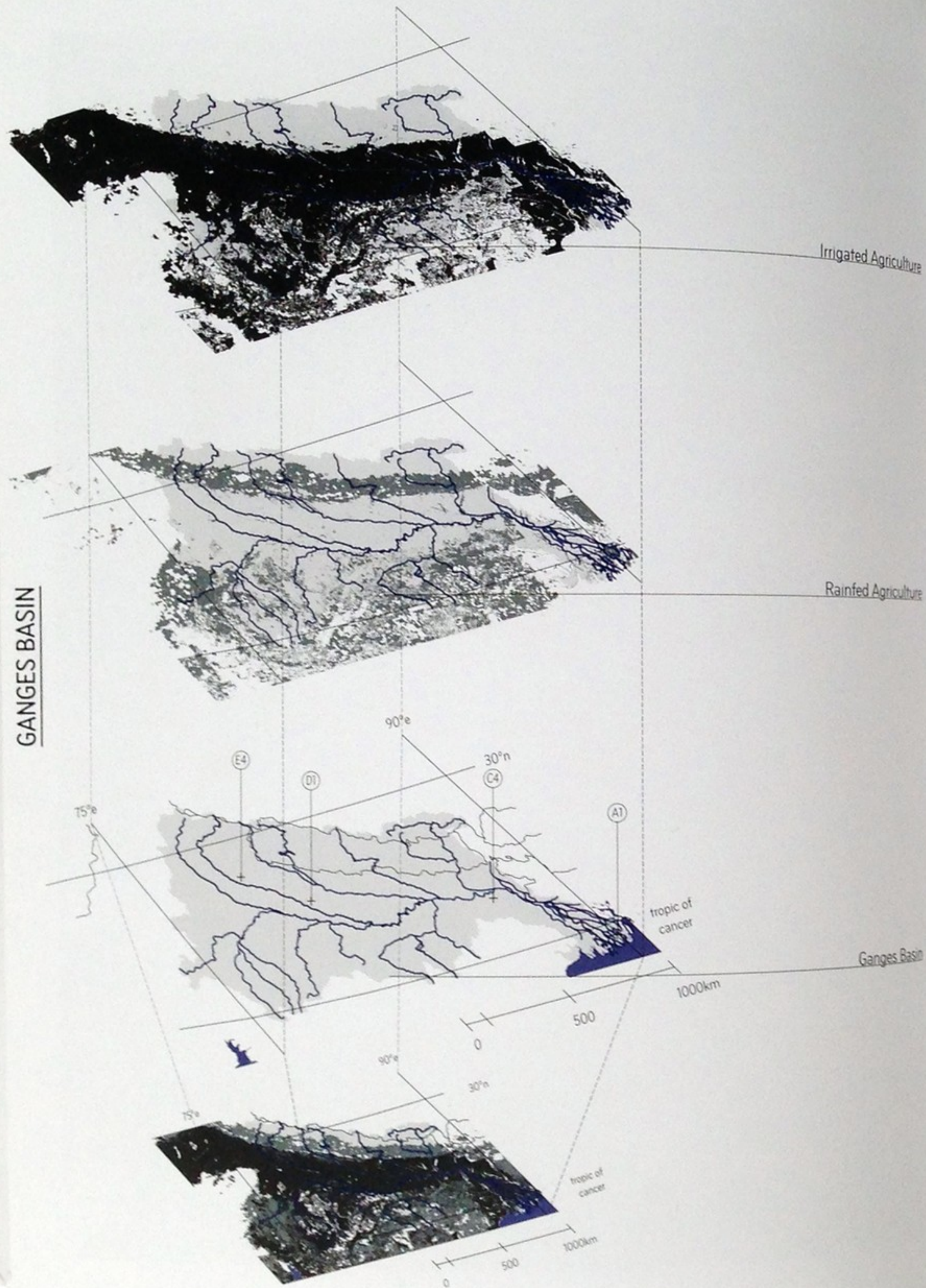
What was tremendous about this work was not its height, but the amount of water that passes across it throughout the year. It was a source of pride for British engineers. "[I]t is upon the great Indian irrigation works that the English engineers have achieved their most recent glorious triumphs. The Solani Aqueduct, upon the Ganges Canal is in fact the most stupendous monument of that kind yet constructed," wrote S. J. Burnell in 1877.⁹⁸ In *The Rudiments of Hydraulic Engineering* (1858), engineer George Rowdon Burnell visually compared the elevation and section of the Solani Aqueduct with the Pont Du Gard Aqueduct built by the Romans. He draws them at the same scale so that "it may here suffice to direct attention to the fact, that the modern work which is comparatively speaking, so little known, has an area of water-way, not less than eighty times that of the celebrated Roman example."⁹⁹

