Radiant Infrastructures

Media, Environment, and Cultures of Uncertainty

RAHUL MUKHERJEE

Radiant Infrastructures

SIGN, STORAGE, TRANSMISSION
A series edited by Jonathan Sterne
and Lisa Gitelman

Radiant Infrastructures

Media, Environment, and Cultures of Uncertainty

Rahul Mukherjee

Duke University Press Durham and London 2020

Printed in the United States of America on acid-free paper ∞
Designed by Drew Sisk
Typeset in Garamond Premier Pro and SangBleu Sunrise
by Westchester Publishing Services

The Cataloging-in-Publication Data is available at the Library of Congress.

ISBN 9781478009016 (ebook)
ISBN 9781478007623 (hardcover)
ISBN 9781478008064 (paperback)

Cover art: Amirtharaj Stephen, *Fishermen proceeding towards the Koodankulam Nuclear Power Plant to lay a siege on World Fishermen Day*, 2011; courtesy of the artist. Cell antennas atop Hotel Supreme; photo by Rahul Mukherjee.

Duke University Press gratefully acknowledges the University of Pennsylvania, which provided funds toward the publication of this book.

CONTENTS

ACKNOWLEDGMENTS

Radiant Infrastructures has benefited from many mentors, critics, research collectives, and institutions. Parts of the book have been nurtured in various intellectual contexts, and there is much debt to be radiated to the fellow research travelers.

During my graduate days at UC Santa Barbara, I worked closely with a marvelous committee: Lisa Parks, Rita Raley, Chuck Wolfe, Colin Milburn (UC Davis), and Bhaskar Da (Bhaskar Sarkar). Their guidance has helped me emerge with theoretical/methodological patchworks for examining environmental publics. Shiv Visvanathan and Radhika Gajjala prepared me for my dissertation research endeavor while I was at Dhirubhai Ambani Institute for Information and Communication Technology and Bowling Green State University, respectively, before coming to UCSB. Their work continues to inspire me. Thanks to the Department of Film and Media Studies at UCSB for taking a chance with me when I was a computer science student who wanted to write on media and culture. In UCSB's campus, I learned much from participating in classes taught by Peter Bloom, Anna Everett, Swati Chattopadhyay, Miriam Metzger, Bruce Bimber, Jennifer Holt, Greg Siegel, Bishnu Di (Bishnupriya Ghosh), Cristina Venegas, Constance Penley, Janet Walker, and Michael Curtin. Graduate school was a wonderful conversation with my colleagues in the Department of Film and Media Studies and the wider campus: Athena Tan, David Gray, Joshua Neves, Nicole Starosielski, Dan Reynolds, Carlos Jimenez, Hannah Goodwin, Teddy Pozo, Lindsay Palmer, Steve Witkowski, Siladitya, Ramya Yeluri, Sarah Harris, Jade Petermon, Jetti Allen, Maria Corrigan, Lindsay Thomas, Lindsay Palmer, Anne Cong-Huyen, Erik Berg, and Seokwon Choi. They are extraordinary thinkers and writers, and it is wonderful to follow their academic and other professional careers.

Five years ago, the Cinema and Media Studies program at the University of Pennsylvania made me its own by their collegiality and hospitality. Tim Corrigan, Peter Decherney, Karen Redrobe, Meta Mazaj, Kathy DeMarco Van Cleve, and Nicola Gentili are a dream team. As part of the English department,

I benefited from the generosity and guidance of two of its chairs: Amy Kaplan and Jed Esty. My colleagues at the Latitudes group—Suvir Kaul, Ania Loomba, Chi-Ming Yang, Rita Barnard, David Eng, and Jennifer Ponce De Leon—have sparked many a conversation about South-South solidarities. Bethany Wiggin, Paul Saint-Amour, and Etienne Benson have kept the Penn Program in Environmental Humanities alive and responsible at Penn. Projit Mukharji, Nikhil Anand, and Lisa Mitchell designed innovative works-in-progress workshops on matters related to South Asia. Jo Park, J. C. Cloutier, Tsitsi Jaji, Ian Fleishman, Emily Steinlight, Heather Love, and Pearl Brilmyer have provided the intellectual companionship and affective sustenance necessary to keep producing scholarship. Two research collectives (colloquium groups)—Penn Humanities Forum (themed year: Translation) and Humanities+Urbanism+Design—brought together interlocutors who enriched the arguments in the book. Jim English, David Brownlee, and Eugenie Birch moderated sessions wisely. Conversations with students in my graduate courses on publics, environmental media, and global media theory have proved extremely helpful in reexamining the many layers of challenging concepts. In particular, I want to thank Orchid Tierney, Knar Gavin, Iggy Cortez, Kerry McAuliffe, and the two student reading groups—Latitudes, and Anthropocene and Animal Studies—for shaping my ideas about ecological and infrastructural approaches to literature, media, and arts. Spread across Drexel and Penn was my writing group of friends and interlocutors: Linda Kim, Debjani Bhattacharya, Beatrice Jauregui, and Alden Young, you know what the book was before it was a book.

The Atkinson Center for Sustainable Futures Fellowship at Cornell University's Society for the Humanities and the Short Stay Fellowship at Utrecht University provided intellectual camaraderie and precious writing time. I profited immensely from interactions with Rosi Braidotti and Berteke Waaldijk in Utrecht. At Cornell's SHUM, Emily Parsons and Paul Fleming organized fascinating conversations and events over delicious lunches. Amy Sara Carroll, Ricardo Dominguez, Conerly Casey, Chairat Polmuk, Ayelet Ben-Yishai, Erik Born, Robert Travers, and Amie Parry were an amazing group of fellows, emitting sincerity, engagement, laid-backness, and generosity in equal measure. Durba Ghosh, Tim Murray, Renate Ferro, Patti Zimmerman, and Lucinda Ramberg gave my book project their attention and me their inquisitive companionship. I fondly remember afternoon tea meetings with Monika Mehta discussing global media theory in various cafés of Ithaca.

Over the years, colleagues and friends in the fields of environmental media and science and technology studies have gifted many conversations

and endless encouragement. Melody Jue, Mel Hogan, Kate Brown, Kath Weston, Monamie Bhadra Haines, Jennifer Beth Spiegel, Itty Abraham, Kavita Philip, Ranjit Singh, Rafico Ruiz, Stacy Alaimo, Brooke Belisle, Ravi Sundaram, Yuriko Furuhata, and Ben Mendelsohn have introduced me to new considerations about data, saturation, intimacy, atmospherics, aesthetics, and matter in my own research on media, infrastructures, and the environment. I still remember that on the sidelines of a conference at the University of Virginia, the inimitable Kath Weston asked me to carefully think about the terms "dosage" and "interference," without which chapter 4 of this book would not be possible.

Courtney Berger is a remarkably insightful editor whose suggestions throughout the writing and revision process have been illuminating and made a huge difference to the final book. Sandra Korn, Jenny Tan, Lalitree, Liz Smith, and the editorial staff at Duke University Press have been fantastic with their guidance and precision. I am deeply indebted to the two reviewers who gave so much of their time to read the book and provide incisive comments and rigorous feedback. I also am grateful to Jonathan Sterne and Lisa Gitelman for including *Radiant Infrastructures* within the Sign, Storage, Transmission series, a series I have long admired. At an earlier stage of the writing process, Brian Larkin and Arvind Rajagopal read a draft of my book as part of a book workshop organized by Tim Corrigan and Jed Esty at Penn. At this workshop, Brian's terrific suggestion that I work to conceptualize "radiant infrastructures" (instead of using the term as a descriptor) inspired a reorganization of the chapters of the book. Arvind's wise reformulation (as summary) of my manuscript draft gave me ideas for the conclusion of this book.

Parts of the book have been presented in conferences at venues such as the Society for Cinema and Media Studies, the Society for Social Studies of Science, the American Anthropology Association, and the International Communication Association. Some sections of chapter 1 and chapter 3 have appeared in modified form as part of journal articles in *Television and New Media* and *Media, Culture and Society*: "'City Inside the Oven': Cell Tower Radiation Controversies and Mediated Technoscience Publics," *Television and New Media* 18 (1) (2017): 19–36; "'You are the first journalist and you are the last journalist who will ever come here': Nuclear Secrets and Media Practices of Access-Trespass," *Media, Culture and Society* 38 (5) (2016): 647–663. Speaking invitations at the University of California, Berkeley (Medium/Environment conference), Concordia University (Global Emergent Lab "Concepts" Seminar), Cornell University ("Sustainable Futures" talk), the University of

Virginia (Environmental Humanities symposium), Yale University ("Aggressive Image" conference), the University of Michigan (Digital South Asia conference), and Princeton University (Postcolonial Studies colloquium) were occasions to tinker with the book project and to have interlocutors point out emergent possibilities. I am grateful to Weihong Bao, Joshua Neves, Paul Fleming, Stephanie Bernhard, Ido Lewit, Aswin Punathambekar, and Daniel Hazard for the kind invitations, and to their respective departments and programs for hosting my visits. In particular, visits to the University of Michigan and Concordia University have led to sustained conversations with Josh, Aswin, and Marc Steinberg. It is a rare privilege for a junior scholar like me to have such mentors as friends.

The project has been sustained by fellowships from the UCSB Affiliates and the Interdisciplinary Humanities Center. Travel grants from the Department of Film and Media Studies and the Graduate Division supported fieldwork visits to India. At Penn, the Wolf Chair and the Humanities+Urbanism+Design collective offered research funds to help with further fieldwork. Numerous research contacts—actors, stakeholders, artists, journalists, scientists, photographers, filmmakers, and communities involved in the environmental debates that form a part of my book—helped me to comprehend the complexity of the arguments I studied and the way in which interactions aided media practices. Without their time and assistance, this project would not have been possible. These many research interviewees include Shipra Mathur, Vibha Varshney, S. P. Udaykumar, Amirtharaj Stephen, Tridip Mandal, Anubha Bhonsle, Shriprakash, R. P. Amudhan, Pallava Bagla, Anumita Roychowdhury, Latha Jishnu, Prakash Munshi, Fathima Nizaruddin, Sarah Irion, and Kumar Sundaram. I am especially thankful to friends and relatives who hosted me in various cities. My sister Rohini and her partner Pratyush were understanding and lovely with the strange schedules of my fieldwork assignments. They take Indian hospitality to another level. My school friends Rohan, Ankur, Vishesh, and Abhigyan continue to watch over me and exchange opinions about life and work. To my relatives (blood and alternate families) spread across Ranchi, Philadelphia, Delhi, London, and Bangalore, I remember with great debt your love and care over many years. Iggy Cortez and Alessandra Mirra have been a key part of my Philadelphia support system; they know they are very special.

Without my teachers Lisa Parks and Bhaskar Sarkar, I could not have written this book. Lisa has taught me that there is always a different, evocative angle from which to approach infrastructures. Bhaskar Da has trained me to

have radical intellectual openness to a wide range of scholarship and affectionately nudged me to pursue ambitious projects.

Jenn Wilson has kept our life together lively and full of happenings. It is a treat to have one's work be read by such a delectable writer as Jenn. I cannot think of anybody more adorable, more endlessly curious. This book is for Ma and Baba, who have cultivated in me both an enthusiasm for science and a proclivity to quarrel with it. They are the most generous people in my life.