Comparing Imperial Rome and the administration of British India, both under the Company and later the Raj, was nothing out of the ordinary—Sir William Jones likened himself to the "Justinian of India" in the 1780s.¹⁰⁰ "There has never been the same misgovernment of India as there was of Roman provinces," noted Alfred Deakin in the 1890s, "but there has been, and is still, a necessary subordination of the conquered country, and a suppression of its individuality, which, though abundantly beneficial to its inhabitants on the whole, renders their relations to Great Britain irksome, and affords a constant opportunity to those whose advantage lies in promoting misunderstanding."¹⁰¹ Before the Solani Aqueduct was even completed, it was said in 1846 that the Ganges Canal will "...remain a lasting monument of British architecture and of British benevolence in India."¹⁰² Upon arriving in Roorkee in 1857–58, following the Indian Rebellion of 1857, Julius George Medley, Captain in the Bengal Engineers, wrote how he, "admired, as every Engineer must, that monument of scientific skill, the Solani Aqueduct."¹⁰³ Even beyond India and Great Britain, the Solani Aqueduct was admired. In his essay for *Scientific American*, "What Civilization Owes the Architect and Civil Engineer," George R. Bramhall wrote of the aqueduct in 1885: "In grandeur of design, solidity, and utility, it challenges competition."¹⁰⁴ As late as 1966, it was said of the Solani Aqueduct: "Unequalled in its dimensions by any work executed anywhere in the world at that time, this crossing is a magnificent monument to the outstanding engineering skill of its builders."¹⁰⁵

AQUEDUCT

"Ganges Canal Bridge—Roorkee." Moodli Dhur & Sons, Ambala Cantt. Circa late 19th or early 20th century (AA). At Roorkee the Ganges Canal enters the plains.





Instead of the passive surrender to an irrational monsoon, the Ganges River Basin shows a culture obsessed with water management to the point of paranoia—an unequalled exploitation of irrigation technologies to regulate capricious rainfall patterns.

With its vociferous advocates and unwitting practitioners spreading the culture of peaceful conquest to all corners of the Ganges River Basin by means of hydrological infrastructure, the insatiable Ganges Water Machine is constantly subdividing existing territory into new territories and adding new territory by extending the reach of its super-surface. The omnipresence of this process—of this surface and its spatial configurations—makes traditional terminology an insufficient descriptor for the changing geography.