INTRODUCTION

Radiant Energies and Environmental Controversies

In mid-2011, fishermen in Koodankulam, India, a coastal area in the southern state of Tamil Nadu, began complaining about a mysterious decrease in their fish yields. They blamed it on radiation from the nuclear reactor being built there. Urbanites in Mumbai rushed to buy radiation detectors, anxious that the cell towers by their apartment complexes were emitting unsafe levels of radiation. Around this time, I was conducting research about science reporting related to environmental issues in India. I had expected that the journalists and scientists I met would tell me about climate change, genetically modified crops, and e-waste management—the usual topics. Instead, they overwhelmed me with anecdotes about cell towers and nuclear reactors. Since the nuclear disaster in Fukushima, Japan, earlier that year, fishermen and farming communities in rural India had been agitating against the continued construction of nuclear reactors. Meanwhile, in urban centers, Indian citizens were deeply concerned about news reports that residents living in close proximity to mobile phone towers were being diagnosed with cancer. Of course, there were other stories about toxic environments: air pollution in Indian cities was a serious issue with city dwellers—who often developed asthma, chronic bronchitis, and other respiratory ailments—but one could see and smell the unbearable smog in New Delhi, the capital of India and the world's most polluted city (see Daigle 2011).[1] In stark contrast, reactors and towers emitted imperceptible radiation, and this imperceptibility seemed to amplify both the apprehension people felt about its health effects and the imperative journalists felt to mediate it, to make invisible radiation visible.

Owing to radiation's ability to evade the human senses, popular news programs in India characterized cell tower signals as *khamosh khatra*, or silent danger.[2] What was common in the coverage of both controversies was the way the invisible radiation became associated with the very visible atomic power

FIGURE I.1 Reliance Jio ad with references to "Digital India" and data for 1.2 billion Indians

plants and mobile towers. These structures embodied the dreams of modernity for many Indians, and therefore could not just be brought down. To halt the construction of power plants or evict cell antennas represented an emotionally charged retrenchment from the promise of development.

Urban India is composed of radiant cities: bustling metropoles where radio waves emanate from thousands of cell antennas, keeping millions of mobile phones (and people) connected. Prime Minister Narendra Modi's "Digital India" program aims at connecting all of India's 1.2 billion people to spur innovation, and cell towers embody the promise of that plan. Reliance Jio, the rapidly rising cellular operator launched in 2016, has been building cell towers very quickly and believes an infrastructural investment in antennas using 4G LTE technology is crucial to bringing "data power" to all Indians through smartphones, thus realizing Modi's vision. In this ad, digital data accessed on Jio smartphones provide new freedom to Indians as they run across beaches, unfettered and joyous (figure I.1). Nuclear energy is also heavily symbolic. Many Indians believe it has the potential to illuminate every home in the country. Radiation and radiance, atomic prowess and national glory have long been synonymous.[3] A 2012 ad released by the Nuclear Power Corporation of India Limited (NPCIL) claims that electricity generated by nuclear reactors helped create a bumper crop harvest. Happy children run across a glorious wheat field as NPCIL's campaign slogan reads, "Brightening millions of lives" (figure I.2).

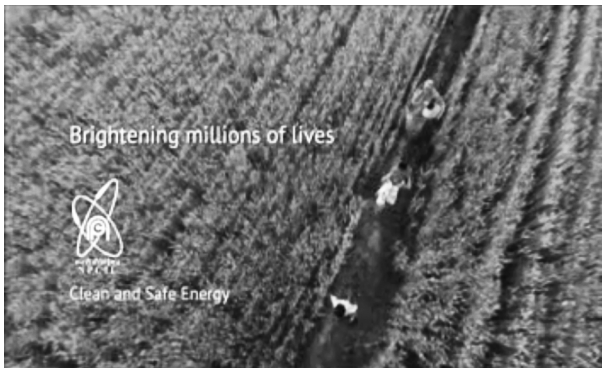

FIGURE I.2
NPCIL ad and slogan, "Brightening millions of lives"

Despite these aspirations, over the last seven years, cell towers and nuclear reactors have come to be perceived as emitting uncontrolled, unruly, and unsafe radiation. News programs have expressed concern that cell tower radiation might be a health hazard (figure I.3). In Koodankulam (also spelled Kudankulam), antinuclear activists and affected communities organized a long and enduring protest to stop nuclear reactors from being constructed.[4] The French corporation Areva was planning to build the world's largest nuclear reactor in Jaitapur on India's Arabian Sea coast. Villages like Sakhri-Nate were vehemently opposed. The village water wells and tea stalls were plastered with graffiti that proclaimed, "Areva Go Back" and, in the Marathi language, "Nako annu urja" (no atomic energy) (figures I.4 and I.5).

Although both reactors and towers emit invisible radiation and play an important role in India's development, they are rarely discussed in tandem. During the period of my study (2010–2017), it would have been extremely difficult to find a newspaper article or a television news segment about cell tower radiation that also referred to nuclear reactors and vice versa. Even as the two controversies were unfolding almost simultaneously in India, these "radiant infrastructures" were not being compared. This lack of comparison, or even citation, struck me as strange.

There are, however, some key differences between cell towers and nuclear reactors. For one, they emit different kinds of radiation—ionizing (nuclear) and nonionizing (cell antennas)—and one could argue that technical specificity matters. Another difference of great consequence is that their locations and affected communities vary vastly. Nuclear reactors are being constructed in rural areas, displacing fishermen and farming communities. Cell towers remain an urban problem, with mostly middle-class populations organizing campaigns

FIGURE I.3 NDTV program discussing cell tower radiation

to evict towers from their neighborhoods. The state, policy makers, and media organizations view rural fishermen and the urban middle class very differently.

I want to juxtapose two examples of the mediations of these controversies to reveal just how divided the social fabric of India is. I have met documentary filmmakers shooting in rural India, and also journalists working on lifestyle shows about urban health problems. The committed documentary filmmakers make an argument against nuclear reactors, while the lifestyle shows take up the plight of upper-middle-class urban residents who do not want cell antennas in their backyards. R. P. Amudhan, who made a trilogy of documentaries on nuclear energy programs in India called *Radiation Stories*, told me that his films are poor people's *mela* (fair or festival), and upper-middle-class elites who have political connections have no place in his documentaries. Shows like CNN-IBN's *Living It Up* are about privileged lifestyles, arguing, for example, that talking relentlessly on the phone is an urban addiction just like eating potato chips. Documentary filmmakers interested in bringing social change do not feel inspired to make films regarding cell tower radiation (and the anxieties of the privileged class), and lifestyle shows assume that rural fishermen have only livelihoods, not lifestyles. The mediations of reactors and towers are imbricated with the political economy, public perception, and government policy regarding these radiant infrastructures.

FIGURES 1.4 AND 1.5 Antinuke protest graffiti in Sakhri-Nate (Screen grab from *Are-Vah!*)

By examining a series of environmental controversies associated with nuclear reactors and cell towers, this book conceptualizes the specificity of radiant infrastructures as a particular kind of infrastructure. Radiant infrastructures, like other infrastructures, provide structure to our lives. They organize our mobility (cell phones keep us connected as we move) and shape the way we use our electrical appliances (nuclear reactors produce electricity). Radiant infrastructures, more particularly, are associated with radiance, understood as fields of energy. The signals emitted by cell antennas move like waves across the city, determining which phones stay connected and which don't. These signals enter people's homes, disturbing erstwhile notions of public-private boundaries. Radioactive isotopes emitted by nuclear reactors also defy boundaries.

The environment around an atomic power plant could potentially include invisible radioactive isotopes of tritium, cesium, and iodine, which then find their way into water, soil, and human bodies. Such radioactive nuclides accumulate in animals and plants, resurfacing and concentrating as they go up the food chain.

Radiant infrastructures are leaky, susceptible to both radiation and information leaks that could cause bodily contaminations and affective contagions. Examining the results of bodily exposure to controlled emissions from radiant infrastructures and the performances of experts and policy makers who hide and reveal information about reactors and towers helps one grasp the reasons for the epistemic uncertainties and ontological indeterminacies surrounding these infrastructures. Media operates across scale—bridging the micro-level bodily encounters with infrastructures and the macro-level discourses circulating about them—and thus becomes central to representing and shaping political subjectivities associated with such infrastructures.

This book critically interrogates the role of the media in covering nuclear reactors and cell antennas, both of which promise development and simultaneously generate intense fears regarding radioactive emissions. The techno-political debates over threshold levels of radiation, the moving testimonies of cancer patients, the claims and counterclaims by experts of an absolute control over the atom and the cell antenna, and the uncertainities about the future expressed by concerned citizens get enacted in mediated arenas. Journalists brag about getting exclusive access to report from inside the reactor core of a nuclear power plant, lifestyle shows depict children playing under the shadow of a cell tower (with camera tilts to emphasize the tower's enormous height), and regulators organize press conferences to allay public apprehensions about an imminent catastrophe. This book traces these intercommunicating media events and practices as a way to understand the temporal fluctuations and geographic spread of environmental controversies. Various media programs help keep the issues and concerns related to the disruptive infrastructure in circulation, and this "discursive circularity" (Warner 2002) sustains the controversy.

In this book, I do not use "radiant infrastructures" as a mere descriptor for cell towers and nuclear reactors. Rather, I conceptualize radiant infrastructures through both their material properties and the work they do for different interests. "Radiant infrastructures" thereby becomes a heuristic that accretes the different ways people try to make sense of radiation-emitting technologies and their everyday encounters with them. The "radiance" of radiant infrastructures is a double-edged sword, because these infrastructures

are at once harbingers of development and emitters of potentially carcinogenic radiations.

Radiance connotes the luster of hope about a nation's economic growth as well as the harmful radiations with carcinogenic effects. Mediation accentuates both aspects of radiance. The mediated radiance of radiant infrastructures as glistening objects of a nation's development is contaminated by the mediated uncertainties about the material effects of impalpable radiations on human bodies and citizens' well-being. Nuclear reactors as infrastructures of electrical illumination and cell towers as infrastructures of information communciation lend themselves well to metaphors and manifestations of radiance (glow, heat, spark, spread). However, for such demonstrations of radiance to occur, invisble processes involving scattering of radioactive particles and radial spreading of electromagnetic rays have to take place. Radiant infrastructures as a conceptual heuristic folds in both these glittering and impalpable aspects of radiance. Mediation of environmental controversies about radiant infrastructures also includes the role of media practices such as radiation detection and biomedical imaging that provide ordinary people the possibility of sensing their exposure to invisible radiant energies emitted by cell towers and nuclear reactors. The concept and phenomena of "radiance" in radiant infrastructures point to media's role in molding political imaginaries, bodily prehensions, and social aspirations about cell towers and nuclear reactors.

Radiance of Infrastructures

Infrastructures can be vast networks that connect and separate human and nonhuman entities. Media anthropologist Brian Larkin (2008) has often noted that infrastructures are both conceptual and technical objects. As such, infrastructures demonstrate material power and agency but also are imbued with social meanings. Infrastructures like nuclear reactors, electric lines, cell towers, sewage pipes, roads, railways, and hydroelectric dams consist of matter in the form of metals and minerals, and they have material effects on the people who build, maintain, and use them. These infrastructures are also associated with meanings beyond their instrumental functions. Nuclear reactors and hydroelectric dams provide electricity and can make a country energy self-sufficient, but they have also been labeled the "temples" and "cathedrals" of modern nation-states, promising a country the lofty goals of development and progress. Gyan Prakash (1999) and Itty Abraham (2009) have persuasively argued that mega-development projects, from big dams to monumental nuclear reactors, have been used by the postcolonial Indian governing institutions to

gain political legitimacy in the name of science.[5] Thus, nuclear and dam technologies became material objects crucial for state imagination.