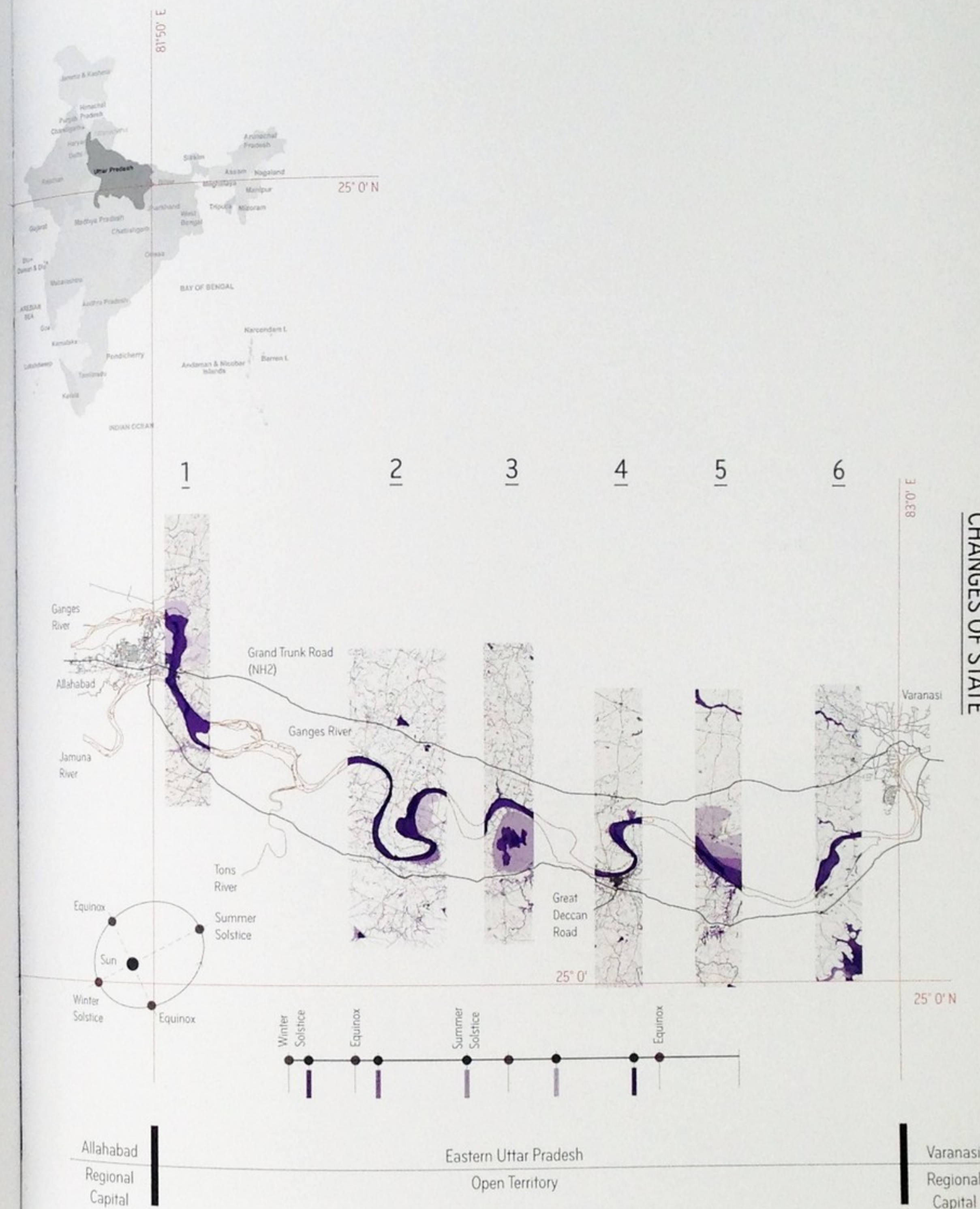
The goal of this book—a dynamic atlas—has been to reveal the narratives and developing spatial logics that generate this vast mega-machine and its urbanism. Because of the mixture of actors, the scale of inhabitation, and the widely varying techniques of interventions, this landscape of infrastructure requires a different kind of map. Now, over 150 years after the opening of Proby Cautley's Ganges Canal, the time is ripe to integrate the fantastic and tragic heroism of the canal systems and the tubewell revolution.

After the mutation of William Stampe's Himalayan Dream into an ungovernable tubewell revolution, the following set of drawings should be considered an elucidation of the elements of the Ganges Water Machine. This will be communicated in part through words and historical documents and artifacts, but more significantly through a series of visual surveys and provocations made from the tip of the Ganga-Jamuna Doab at Allahabad (Prayag) to the city of Varanasi (Kashi). These drawings, which are the outcome of nearly a decade-long analysis of the Ganges Water Machine by foot, boat, and car, explore the speeds of cyclical change produced by the monsoon and agriculture, and the evolution of urban settlement.

The tract of land between Allahabad and Varanasi exemplifies the overlapping states of urban, rural, riparian, and agrarian spaces permeating this vast alluvial basin. The seats of former empires, principalities, and satrapies, Allahabad and Varanasi have always served as regional capitals and continue to do so today. At each of their historic cores, they are consolidated cities: dense, compact settlements. Both are revered as important religious sites within a larger sacred geography, and each city, at different times of the year, hosts a large festival. The open territory between these two consolidated, regional capital cities is less dense, but equally complex in terms of its smaller, decentralized enclaves of villages and towns within a tight patchwork of agriculture.

This particular belt in the Gangetic plains occupies a number of soluble states: it is at once water, mud, dirt, dust, deity, and atmosphere. The term "state" not only refers to the coincidence of physical changes of state (molecular transformations from solid to liquid to gas)—but also political and cultural changes of state (the village, the town, the city, the nation as well as the religious festival and winter and spring harvests). In other words, the impact of weather and climate are intertwined in the matrix of everyday life in all of its manifestations. Physical changes of state induced by weather and climate often are synchronous with urban events and festivals—most notably Magh Mela in Allahabad and Durga Puja in Varanasi.

CHANGES OF STATE: ALLA- HABAD TO VARANASI



Every twelfth year, the sleepy university town of Allahabad is transformed into a colossal tent city populated by millions of pilgrims for the Kumbh Mela (literally Pitcher Celebration). And it all seems to happen so fast. The waters of the Ganges and Jamuna slowly recede after the monsoon. A city grid is tattooed into the banks and shoals at the Sangam. Tents and temples pop up in October. Pontoon bridges stretch from one bank of the Ganges to the other and pilgrims begin to arrive in January. Then come reporters and camera crews from all over the world, who come to document the life of what must at first appear to be the world's largest Instant-Mega-City: an ephemeral tent city with the major infrastructure of a metropolis.

Yet how can an instant city possibly provide a constant flow of running water and electricity, a coherent layout of avenues and roads defining 14 sectors, 18 pontoon bridges, 38 hospitals, 30 police stations, 30 fire stations and 35,000 toilets? Given the months or years of planning involved to make the Kumbh happen, it is anything but an instant city or a permanent metropolis. It is impossible to standardize the plan of the city as the waters of the Ganges recede differently each year, depositing a different configuration of sandbars and edges. It is a methodically planned ephemeral city. To make this happen, government officials collaborate with public health workers and akharas (religious orders, sects) to organize the physical layout of the temporary city. While at first glance it might have the ephemeral qualities of a pop-up city, its deep structure is that of a carefully planned metropolis in an ephemeral and dynamic landscape. It is ephemeral and dynamic, but it is not instant.

A similar cyclical process takes place every year with the bathing festival Magh Mela at the Sangam, which, like the Kumbh, is held during the month of Magh (January-February). There, too, a gridded city plan is laid out. Plumbing is buried in the sandbars dotting the Ganges. And an electrical grid provides power for millions of pilgrims and news crews. The Kumbh and Magh Melas are so regularly timed that they just seem part of the annual cycle of the Ganges to residents of Allahabad.

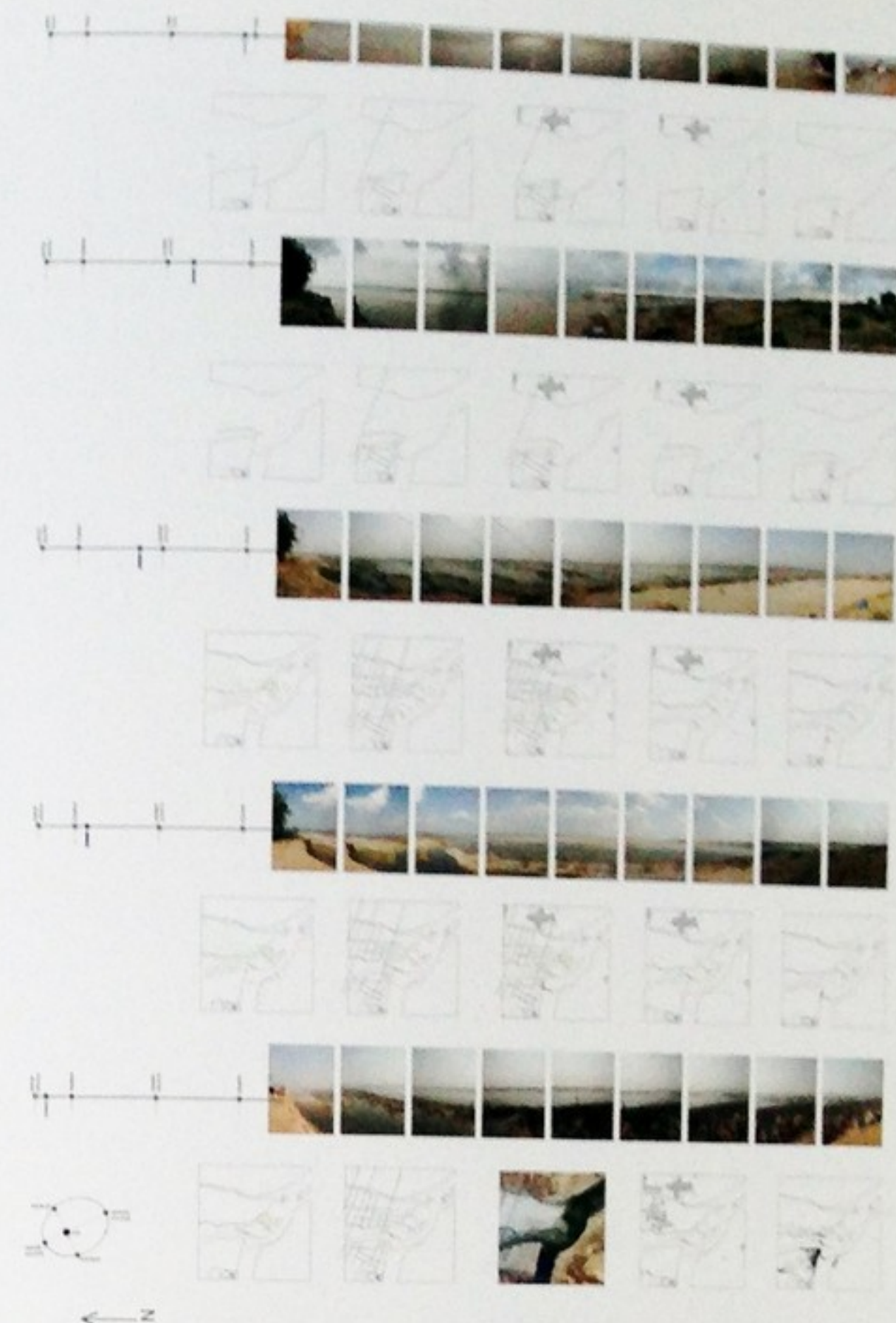
While the exact date of the Kumbh Mela at Allahabad is debatable, the sanctity of the Sangam and the occasion of Magh Mela date back well over ten centuries. Hieun Tsiang, a Buddhist monk from China traveling throughout north India during the seventh century CE, witnessed a yearly festival at the Sangam. He not only recorded bathing at the confluence in great numbers and alms giving to Brahmins, but also the Akshyabat tree, noted in the *Matsya Purana* for its profound sanctity and its timeless state of green. By the late-sixteenth century, the site of the Akshyabat tree was enclosed within Allahabad Fort. A portal with controlled access to the tree and temple was constructed for pilgrims.