Soon after Indian independence, it was believed that the peaceful harnessing of the properties of the atom would produce abundant energy and end India's poverty and economic underdevelopment. While India has some coal, it has limited oil reserves; hence, the nuclear option, with its promise of boundless energy generation in the near future (pending some technical hurdles), has been attractive for bureaucrats and scientists alike (Mathai 2013). Both the nuclear weapons and atomic energy programs received tremendous backing from the government, which continued even after the international nuclear community boycotted the Indian nuclear establishment following the 1974 atomic tests. Domestic reaction to the atomic bomb tests conducted in Pokhran on May 18, 1974, painted it as a peaceful explosion, but international reaction suggested that India was accelerating its nuclear program, and with time, the international body of the Nuclear Suppliers Group (NSG) had ruled out nuclear exports to India. India pursued a self-reliant indigenous atomic power program and manufactured nuclear weapons. Within the Indian public discourse, nuclear weapons were championed as being essential for national security, and such discourses, referred to as "nuclear nationalism" (Bidwai and Vanaik 1999), rose to a pinnacle following the nuclear tests conducted by India (and then Pakistan) in 1998. Since signing the US-India Nuclear Nonproliferation Treaty in 2006 and befriending the global nuclear fraternity all over again (that is, nuclear trade with India blocked earlier by NSG resumed again), the Indian government has decided to gain energy security and minimize its carbon footprint through nuclear power plants. The unique selling point for nuclear reactors is that they emit zero greenhouse gases.[6]

In addition to dams and nuclear reactors, cellular infrastructures—enabling omniscience and connectivity—are also touted as the new temples (and cathedrals) of modern India. In August 1995, Jyoti Basu, at that time the chief minister of West Bengal, called Union Telecom minister Sukh Ram on a Nokia mobile phone, inaugurating the cell phone revolution in India. From that one cell phone subscriber to one billion subscribers as of January 2016, the Indian mobile phone market is the second largest in the world, surpassed only by China. With this exponential growth of cell phones, the cellular infrastructure to support them, particularly cell towers, has also had to grow at a breakneck pace. Indus Towers, the biggest tower company operating in fifteen circles in India, manages 116,454 towers.[7] Drawing a fascinating infrastructural analogy, Jeffrey and Doron (2013) note that towers are to cell phones what gas stations had been to automobiles.

Cell towers and nuclear reactors, like railways and hydroelectric dams, have often been associated with the symbolic glow of development and progress. This is one kind of radiance associated with many infrastructures. Media, too, has a crucial role to play in amplifying the discursive promises of infrastructures and publicizing the ceremonial events marking their inaugurations and anniversaries. So, if infrastructures other than radiant infrastructures have the symbolic radiance of development (and media is key to building such radiance), how are radiant infrastructures different from other infrastructures?

What differentiates cell towers and nuclear reactors from other infrastructures is their ability to emit radiant energies. Conceptualizing radiant infrastructures involves focusing on the electromagnetic fields and radiaoactive particles that such infrastructures emit. In order to explain the phenomena of radiance associated with these infrastructures, one would have to examine discourses surrounding radiant energies and the sociotechnical relations engendered by them. In a twenty-first-century world obsessed with digitality and information, the connections between energy and digital technology have created new conversations. The recent push toward grappling with climate change and the Anthropocene has renewed debates about energy and infrastructure, but energy considerations get eschewed as fascinations with screens, interfaces, and apps direct attention toward software. Contemporary digital life in India is made possible by cell antennas. But cell antenna signals don't just carry information; these signals are lightning-like pulses intensively drifting across electromagnetic frequencies. These electromagnetic waves were detected as part of highly publicized discoveries and inventions involving X-rays and wireless telegraphy in the late nineteenth century (Gabrys 2010; Thibault 2014).[8] In the Victorian period, before wireless science and capitalism bracketed and labeled the space through which these signals traveled as the "electromagnetic spectrum," the waves were intuited as radiant energies vibrating in the "luminiferous ether" (Clarke and Henderson 2002).

The discovery of X-rays, radio waves, and later microwaves—which constitute the electromagnetic spectrum—owed much to the early twentieth century's preoccupation with the science and technology of energy, which then led to the discovery of radioactivity.[9] Indeed, the media object "radio" and the element "radium" share not only etymological roots but also intersecting histories and cultures associated with luminescence, sparks, lightning, and glow. During the 1920s, cafés in Vienna advertised free radio using the image of a lightning bolt. This ideogram evoked the speed and power of electricity, as well as a visual translation of the sparks emitted from early radio devices or wireless transmitters (Born 2016). The element radium, discovered by Marie

Curie and later extracted for commercial purposes, gave off a wondrous glow when mixed with zinc sulphide. These properties of radium made it indispensable for watch dials that glowed in the night. In the 1920s in the United States, radium was dubbed "liquid sunshine."

Radiophones and cell phones emit radio waves. Radium and uranium are radioactive elements. Unlike the radiophones of the 1920s, cell phones of today do not spark, and unlike radium, uranium (used in nuclear reactors) does not render objects shiny. That said, cell antennas and nuclear reactors (like radio and radium) emit rays that seem to move in concentric circles. The radial spreading of particles and waves is thus a key characteristic of radiant infrastructures. These waves and particles, if considered harmful, make the radiant infrastructures disruptive in nature.

The word for "nuclear radiation" in Sanskrit, विकिरिण (*vikiran*), connotes "scattering" and "strewing on," which captures perhaps the leaky quality of radiant infrastructures. Similar etymological understanding for "signal" or "wave," तरङ्ग (*tarang*), could mean "fly over" or "run over"—or तरङ्गिन् (*tarangin*), meaning "moving restlessly to and fro"—endowing radiant energies with atmospheric qualities, vibratory motions, and the ability to spread out.

All Radiations Are Not the Same!

Radiation is unstable matter continuously transforming (often decaying) to be stable, and is better understood as "the sign of energy in the process of transformation" (DeLoughrey 2009, 471). Radiation permeates the atmosphere, pervades the body and soil, and suffuses even the cosmos. There are many kinds of radiation, and different radiant infrastructures emit rays with varying wavelengths and frequencies. All of them therefore should not be slotted together, and to understand the differences between them is a key part of theorizing radiant infrastructures. Nuclear radiation, especially gamma ray, is high-energy ionizing radiation that is carcinogenic and known to cause genetic mutation. Cell tower signals fall within low-energy nonionizing radiation, and their carcinogenic effects are yet to be fully established. That said, there continue to be debates both within the scientific community and beyond that suggest that cancer from long-term exposure to cell antenna signals cannot be ruled out.[10]

Even within nuclear radiation, there is a lot to differentiate. Gamma rays are one kind of ionizing radiation, the others being alpha and beta particles. Alpha particles, unlike gamma rays, do not travel long distances. While gamma rays can penetrate clothing and skin, alpha particles can be easily stopped by a sheet of paper. And yet, years of nuclear history warn us against underestimating the devastating power of alpha particles. In 1943, medical radiologists

working on the Manhattan Project discovered the terrible consequences of plutonium, which emits primarily alpha particles (Brown 2013).[11]

In late 2011, when construction of the Koodankulam nuclear plant was stopped, NPCIL, in collaboration with Vigyan Prasar, the science publicity wing of the Indian government, placed a number of ads in leading newspapers. One of these read: "Radiation: A Constant Companion in Our Life." It contained statements like "The food that we eat, the water we drink and the houses in which we live also emit radiation continuously," "The medical examination like X-ray, CT-scan etc. exposes us to 15–20 times more radiation than the natural radiation," and "The radiation exposure received by population living nearby a nuclear power plant in 10 years is comparably less [than] that received in a single chest X-ray."[12]

Instead of presenting nuclear plants as threatening and the environment as threatened, this discourse merges technology and nature. In such a political ecology of "technonatures" (Escobar 1999; Masco 2004), the environment is seen as robust in the face of radioactive contaminants because radiation with atomic signatures is presented as insignificant compared with so many other sources of radiation: natural, biological, industrial, and medical. Radiation from these multiple sources blends together effortlessly.

Because NPCIL deals with nuclear radiation, which is ionizing and has proven carcinogenic effects, it produces a discourse where radiation remains undifferentiated and has so many sources (including the sun) as to effectively render radiation benign, mundane, and pervasive. In the past, nuclear scientists and organizations have drawn analogies between sun and nuclear radioactivity and have compared the light and heat emanating from atomic tests to the "radiance of a thousand suns."[13] Cell tower radiation is nonionizing, consisting of low-energy radio waves; hence the Telecom Regulatory Authority of India (TRAI) does differentiate cell antenna signals from the ionizing radiation of X-rays and nuclear reactors. In fact, in a "fact sheet" issued about "EMF radiation from mobile towers," TRAI asks a question: "Are all radiations the same?"[14] It then goes on to answer in the negative by differentiating between nonionizing and ionizing radiation, denoting nonionizing in green and marking ionizing in red. The nonionizing section of the electromagnetic spectrum is also labeled "No Harm Radiation." Based on this image, nuclear radiation in the form of gamma rays is harmful because it consists of high-energy waves (like X-rays) that can break molecular bonds, while nonionizing radiation of cell towers has low energy and "cannot break any chemical bond within the body."

Cell antenna signals "can warm cells, boil water and stimulate chemical reactions," but they cannot break molecular bonds or lead genes to mutate. Can

something be a carcinogen without damaging the DNA? Nuclear radiation and X-rays can cause DNA to mutate, but cell antenna signals cannot. That, however, does not rule them out as potential carcinogens. Some carcinogens have the ability to chemically modify DNA without causing mutations.[15]

(Un)Controlled Emissions and Bodily Encounters

Radiant infrastructures are not random radiation-emitting machines. Any theorization of nuclear reactors and cell towers as radiant infrastructures will have to grapple with the fact that reactors and towers are controlled emitters. Nuclear reactors control the radioactive power of uranium atoms to harness electricity, and cell antennas modulate, filter, and process signals and direct them toward mobile phones. The duality of spread and containment is critical to both the materiality of radiant infrastructures and the discourses surrounding them. India's nuclear establishment and cellular operators want to control conversations about nuclear reactors and cell towers. The nuclear authorities and cellular operators do not want to share with ordinary Indian citizens their knowledge about a reactor's nuclide emissions or permitted threshold levels of cellular signals, beyond a certain extent. Some opacity is necessary; total transparency is just not possible. Spillage of such knowledge could lead to public anxiety and panic. It might affect state and corporate interests, as they would have to incur high mitigation costs in redressing affected citizens' compensation claims and building robust risk prevention programs. On television shows, experts try to frame and contain questions about reactors and towers within specific boundaries. Studying radiant infrastructures therefore requires that we carefully explore such strategies of containment, which involve containing both radiation and discourses about radiation.

The siting of radiant infrastructures is often prone to debates about exposure: contacts between radiation and human flesh. Even when experts pronounce particular distances from radiant infrastructures and specific threshold levels of radiation to be absolutely safe, the bodies of victims and survivors rebel. Different bodies demonstrate different sensitivities toward ionizing radiations and electromagnetic emissions. Therefore, many citizens question the wisdom of blanket threshold levels. On television, patients often offer testimonies next to the cell antenna near their house. Such mediations of uncertainty can be seen in the lifestyle show *Living It Up*.

On an episode of *Living It Up*, Rabani Garg offers a "situated testimony" from the place where and when she first recognized the deleterious effects of proximate cell towers (Walker 2010). By presenting Garg next to the tower, by using her embodied presence in a mobile tower's field of influence (the

FIGURE I.6 Garg in situated testimony with cell tower (*Living It Up*)

strength of a tower's signal is inversely proportional to the square of the distance from it), *Living It Up* wants to emplace the audience in that location, in that moment (figure I.6). The audience gets a sense of the affective intensity that would have oscillated between Garg and the mobile tower when her eyes became transfixed on it for the first time. Affect cannot be fixed; it circulates, and it operates not only through conscious emotions but also through unsayable feelings and molecular-level (not molar-level) impulses (Massumi 2002).

In some instances, the bodies of cancer patients—former workers in a rare earth minerals mine—testify. Radioactive minerals such as monazite have interred themselves in the bodies of these miners, leading to cancerous growths and contorted limbs. (The mined monazite is later used in nuclear reactors.) R. P. Amudhan's documentary *Radiation Stories* mediates such bodily testimonies.

Amudhan interviews a cheek cancer survivor who demonstrates her symptoms. She drinks quickly from a glass and then has to eject the excess water through her nose. Audiences see water oozing from her nose. Sometimes, people do not talk. They stare offscreen with sad smiles. A man at his doorstep is captured with a handheld camera; the camera moves down slowly, surveying him from head to toe, showing a bent arm and a tumid belly. Oral testimonies are at times no longer needed; the radioactive body testifies by itself.

Both *Radiation Stories* and *Living It Up* provide platforms for "lay" citizens to present anecdotal evidence about the hazards of nuclear energy and cell towers. Bodily encounters with radiant infrastructures happen at both the molar and the molecular level. At the molar level, we have visible bodies living close to conspicuous infrastructures such as cell towers and nuclear reactors. At the molecular level, imperceptible electromagnetic radiations interact with

invisible neural impulses, and radioactive nuclides inconspicously accumulate. Media remains important in putting the spotlight on the phenomenological encounters between human bodies and radiant infrastructures and in showing the possible dark outcomes of radiant energies on bodies.

Taking seriously the embodied sensitivities of humans living in unwanted intimacies with radiant energies is another way to understand wireless signals and radioactivity. During the late nineteenth century, the Indian biophysicist Jagdish Chandra Bose developed wireless signal-emitting devices in Calcutta (then part of British colonial India) before Marconi's radio (Shepherd 2012). Bose was less interested in commercial applications of wireless and more drawn toward using wireless devices to measure plant sensitivity to radiation exposure. Bose believed that plant, animal, and human matter were all powered by *mahashakti* (Sanskrit for "ultimate energy"), and that wireless signals were interfering with this mahashakti (a notion of energy similar to "ether" in its all-encompassing quality) (Shepherd 2012). Bose's wireless devices were later modified for use in radar technologies. More recently, the millimeter-wave band spanning from 30 to 300 GHz (which Bose's devices operated in) is being used in 5G (fifth generation) wireless networks. Yet again, like the late nineteenth-century debates regarding plant sensitivity to millimeter waves, the electro-sensitivity of today's human beings to waves emitted by 5G cellular antennas is a subject of controversy (Moskowitz 2019; Rappaport, Roh, and Cheun 2014).[16]

While occasionally gesturing to historical controversies surrounding radiant infrastructures like the one mentioned earlier, this book focuses on contemporary media debates about such technologies. Indeed, this coming together of what I call "environmental publics" around radiant infrastructures is not possible without a variety of connected media events and texts.

Environmental Publics

Radiant energies are the reason that radiant infrastructures are both useful and disruptive. When infrastructures get disrupted or cause actual or anticipated disruption, people are affected and, to deal with the issue at hand, they organize themselves into publics. I examine how such environmental controversies gather stakeholders such as scientists, activists, policy makers, and affected patients. These stakeholders compose an environmental public, which uses or interacts with the media to influence public opinion. The environmental public cannot be materialized or imagined without mediation. Thus, environmental publics and mediated publics intersect with and shape each other, and my book tracks the dynamic reconfigurations of such publics

and the debates that ensue. I posit "environmental publics" as a key conceptual framework to examine the interactions between stakeholders during an environmental controversy. Many of such interactions occur in mediated venues.

Environmental publics gather around disruptive infrastructures because affected stakeholders realize they have to work together to adequately negotiate the consequences of the infrastructures' effects. John Dewey's contention that a public is invoked into being only when an issue at hand needs such a public is crucial for my conceptualization of an environmental public. In his key book on political theory, *The Public and Its Problems*, Dewey ([1927] 1991) notes, "The public consists of all those who are affected by the indirect consequences of transactions to such an extent that it is deemed necessary to have those consequences systematically cared for" (213). Thus, the specificity of the environmental public is that its emergence is sparked by an environmental issue, and the public consists of people who are implicated in the issue.[17]

When the cell tower panic erupted, cell tower operators, telecommunication regulators, radio-frequency scientists, and antiradiation activists responded. Cancer patients demanded that the towers be removed to protect their health, and telecom operators wanted them to remain in place to guarantee cell service. Radio-frequency scientists looked for ways to measure the signals from the antennas reliably. Oncologists tried to determine whether the signals were indeed carcinogenic. Tower builders attempted to convince apartment dwellers that the towers were not harmful. Regulators kept trying to come up with a safety standard for the emission of signals that could maintain network coverage and alleviate public apprehension. Journalists covering the controversy went around the city with radiation detectors and then published maps of radiation hot spots.

Even before the controversy erupted publicly, many of these actors had been involved with the infrastructure of cell towers. The radio-frequency scientists I talked with described how they made cell tower components such as filters in their laboratories. The tower builders rented space on rooftops of houses and apartments from the building owners, while cellular operators and tower builders worked together to ensure smooth cellular network coverage. Infrastructures, therefore, not only instigate new public actors but also serve as "crystallizations of institutional relations" (Dourish and Bell 2001) and manifestations of everyday cultural practices (see Star 1999). At the same time, disruptions bring new actors into contact with earlier players, generating new social arrangements.

In suggesting that environmental publics be explored as issue-based publics, I do not mean to adhere to a strictly Deweyian framework of understanding

publics. Interpreted and championed by Bruno Latour and Noortje Marres, among others, John Dewey's model seems to suggest that *no issue* means *no politics* and *no publics*. As somebody who is committed to retheorizing publics based on grounded empirical investigations, I find it necessary to recalibrate such absolute object-oriented notions of publics. Publics are sparked and catalyzed by issues that have consequences for affected communities. Having said that, publics do not just appear because of issues. The form that publics take on has much to do with historical and cultural ways of gathering and prior ideas and practices of community making. Furthermore, an issue-based public does not mean an eschewal of other forms of political subjectivity realized through public spheres and public spaces: throughout my tracing of the trajectory of the cell tower radiation and nuclear radiation issues, the reader will encounter deliberative publics, publics realized through embodied experiences and contagious effects, and publics as displaceable populations because of sovereign exceptions. Beyond denoting the stakeholders as the environmental public's constituents, the term "publics" in "environmental publics" gestures toward the centrality of publicity to the formation of publics. Publicity should not be construed as just propaganda. Rather, publicity allows for mobilization of subjects at affective, performative, and cognitive registers.

The use of the word "environmental" in "environmental public" denotes not an imagined pristine nature *out there* but a political ecology of densely enmeshed human-nonhuman relations and interhuman social connections.[18] Indeed the "environment" cannot just be about human relations, and it cannot merely be about the "green" or "blue" wilderness. The environment includes the invisible radioactive isotopes of tritium, cesium, and iodine that are emitted by reactors and then find their way into water, soil, and human bodies. The human body is also part of the electromagnetic environment created by cell antenna signals, as the impulses within the body vibrate and interfere with the electromagnetic fields of antenna radiation. The environment imagined in the molecular-atomic level therefore becomes a "bioelectromagnetic terrain" (see Mitchell and Cambrosio 1997).

Why not call the environmental publics formed around disruptive infrastructures such as cell antennas and nuclear reactors simply "infrastructural publics"?[19] Why choose "environmental publics"? Susan Leigh Star (1999) has noted that infrastructures are best treated as socioeconomic, political, and technological arrangements; as such, they are simultaneously "ecological" and "relational." By mobilizing the term "environmental publics," I want to stress the ecological and relational characteristics of infrastructures. Furthermore, most of the book's focus is on the environmental effects of radiant

infrastructures and how media shapes the environmental controversies that are activated by them.

During environmental controversies, the environmental public includes actors who debate and champion their positions in various mediated arenas, including newspaper columns, social media hashtags, and television studios. Newspaper readers, online activists, and television audiences may not be directly impacted by radiation, but they nonetheless take an interest in the issue through mediation, and some of them act on the views expressed in the article/hashtag/show. In so doing, they become part of the reconfiguring public.

One example of an environmental public formed around radiant infrastructures is the way different stakeholders debated the cell tower radiation issue on television. The television journalist Faye D'Souza hosts an issue-based show called *The Urban Debate*, which discusses issues affecting urban citizens such as crime, corruption, women's safety, and air pollution. The cell tower radiation hazard had concerned citizens expressing outrage over too many towers mushrooming across cities like Delhi and Mumbai with complete disregard for municipality regulations. On April 18, 2017, various stakeholders in the cell tower radiation issue assembled in Mirror Now's studio in Mumbai or joined the discussions via Skype. The issue that had brought them all together was the supreme court ruling to shut down a cell tower in the city of Gwalior. A domestic worker based there named Harish Chand Tiwari won the case. He and his attorney, Nivedita Sharma, had argued that Tiwari was suffering from Hodgkin's lymphoma, a form of cancer, because he had endured continuous and prolonged exposure to signals from the cell tower for the last fourteen years. This decision fueled the debate unfolding in Mirror Now's studio.

The televised debate in contemporary India is now part of most news channels' prime-time programming, with several shows like *The Urban Debate* across different channels that focus on particular issues of the day. This shared practice indicates the popularity of televised argumentation in the country and substantiates Nalin Mehta's (2008) claim that Indian television's basic feature is that it is "argumentative television." At one point in the *Mirror Now* show, the screen is divided into seven boxes, with different stakeholders occupying different sections (figure I.7). The split screen is a familiar device used in television news to depict often simultaneous action in two or more locations and dialogue between news makers and newscasters in disparate locations. The split screen emphasizes the *liveness* of the televisual medium and its ability to manage contingency. In transitioning from interrogating one expert to another, D'Souza gets an opportunity to shape the debate. The larger section she occupies emphasizes her centrality to the show and the conversation.