Since Hieun Tsiang, numerous travelers visited Allahabad and recorded their experiences of Magh Mela. Touring the British Empire in 1895, Mark Twain visited Allahabad and described the festival: "Two millions of natives arrive at this fair every year. How many start, and die on the road, from age and fatigue and disease and scanty nourishment, and how many die on the return, from the same causes, no one knows; but the tale is great, one may say enormous. Every twelfth year is held to be a year of peculiar grace; a greatly augmented volume of pilgrims results then." The year of grace Twain described is the modern day Kumbh Mela. By the late-nineteenth century, the Kumbh rotated every four years between Allahabad, Haridwar, Nasik, and Ujain.

A decade later, standing atop the ramparts of Allahabad Fort in 1906, Sidney Low described a sprawling human settlement of two million souls at the Sangam. For Low, "the camp, indeed, should not be called by that name. It is a town—a temporary town, it is true, but while it lasts one of the great cities of the world, more populous than Peking or Vienna." Describing the avenues and crossroads laid out by the government, Low observed trade and commerce taking place like in any city. Low's account is similar to many foreign travelers who were amazed and appalled by the deluge of pomp and color of the gleaming palanquins, beggars, sadhus (holy men), bathers, and banners of silk and gold rustling above the crowds. Since the time of the Raj, the government has played a marshal role in the layout and design of the temporary city.

But what is more spectacular than the reliable delivery of water and electricity, and the planning for millions of pilgrims—no doubt feats unto themselves—is the inherent ephemeral nature of the Sangam and its place in the larger system of the Ganges once the bathing festivals end in March. After the tents and temples are dismantled and the cameras are gone, the gridded city remains etched into the banks of the Ganges. Footprints of tents remain in the grey silt. Farmers use these residual lines from the sprawling metropolis to cultivate wheat and rice. Herds of cows and goats graze while water buffalo plunge into the river. The ephemeral metropolis is transformed into an agropolis. This process occurs every year: transitioning from a pastoral landscape to a densely populated tent city to islands of wheat and rice paddies to a monsoonal deluge of gelatinous silt. This process is not instantaneous; it happens in slow motion.

SANGAM: CELESTIAL- TERRESTRIAL MICROCOSM



Measures the ways in which the Ganges and Yamuna rivers expand and contract around Allahabad throughout a single solar cycle. Events at the Triveni Sangam are mapped, diagrammed, and photographed from the same vantage point to vividly visualize the cyclical changes taking shape.