FIGURE 1.7 Split-screen debate (Screen grab from *Mirror Now*)

The chairman of the Cellular Operators Association of India, Rajan Matthews, spars with radio-frequency expert and dissident scientist Girish Kumar and concerned citizen Prakash Munshi about whether or not the currently mandated threshold levels in India are stringent enough when compared with those in other countries. Matthews maintains that the nonionizing radiation emitted by cell towers is not harmful, and he asserts that Kumar and Munshi are wrong about their facts, figures, and beliefs. The altercations continue. Kumar contends that the reduction in cell antenna signal limits prescribed by TRAI is insufficient, as it only takes into account acute exposure, not the chronic exposure that the people who live close to the towers are subjected to. Matthews disputes Kumar's claims, arguing that the reduction in the threshold prescribed by TRAI is substantial; it is one-tenth of the original electromagnetic field (EMF) value. He argues against further reduction of the threshold, which would affect the cellular network's ability to support calls. Furthermore, he does not want cell towers to be regarded negatively by the public. With such competing stakes, the cell tower has turned from a benign technology into a disruptive infrastructure, spawning both alliances and divisions.

It is this gathering of people in news studios and beyond—in rooftop meetings and tea stalls—to resolve issues sparked by disruptive infrastructures that I study through the concept of environmental publics. Environmental publics consist of both the stakeholders and the wider public that the stake-

holders are trying to woo. Media forms a key arena for dialogue and debate among the stakeholders, and it serves as an important link between the interested parties and the general public of televisual audiences, newspaper readers, and Twitter users, among others. Girish Kumar and Rajan Matthews are using the platform of *The Urban Debate* to convince the public *out there*, the audience of the show, of their positions on the radiation controversy.

Intermediality

To trace the emergence and reconfiguration of environmental publics, it becomes crucial to track the intermedial connections: how one type of media coverage follows another, and how a news story develops as information and rumors flow across various news platforms. Media technologies transform publics by affording new spaces of sociality and novel forms of interaction across scales (Couldry and McCarthy 2004). The cell tower radiation or the nuclear radiation issue can be discussed on Twitter or a talk show, and each of these media venues forms one fragment of the public sphere. What we have here is what Axel Bruns and Jean Burgess (2011) call a "network of issue publics," some of which are formed at the moment of the controversy (ad hoc publics) and others that follow the controversy (post hoc publics). These media help connect disparate public spaces and events, leading to dynamically emerging issue-based publics. Since mediation and environmental publics are so entangled, it is important to discuss intermediality.

There is no one central, all-capturing (or all-conquering) medium capable of covering the entire environmental controversy around radiant infrastructures. Rather, media are dispersed across many forms, genres, and practices: documentary films, talk shows, and digital maps (of radiation hot spots). Intermediality allows for a capacious notion of media by enabling the mixing of different formats, platforms, and technologies and interlinking different media's discursive, materialist, sensory, and phenomenological dimensions (Parks 2018).[20] The concept of "intermediality" accounts for relations among media texts and forms covering a particular environmental controversy, as well as the interactions between the media technologies assembled to demonstrate radiation.

During the nuclear reactor controversy, the continuous ricochet of points and counterpoints between the nuclear establishment and the antinuke activists played out in diverse media forms: painting competitions, skits, advertisements, documentaries, amateur atomic superhero animations, protest pamphlets, blogs, and Twitter updates. These media texts seemed to be responding to one another, to the imminent crisis of electricity, and to the anticipated fear of nuclear fallout. Often, they followed one another as the controversy

unfolded: a press release would be followed by an ad, an ad would be countered by a documentary film. As a researcher, I found myself moving from one media event to another while tracking the controversy. The concept of intermediality comes into play here, as media texts refer to one another, but intermediality is not just intertextuality. The practices of producing and consuming those texts are also entangled.

The concept of intermediality could mean many different things, depending on whether it is being discussed in an art history or a political communication context. However, both art historians like Jill Bennett (2007) and media studies scholars like Juha Herkman (2012) agree that "intermediality is not confined to semiotic or iconographic operations."[21] In addition, they agree that "instead of focusing on one medium alone, [intermediality] focuses on the interfaces and interrelationships between different media."[22] I shall now provide some examples of intermediality in the environmental controversies discussed in this book.

In February 2012, Prime Minister Manmohan Singh talked about a "foreign hand," alluding to US-based nongovernmental organizations (NGOs) involved in instigating protests in Koodankulam. In an interview with Pallava Bagla in the columns of *Science* magazine, Singh complained about this foreign involvement: "What's happening in Kudankulam . . . the atomic energy program has got into difficulties because these NGOs, mostly I think based in the United States, don't appreciate the need for our country to increase the energy supply."[23] According to Singh, external groups do not want India to achieve energy independence and would prefer an India unable to develop. The internal problem of energy security is externalized into a discourse about "national security."[24]

Following the prime minister's accusation, the international environmental organization Greenpeace published an ad in Indian newspapers countering Singh's charge by saying that it is not activists who are supported by foreigners, but rather it is the nuclear plant being built in collaboration with foreign players. Greenpeace gave the Indian government a taste of its own medicine by asking about the secret transactions between the government and foreign investors. To quote a passage from the ad: "If you're looking for it [foreign hand] in hunger strikes and protest marches, you're looking in all the wrong places. . . . So, where it is then? . . . *It is in the nuclear reactor on the horizon. It's in every nuclear reactor on the horizon. . . . The foreign hand is behind nuclear deals* that value Indian lives at Rs 1,500 crores, the amount said to be enough compensation if a nuclear reactor blows up somewhere near you."

The Greenpeace ad is both an expression of solidarity with the Koodankulam protesters and an appeal for greater regulation. The photograph is taken close

FIGURE I.8 Where is the "foreign hand," asks a Greenpeace newspaper ad with women protesters pointing to nuclear reactor

to the nuclear plant site in Koodankulam (figure I.8). It is not an omniscient view of the crowd of protesters from above but an embedded view from the margins toward the reactor, which appears on the horizon. The accusatory fingers point toward the foreign-built nuclear reactor, implying that the whole plan for atomic power plants is based on geopolitical negotiations between the Indian government and foreign countries. The nuclear liability bill has been a highly contentious document, with critics alleging that the government has been soft on foreign investors and equipment suppliers. Lacking indigenous expertise, the Indian government has been courting foreign investors (from the United States, Russia, and France), who have been reluctant to put their money into nuclear plants, particularly because the plants are expensive to build.[25]

Examining the claims made by the prime minister and the counterclaims voiced by Greenpeace is one way to think of intermediality in terms of texts and practices. Intermediality (and an intermedial approach) helps me understand the sociocultural relationships through which media shapes and is shaped by infrastructural power. For example, secrets about nuclear reactors were revealed through strategic access provided to select journalists. In contrast, the preferred media for exposing emissions from cell tower radiation were e-portals providing interfaces to radiation maps. The different ways of disclosing details about these infrastructures have as much to do with their material

properties (their scale of operation and their method of emitting) as with the way such infrastructures are historically and politically governed. Thus, intermediality refers to the historically specific media assemblage that is in place in India, where discourse about particular infrastructures moves across distinct media systems, gathering and losing publics in the process. Another kind of intermediality involves relations between radiation-sensing technologies as part of a complex media system.

Some objects become media objects when placed in medial relation to other objects. It is important to focus on the medial (and not just media) portion of intermediality. The move from *media* to *medial* makes one more attuned to the connections, conjunctions, and intersections in drawings, diagrams, and flows, which are all aspects of the medial. For example, espousing a media ecology approach, Matthew Fuller (2005) demonstrates that if one moves away from thinking of "pirate radio" as one media form and instead considers it to be composed of elements of complex medial systems (from microphone to reception technologies to mixers), then one observes that what is produced from the cooperation of these different medialities is more than the sum of their parts. I found something similar during the radiation demonstrations being carried out in public meetings in Mumbai by concerned citizens as they campaigned for greater regulation of cell towers. Here, too, environmental publics are formed not by circulation of media content but as part of media events entangled with sociomaterial practices of making radiation visible.

On July 27, 2013, I accompanied Prakash Munshi, one such concerned citizen, to a presentation he was giving in the Meherabad building on Warden Road. We were met by our host Pravet Javeri, who lives in the building. We then made our way through the elevator to Javeri's apartment to collect a microwave oven before heading to the rooftop for a presentation. On the wall of the elevator, I saw a notice asking the residents to attend the meeting. The residents had received complaints from neighbors that the cell antennas in their building were spurring cancer cases in the buildings facing them, and they had been asked to remove the towers. The tower officials had also been invited to present their side of the story, and they came with a blackboard on which to draw figures. The officials wanted to retain their towers in these apartment buildings and did not want the residents to be persuaded by Munshi.

During the presentation, Munshi switched the microwave on and stood in front of it with the radiometer manufactured by Girish Kumar's company, NESA Solutions. The LED lights of the radiation detector glowed red. As soon as Munshi moved away from the microwave oven, the detector lights shifted to green (figure I.9). "Ladies should not stand in front of the microwave oven,"

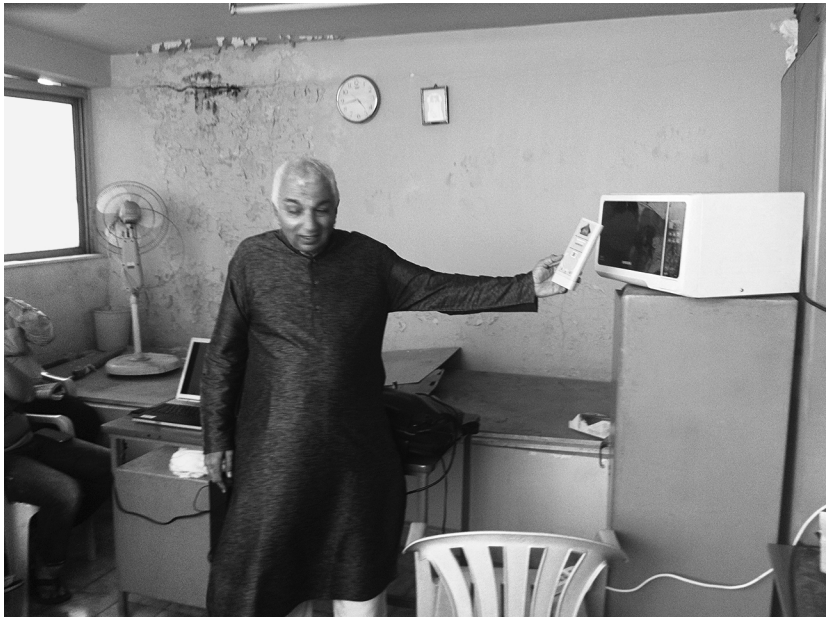

FIGURE 1.9 Munshi demonstrating with a microwave oven in an apartment rooftop meeting

Munshi cautioned. The radiation detector also glowed red when cell phones rang as they exchanged signals with cell antennas.

Here, detectors translate across different modes of perception. The similar heating effects of microwaves and cell tower signals can be perceived by bringing radiation detectors close to microwave ovens. People begin to comprehend that microwave ovens might have properties similar to those of cell towers when they become part of a medial configuration using radiation detectors. In order to understand how media works and how people use it, it is important to attend to such intermedial relations, where "intermediality is a concept that brings forth relations that cannot be defined in media as fixed forms" (Krtilova 2012, 40). The concept of intermediality helps to ascertain the ways in which the technological objects of media are related both to one another and to human actors.

If we consider the intermedial relays in Munshi's experiment across cell antennas, mobile phones, microwave ovens, and radiation detectors, we emerge with a media assemblage for measuring radiant energies. Instead of a techno-deterministic or media-centric approach that highlights the efficacy of radiation detectors and sensors, I am more interested in interpreting Munshi's

experiment as an exercise in lay citizen participation, where human capacities to apprehend radiation emerge through actual encounters with sensing technologies. Here, media becomes a complex assemblage or, still better, a "practice in the making," where particular radiation-monitoring technologies and environmental concerns, as well as bodies and politics, "concretize into specific occasions that can galvanize citizen sensing" (Gabrys 2018, 508). In stressing media relations, intermediality becomes a useful concept to foreground how media is part of sociomaterially situated practices of radiation detection and citizen participation.

And Then the Peacocks Came Back to the Garden: Public Cultures of Uncertainty

The environmental publics I study grow out of fears of carcinogenic nuclear fallout and cell tower radiation. One significant reason these issues have the kind of impact they do is the unpredictable behavior of technological objects such as atomic reactors and cell antennas. However, technologies by themselves cannot provoke sustained protests. Technologically caused disruption can only lead to advocacy or strict regulatory frameworks in the presence of other conditions, like people's capacity to organize, the perception of an affected community about their own vulnerability, and cultures of formal and informal regulation maintained by the state and other players.

In science and the sociology of science, "uncertainty" as a term is often distinguished from risk. The notion of risk is associated with a scenario where the potential dangers from a new technology can be predicted within a quantifiable probability. Unlike risk, uncertainty does not operate within the "scientific calculus" (Button 2010). Uncertainty, in the words of Callon, Lascoumes, and Barthe (2001), carries the weight of unknowability: "We know that we do not know, but that is almost all that we know, there is no better definition of uncertainty" (21). Through "public cultures of uncertainty," I want to consider not only technical uncertainty but also social uncertainty (Wynne and Dressel 2001). The volatile materialities of radiant infrastructures certainly cause uncertainty, and even scientists are unsure about the effects of radiation. However, this is not the whole story of uncertainty. Uncertainty is politically inflected and socially produced. The fishermen in Koodankulam are worried not only that the reactor will explode one day but also that, once the reactor spills radioactive waste, the local administration will ignore the fishing villages and rescue the upper-caste Nadar villages. These fishing communities suffered from the December 2004 tsunami, and at that time the local administration was not helpful. Social relations shape technical uncertainties, as has been described by scholars in science studies.

In this book, I endeavor to explain the role of media in such sociocultural production of uncertainties. Along with culture, sensory and bodily knowledges shape uncertainties. It also needs to be stressed that the literature on public cultures in India—whether discussing contemporary consumption patterns of the neoliberal Indian urban middle class (Appadurai and Breckenridge 1995) or religious practices of Indian villagers in the late twentieth century (Pinney 2004)—has contended that there is a strong relationship between the "corporeal/affective" and the "discursive/ideological" aspects of sociopolitical life (Mazzarella 2005). Therefore, cultural knowledges and bodily knowledges cannot be neatly separated when considering cultures of uncertainty within Indian environmental publics.

What does such a public culture of uncertainty look like, or rather feel like? What kind of cultural density do uncertainties about radiant infrastructures attain in particular Indian contexts? The following anecdote might help us comprehend how public perceptions about risky infrastructures get inflected by vernacular mythologies.

During my fieldwork in December 2012, Sudhir Kasliwal, the brother of a cancer patient in the city of Jaipur who resided close to a cluster of cell towers, spoke of his efforts to get the towers removed. Kasliwal was convinced that the signals emitted by cell towers were causing his brother's cancer. The municipal authorities and telecom operators resisted Kasliwal's efforts but reassured him that they would reduce the signal levels emitted by the towers. Kasliwal feared that they would trick him by suddenly deciding to increase the power density of the electromagnetic radiation. He regularly monitored the transmission power levels with a radiation detector. The radiation detector helped Kasliwal perceive the cell tower radiation—in the form of glowing LED lights—that he could not see, smell, or taste. However, this did not give him complete satisfaction. He was only convinced that the radiation levels had been truly reduced when he saw peacocks return to his garden nine years after the mobile towers had been erected. The return of the peacocks was a sign of things getting back to normal. He relied more on the peacocks' perception of radiation than on the readings of the radiation detector. If the peacocks did not feel the radiation signals to be oppressive, they must be below the norm, and Kasliwal could finally relax. A peacock's body here mediates the infrastructure of cell towers: at the molecular level, impulses in the peacock's body interact and interfere with electromagnetic signals of the towers.

This anecdote, one among many that people living close to cell towers shared with me, suggests that, in situations of uncertainty, perceptions of technology are articulated using vernacular mythologies of the everyday. In this

story, we sense the merging of discourses, affects, and practices as relationships between human bodies and animal bodies continue to emerge. Here mediation takes an "inter-species" turn (see Haraway 2003), a turn that also has a cultural dimension.[26] Sensory experiences change with new technologies (detectors, antennas), and yet they are culturally situated: the peacock is India's national bird and particularly dear to the people in the state of Rajasthan, whose capital is Jaipur.

Uncertainty, unlike risk, is less inclined to quickly assign probabilities and numbers to future scenarios and outcomes. That said, uncertainty, with its discursive usage in environmental controversies, is not without its share of problems. While a focus on uncertainty helps to bring to the public sphere new questions that are often not taken up by narrowly defined, official, expert-driven risk discourses, it is also possible that uncertainty is devised by experts who want to continue to create ambiguities about the particular effects of electromagnetic radiation or radioactive chemicals. Any finding that would support the claim that there are carcinogenic effects associated with electromagnetic radiation can be challenged by pointing to another study that found no effects.

Perhaps an indication of the uncertainty that remains in linking wireless radiation to cancer or genetic damage can be seen in the publication of the results of the World Health Organization's (WHO) Interphone Study in the pages of the *International Journal of Epidemiology* in 2010. This international, population-based, case-control study across thirteen countries concluded that "there were suggestions of an increased risk of glioma at the highest exposure levels, but biases and error prevent a causal interpretation. The possible effects of long-term heavy use of mobile phones require further investigation" (Cardis and the Interphone Study Group 2010, 675). As a recent article in the *Nation* by environment correspondent Mark Hertsgaard argues, this part of the results was sidelined by the spin doctors at the US-based Cellular Telecommunications and Internet Association and Federal Communications Commission, who influenced mainstream media to concentrate on the other part of that paragraph: "Overall, no increase in risk of glioma or meningioma was observed with use of mobile phones" (Cardis and the Interphone Study Group 2010, 675). Hertsgaard and Dowie (2018) contend that the word "overall," often used by telecom industry professionals, helps ignore those papers that connect incidences of cancer with phone usage, because there are always other papers that assert there is no connection between them. The industry explicitly and implicitly finances studies (which lead to peer-reviewed papers) that contradict those articles finding statistically significant results about the

health effects of cell phones (Huss et al. 2007). Hertsgaard and Dowie (2018) somewhat provocatively suggest that wireless industry officials have realized that they do not have to win the scientific argument; it is enough to actively create doubt because the apparent "lack of certainty helps to reassure customers," even as controversies drag on.

Michelle Murphy (2004), writing about sick building syndrome, discusses several cases of environmental toxicology and chemical sensitivity where competing agencies with different funding sources led to the "generation of uncertainty ad infinitum, helping to make regulation next to impossible" (274). One of the key public perceptions about the mobile phone and cell tower companies is that they are very rich and, in order to save their business, will work very hard to prevent information or research that harms their reputation. Like cigarette companies before them, some antiradiation activists allege, cellular operators will go to any extent to scuttle research that proves their product is harmful.

Some nuclear workers, especially migrant and temporary workers, laboring at India's NPCIL did not know for a long time that they could be exposed to harmful radiation. The company regularly recruits seasonal workers for its Rawatbhata reactor site in the state of Rajasthan. Agricultural labor tends to be seasonal in this area, and in lean seasons these people work in the atomic plant without dosimeters or safety helmets.[27] Information about dangerous areas and hazardous substances was not communicated to them. By willfully witholding information in order to distance itself from being held responsible for exposure-based illnesses, NPCIL creates what Scott Kirsch (2004) has called "geographies of unknowing." Such geographies of unknowing create a perpetual regime of imperceptibility and uncertainty, where nuclear workers continue to not even know that they are being exposed to nuclear radiation.

To comprehend more fully the relationship between media and public cultures of uncertainty, we have to understand the place of media in Indian public spheres. This more general sense of Indian media publics will help us, then, to focus on how media influences public perceptions about uncertain behaviors of radiant infrastructures. Fear or trust of any technology or infrastructure based on media-generated information or rumor depends on the audience's view of media itself. Therefore, media—depending on its form (Twitter, WhatsApp, television) and who is producing it (the state, a corporation, an activist)—carries its own uncertainty of circulation and reception. Publics are a culturally dense concept, and thus attending to differentiated publics based on caste, class, region, and gender is critical in the postcolonial cultural context of India.

Indian Media, Public Spheres, and Different Environmentalisms

The cultural assumptions (about health, purity, danger, and pollution) that influence everyday environmental practices of different social groups in India may not neatly overlap with Western notions of risk perception. That said, by situating the study of radiant infrastructures in India, my endeavor is not merely to add cultural specificity (and variation) to already existing studies of environmental controversies around such infrastructures. Upon reading this book, it should be evident that ideas about radiation, nuclear reactors, and cell towers are not confined to national boundaries but circulate globally through multiple media platforms amid diverse publics. In elaborating different forms of activism and advocacy that emerged within the historical context of environmental movements in postcolonial India, I will be demonstrating that there is no one kind of environmentalism in India. The different environmentalisms there are shaped as much by historical contexts as they are by contemporary transnational processes. Even as the choice of environmental movements I study is guided by my scholarly location in South Asian media studies, the theories of intermediality, radiance, and public cultures of uncertainty elaborated here are not limited to South Asian contexts. In this book, I have explained the many innovative ways that Indian environmental activists deploy media to spotlight the volatile materialities of radiant infrastructures. I ask readers to engage with these media practices in order to better comprehend the intricacies of media coverage of environmental movements unfolding at both local and global scales.

The construction of nuclear reactors is sanctioned in rural areas of India without fair public hearings. While the government is more agreeable to engage with urban elites, it often views rural farmers and fishermen as unscientific and illiterate people whose worldviews and knowledge systems need not be respected. They are at best "governed populations" of "political society" (Chatterjee 2004), not part of civil society, and can be displaced from their homes and livelihoods and placated by monetary compensations. The antinuke movement can be considered part of the long tradition of ecological movements in India and the Global South known as "environmentalism of the poor" (Guha and Martinez-Alier 1998). Subaltern classes waging such movements have pointed out that the ecological sustainability of their livelihoods has been threatened by resource extraction by the privileged classes and multinational companies. Cell towers are considered proximate and immobile encroachments, and this has made them the concern of "bourgeois environmentalism," which is often about an individual's immediate surroundings.[28] Both environmentalism of the poor and bourgeois environmentalism are part

of Indian environmentalisms. If we are to understand how the different political and ecological claims of these environmentalisms are expressed through media and find themselves circulating in the Indian public spheres, we need to recognize the linguistic and cultural diversity of such publics.

With an ever-expanding media landscape marked by vernacular newspapers and niche television channels, it has become more and more difficult for any single organization or stakeholder to define or appropriate the public (see Punathambekar and Kumar 2012). How can a project on environmental publics in India both draw from and provide insights about the general transformations that different public spheres have undergone over the years?[29] How has environmental reporting changed with the recent trends in contemporary media publics? I shall mention my own interventions as I undertake a brief historical overview of publics and media in India.

To begin, one has to question whether avenues to participate in decision making about technologies and to deliberate the legitimacy of environmental and development projects even exist in India. At times, deliberative democracy becomes difficult to attain. For example, in Koodankulam, the nuclear science establishment refuses to deliberatively engage with the local fishing communities as citizens and instead considers them an unruly population that can be appropriated through either employment incentives or police brutality. The Indian government has been far more responsive to concerns raised by elite urbanites about cell antennas. Such examples suggest the need to empirically examine the relation of publics to state, citizenship, and civil societies in non-Western contexts through Partha Chatterjee's (2004) concept of "political society."

Chatterjee suggests that only a small elite group in India has access to civil society, and most population groups have a political relationship to the Indian state based on the distribution of welfare benefits.[30] Drawing on Chatterjee's work, Shiju Varughese (2012) categorizes "scientific-citizen publics" as constituted by those who are able to participate legitimately in civil society. He labels those publics that are formed by groups who belong to the political society as "quasi-publics," a sphere in which quasi-legal transactions and informal methods of seeking welfare benefits operate. As an example, Varughese points out that when former president of India and nuclear scientist Dr. A. P. J. Abdul Kalam visited the construction site of the nuclear reactor at Koodankulam, he had long discussions with the scientists at the plant but no meetings with local community members. Soon after his visit, Kalam addressed Indian civil society through a column in the widely read English newspaper *The Hindu*, where he endorsed nuclear energy, as opposed to fossil fuels, as the way for India to move forward. To placate the vulnerable fishing communities, the

"quasi-publics," Kalam proposed welfare measures when the nuclear plant becomes operational (Varughese 2012, 248). Kalam's column, which appeared in an important newspaper full of copious endnotes, can be seen as a performance of expertise in a mediated arena. Even more important, it shows how experts publicly deal with different population groups.

The concept of political society as a macro perspective is helpful in explaining general trends. My effort has been to begin with this approach and then see how my ethnographic research on media practices can complicate the neat divides between civil society and political society. I have found instances where communities of fishermen, whom the Indian government refuses to treat as citizens, assemble with metropolitan antinuclear activists in order to build a charter against nuclear energy. Such activities demonstrate the possibility of mediations across civil society/political society binaries.[31]

During my fieldwork, another fruitful way of thinking about media and publics was to find out who the vernacular media and English mainstream media imagined their audiences, readers, and consumers—that is, their publics—to be. When it came to anticipated nuclear fallout and cell tower radiation, vernacular newspapers seemed more open than English-language dailies to carry stories that were critical of the scientific establishment. The English media seemed hesitant to criticize the scientific establishment when there were high levels of uncertainty about these infrastructures. Thus, they ended up opting for "objective" reports—quoting different sources but eschewing opinion.[32] The vernacular newspapers and regional television channels depicted the miseries of their local citizenry; they aired and published stories of city neighborhoods that were riddled with cancer cases, potentially caused by cell towers. Vernacular media did not wait for scientific uncertainties to become certain, for, as one editor of such a newspaper, *Rajasthan Patrika*, said to me, if members of the community are suffering, how can they be expected to keep quiet? To not criticize the scientific establishment would be tantamount to a conspiracy of silence. Another editor noted, "They [English media] write for the parliament; our [local Hindi newspaper] readers are our local community" (interview excerpt, Jaipur, December 19, 2012). The close association that local vernacular newspapers have with their readers is thus different from mainstream national English media.

Arvind Rajagopal (2001) describes a similar trend while evaluating the differences in the reporting by English and Hindi newspapers of the Ram Janmabhoomi movement in 1991. The movement consisted of right-wing fundamentalist Hindu organizations' efforts to tear down a mosque in Ayodhya and build a temple of Lord Rama in its place. The local Hindi newspapers,

राजस्थान पत्रिका
जयपुर . बुधवार
16.05.2012

पिंकसिटी

राज्य समाचारों और फोटोग्राफ्स के लिए लॉगऑन करें: patrika.com

02

चाहें तो कार्रवाई संभव | सीआरपीसी व आईपीसी में हैं प्रावधान

कानून से ऊंचे टावर

सुप्रीम कोर्ट मान चुका कार्यपालक मजिस्ट्रेट कर सकते हैं कार्रवाई

जयपुर
cityreporter.jaipur@patrika.com

जनता की सेहत को चुनौती दे रहे मोबाइल टावर कानून से भी ऊंचे नजर आ रहे हैं। 150 साल पुरानी आईपीसी और 39 साल पुरानी सीआरपीसी में जानलेवा साबित हो रहे कारोबार या व्यवसाय को रोकने के प्रावधान हैं। इनके तहत टावरों पर भी कार्रवाई की जा सकती है, लेकिन इस दिशा में सभी चुप्पी साधे बैठे हैं।

मध्यप्रदेश में इसी तरह के मामले में कारखाने से निकली गैस के घातक होने की शिकायतों पर एसडीएम की कार्रवाई को सुप्रीम कोर्ट तक जायज मान चुका है। राज्य में भी एक बार चिमनी से निकली गैस को सेहत के लिए घातक मानकर कार्रवाई की जा चुकी है। इतना ही नहीं जन स्वास्थ्य के लिए घातक मानते हुए मिर्च के एक गोदाम और खेतों के बीच चल रहे एक क्रशर पर कार्रवाई को भी कोर्ट सही ठहरा चुके हैं। विशेषज्ञों का कहना है कि सीआरपीसी में तो कार्रवाई नहीं करने वाले अधिकारियों पर भी कार्रवाई संभव है। जबकि आईपीसी में यह साफ है कि सेहत से खिलवाड़ के किसी मामले में कार्रवाई को इसलिए नहीं रोका जा सकता कि उससे लोगों को सुविधा मिल रही है।

सुरक्षा के लिए खुद देना होगा प्रमाण

जयपुर. जिन भवनों की छतों पर मोबाइल टावर लगे है, वे भवन संरचनात्मक दृष्टि से टावर का बोझ सहने लायक हैं, इसकी गारंटी संबंधित मोबाइल कंपनी को ही देनी होगी। इसके लिए कंपनी को सुरक्षा संबंधी प्रमाण पत्र संबंधित शहरी

मोबाइल रेडिएशन भट्टी में शहर

धारा 133 में कार्रवाई संभव

सीआरपीसी की धारा 133 के तहत मोबाइल टावर के खिलाफ भी कार्रवाई की जा सकती है, क्योंकि टावर से निकली विद्युत चुम्बकीय तरंग अधिक टावर से होने पर लोगों की सेहत के लिए घातक हो सकती है। अवैध इलाकों में टावर लगवाकर लोग कमाई कर रहे हैं और पड़ोसी परेशान हैं या तंग रहे हैं।

आर.पी.सक्सेना
पूर्व जनकवील, राजस्थान हाईकोर्ट

चाहें तो 24 घंटे में रोक

सीआरपीसी में 120 साल व आईपीसी में 150 साल से पब्लिक न्यूसेंस पर कार्रवाई का प्रावधान है। मोबाइल टावर भी इस दायरे में आ सकता है। कार्यपालक मजिस्ट्रेट चाहे तो 24 घंटे में कार्रवाई संभव है। अस्पताल व स्कूल के पास से टावर हटे।

ब्रह्मानन्द सान्दू
अधिवक्ता, राजस्थान हाईकोर्ट

सीआरपीसी में यह

- धारा 133 (ख)- जिला कलक्टर या एसडीएम या सक्षम सरकार से अधिकृत कार्यपालक मजिस्ट्रेट पुलिस या अन्य किसी प्रकार से मिली सूचना के आधार पर तात्कालिक सुरक्षा या जन स्वास्थ्य के लिए घातक खतरनाक या उपद्रव को रोकने, उसके बारे में ताकीद करने या उसे हटाने की कार्रवाई कर सकते हैं।
- धारा 139 (ख)- मजिस्ट्रेट अहलेदी व्यक्ति को तलब कर सकता है। साथ ही उसे समन्वय या मीडिएशन के रूप में परीक्षण दायरे का अधिकार है।
- धारा 144 (2)- जिला मामले में तुरन्त कार्रवाई तभी जरूरत हो, मजिस्ट्रेट तत्कालीन सूरतहाई कर कार्रवाई भी कर सकता है।

आईपीसी कहती है...

- धारा 268- पब्लिक न्यूसेंस को इस आधार पर साफ नहीं किया जा सकता कि लोगों को सुविधा/लाभ मिल रहा है।
- धारा 269- पब्लिक न्यूसेंस के मामलों में एक माह की सजा या जुर्माना अथवा दोनों छह साल दी जा सकती है।

मासूमों पर भी रेडिएशन का साया

3 टॉवरों के बीच फंसी जान

सेक्टर आठ में जनरल स्टोर चलाने वाले हरीश ने बताया कि उनका मकान भी स्कूल के पास है। इसके अलावा पिछली गली के मकान की छत पर भी टावर लगा है। यही शिकायत मदनलाल रावत, राकेश रावत, गीता देवी व रेणु अग्रवाल की है।

विद्याधर नगर के सेक्टर आठ स्थित ज्ञान ज्योति पब्लिक स्कूल की छत पर फैसला किया है। टावर के पास ही व्यवसायी महेन्द्र कुमार गर्ग का मकान है।

पड़ोस का व्यवहार भी खराब हुआ

FIGURE I.10
Patrika's spirited antiradiation campaign, *bhatti mein shahar* (May 16, 2012)

in Rajagopal's reading, demonstrated a significantly greater authentic involvement with the thoughts, practices, and ideas of the movement. The English dailies, on the other hand, appeared to suggest that Ayodhya and its values system were extremist and foreign to the sensibilities of its secular metropolitan readers. Rajagopal characterizes the distinct roles of vernacular and English-language newspapers as "split publics," for they seemed to be speaking to two very different audiences in India.

The way media imagines its audiences and readers also influences the modes of address it deploys to target such publics. The vernacular newspaper *Rajasthan Patrika*, operating in the city of Jaipur, launched a campaign called *bhatti mein shahar* (city inside the furnace) that aimed to regulate cell towers. The campaign logo depicted skulls and bones around cell antennas (figure I.10).

Patrika opened a forum for complaints and asked its readers, the denizens of the city of Jaipur, to respond with text messages, phone calls, and letters about the problems they were facing from mobile towers. The newspaper articles that followed aggregated anecdotes of people suffering from radiation in different neighborhoods of the city. *Patrika* claimed to speak on behalf of the oppressed collective of Jaipur's residents while placing demands before the government and criticizing the activities of cellular operators and tower builders. *Patrika* spoke of, and addressed, the readers as formal citizens of a general community and, at the same time, vulnerable and embodied members living precariously in a city that was being slowly baked by the heating effects of cell towers.

The split-publics thesis, just like the civil society/political society framework, needs to be problematized.[33] I have examined letters to the editor of *Patrika* from residents of Jaipur and tweets responding to *We the People*, a mainstream national talk show; both types of communication asked media organizations to help them evict cell towers. Therefore, even as *Patrika* and *We the People* practice different modes of journalism in different languages and on different scales, their audiences have similar ways of asking them to make regulators and experts accountable.[34] Obviously, interactive journalism has a long history and did not begin with the internet and Twitter, but attending to the medium-specific qualities of immediacy and the liveness of new media is also important. In the age of convergent media, Web 2.0 technologies work together with live television shows, providing new avenues of participation. The Indian Twittersphere is often polarized, favoring extreme positions over moderate ones and trolling journalists and politicians. Thus, when Twitter conversations become part of an ongoing news segment or chat show, they amplify the show's spectacular value (Arya 2013). At the same time, tweets are a way that audiences react immediately to controversial issues, and such reactions could shape the ongoing televised conversation.[35]

Scholars in both science studies and media studies have for many years been trying to understand the epistemic possibilities of participation. In television studies, the question has been whether an audience (or public) can benefit from interactive television show formats "to hold politicians and experts to account" (see Livingstone and Lunt 1994; Livingstone 2013). Science studies scholars have reconceptualized science as a social activity, where avenues such as "hybrid forums" are being formed to permit boundary crossings between science experts and nonexperts and to open the possibility of collective decision making on uncertain issues (see Callon, Lascoumes, and Barthe 2001; Rip 2003). Tracking various television shows where the same environmental

issue was discussed, this book analyzes the scope for dialogue and participation amid epistemic hierarchies of experts and laypersons.[36]

Approaching Infrastructures

A key research question for this book is: How does considering radiation reconfigure the way we approach infrastructures? Radiant infrastructures are not spatially restricted to their tangible materialities; they in fact cast a wider net through the effects of their imperceptible emissions that scatter and spread. While conceptualizing the infra-ness of (radiant) infrastructures, scholars simply cannot confine themselves to studying the visibility and/or invisibility of cell towers and nuclear reactors; they must account for the invisible radiations. And yet, radiations by themselves are not enough to comprehend the epistemic and political orders governing such infrastructures. For that, one would have to study mediations of such radiant energies. Networked media systems shape uncertainties, citizenship claims, and different environmentalisms about radiation and radiant infrastructures, thereby gathering or forestalling publics around them. By foregrounding the critical terms—environmental publics and intermediality—in the various chapters, I want the readers of the book to carefully attend to the relationship between mediation and radiance of infrastructures.

Across the chapters of the book, the central argument remains that to comprehend how ordinary people make sense of radiant infrastructures and to understand specific material properties of these infrastructures like leaks and exposures, we need to map the diversity of media forms and practices through which radiant infrastructures and radiant energies are made both palpable and nebulous. In chapter after chapter, through sustained and grounded empirical research, I traverse multiple assemblages of media (from talk shows to documentary films, from radiation detectors to biomedical imaging techniques) to explore how they afford the different modes of communication required to render radiations intelligble to various publics.

If one has to study infrastructures, one needs to get close to them. During my project, I visited cell antenna sites and talked with network engineers who maintained base stations. I cannot say the same for nuclear reactors. I never got permission to go inside them because these structures are a matter of state security. I negotiated this limitation in my research by conversing with people who had been inside the atomic power plants. If one is to understand infrastructures, one has to comprehend how they are perceived by the people who engage with them. Research for the cell tower case studies in

this book was conducted in three cities: Jaipur, Mumbai, and New Delhi. It included interviews with stakeholders affected by the radiation issue and visits to densely clustered cell antenna locations, media organizations, and public meetings organized by apartment residents to debate the impact of cell tower signals. Research for the nuclear reactor sections in the book was undertaken in Chennai, Koodankulam, Nagercoil, Ahmedabad, and Delhi. Interviews with members of the People's Movement against Nuclear Energy were conducted in Koodankulam and Nagercoil, places close to the southernmost tip of India in the state of Tamil Nadu. I chatted with documentarians and journalists who were covering the Koodankulam nuclear reactors in Chennai and Delhi. I spent about a month interning and doing participant observation at the Delhi office of *Down to Earth*, one of India's only science and environment magazines. Anti-nuke activists engaged in protesting nuclear reactors in different parts of India had gathered in Ahmedabad in July 2013, and I attended that conference.

Infrastructures, at times, are very noticeable, yet, at other times, they can seem hidden or "infra." Public displays of nuclear reactor domes in media coverage are a way of highlighting their radiance, their monumentality. While the exterior footage of nuclear reactors is made hypervisible to highlight India's energy might, very little attention is devoted to understanding the daily operational processes that occur at a reactor. Mundane operations inside the nuclear chamber and spectacular displays of domes from the outside are two very different orders of visibilities, not always comparable. Indeed, as Harvey, Jensen, and Morita (2016) note, "Regular operations of infrastructures might remain opaque even as the infrastructure is publically exhibited" (20).[37] This should not be meant to suggest that media cannot give us a tour of the operations happening inside the atomic power plant. In fact, I discuss several television features and newspaper articles that do precisely that. However, governing radiant infrastructures leads to calculated deployment of media to make visible only specific characteristics, so as to manage public perceptions about their environmental effects.

Environmental controversies are conjunctive moments that provide opportunities to reassess previously unquestioned narratives of techno-political development. I am deeply interested in comprehending how, during a controversy, media can potentially redefine the debate over the environmental footprints of nuclear energy and wireless communication.[38] In investigating mediation of infrastructures and people's phenomenological encounters with infrastructures in terms of public health, I draw from the emerging literature on "critical infrastructure studies," including the landmark anthology *Signal Traffic* by Lisa Parks and Nicole Starosielski (2015), in which the authors em-

phasize studying the materialities of the electronic distribution circuits that form the basis of screen-media content. Olga Kuchinskaya's monograph *The Politics of Invisibility* (2014) explains how the radiological violence of nuclear accidents can be made invisible through exertions of political and infrastructural power. I extend such approaches to further consider the influence of infrastructures on people's everyday lives in postcolonial democracies like India. In doing so, I am invested in not only thinking through the informality of politics in the Global South (Chatterjee 2004) but also exploring the technical and material aspects of infrastructures that can shape citizenship claims and political goals. This is something that Nikhil Anand (2017) and Antina Von Schnitzler (2016) have admirably demonstrated in relation to their projects about water pipes in Mumbai, India, and water meters in Soweto, South Africa, respectively.

The first chapter deals with heated arguments about cell antenna signals, and the second lays out the major debates concerning the construction of nuclear reactors. These chapters map out the infrastructures and their corresponding environmental publics, tracing and unraveling connections. In so doing, the major risks and benefits associated with these infrastructures come to the fore. The third, fourth, and fifth chapters zoom in on particular aspects of these infrastructures: the leakages of radiation and information, the unwanted bodily intimacies with such leaked radiation, and the political subjectivities and environmentalisms shaping and shaped by radiant infrastructures.

In the first chapter, "Debating Cell Towers," I track environmental publics of cell tower radiation controversy by examining the work of the dissident scientists and antiradiation activists who helped carry news stories from local vernacular newspapers to mainstream national talk shows. The talk show *We the People* brought the affected stakeholders, studio audience members, and television viewers together to interrogate expertise in a live assembly. The local newspaper *Rajasthan Patrika* highlighted complaints about cell towers and prioritized community interests over objective journalism. The inability to properly measure radiation and the uncertainty about the health effects of cell tower signals exacerbated the debate between cancer patients living close to mobile towers and cellular operators. After stricter regulations were placed on the permitted signal levels from cell antennas, a new problem—call drops—emerged. Cellular operators asked the state and public to help them set up more cell antenna sites to provide mobile connectivity. Two entwined issues, cell tower radiation and call drops, kept reconfiguring environmental publics.

The second chapter, "Contested Nuclear Imaginaries," investigates how various constituents of the environmental public formed around nuclear

reactor controversies used diverse media forms. Following the Fukushima catastrophe, and amid protests by Koodankulam fishermen about the effects of increasing radiation levels on their lives and livelihood, construction work at the nuclear power plant in Tamil Nadu came to a halt in September 2011. The nuclear establishment faced a crisis of accountability, and in order to gain public acceptance for the project, it went on an aggressive publicity campaign about the virtues of nuclear power. These efforts were countered by antinuke activists who deployed their own mediations to shape public perception about the dangers posed by nuclear reactors. In helping to conjure an environmental public, mediation created contrasting visions of a future lived in the shadow of these reactors.

The third chapter is titled "Emissions," which refers to a characteristic of radiant infrastructures. In order to ensure smooth functioning, both radiation and information leaks from nuclear reactors have to be regulated. The NPCIL gave privileged access to chosen journalists to report from inside nuclear reactors and thereby claimed to be transparent about its operations. Similarly, telecom regulators and cellular operators argued that doing away with cell antenna signals would be tantamount to not having phone connectivity. However, to win back public trust, they created Tarang Sanchar, an e-portal to share information about cell antennas and their emission levels. In this chapter, I analyze NPCIL's and Indian telecom players' media practices of transparency, which seek to control the flow of both radiation and information. Radiation and information leaks are sometimes controlled and sometimes uncontained. "(Un)regulated emission" therefore becomes a heuristic to understand both the material properties of radiant infrastructures and the way information about them is being shared with lay publics.

The fourth chapter, "Exposures," portrays the efforts by media groups to depict communities exposed to radiations and affected by radiant infrastructures. Audiences listen to testimonies from cancer patients, whose proximity to radiant infrastructures is captured by lifestyle shows and documentary films. Such situated testimonies carry an affective charge, even as some scientists dismiss them as mere anecdotal evidence. At a molecular level, there is the imperceptible, almost extrasensory intimacy of the human body with radiant energies emitted by cell antennas and nuclear reactors. Various visualization techniques, from CT scans to electroencephalograms, have been used to probe the intimacies between radioactive isotopes and human bodies, as well as to demonstrate the molecular-level interactions unfolding between neural impulses and nonionizing electromagnetic fields. Such mediations of interac-

tions and interferences between human bodies and radiant energies, I argue, help us to understand the environmental effects of radiant infrastructures.

The fifth chapter, "Styling Advocacy: Activism and Citizenship," elaborates on the contrasting styles of advocacy adopted by antinuke and anti–cell antenna activists. One of the reasons that the movement for greater regulation of cell towers gained popularity among urban middle-class publics was that famous cases involving Bollywood personalities, such as Juhi Chawla, were reported early on. The campaign has continued to be associated with celebrities. In contrast, the movement against nuclear power plants, led by committed Gandhian and Marxist activists, comes as the latest stage of a peace movement with a long history of activism in India. The people I met who were opposing the indiscriminate growth of cell towers were often corporate professionals and managers. In my interviews with them and in interviews with the media, these urbanites have refused to be labeled or addressed as activists. They see themselves as concerned citizens. Such labels matter because they influence the modes of media involved in public outreach, the forms of address, and what I call "styling advocacy."[39]

If the first two chapters describe the environmental controversies related to nuclear reactors and cell towers, the next three compare the radiant infrastructures in terms of (1) the radiant energies they emit and the regulation of such emissions, (2) exposure of human bodies to such emissions, and (3) the varied political subjectivities that the radiant infrastructures engender.[40]

During environmental controversies, experts, gatekeepers, filmmakers, hackers, and advertisers have a role to play in naming risk, covering up or revealing defects in infrastructures, and making sense of sociotechnical uncertainties. Throughout the book, I endeavor to work out the notion of "public cultures of uncertainty" by tying together examples across my case studies. Ordinary people use their experiences and their wide and deep backgrounds to think about uncertain futures: the community of *beedi* sellers, agriculturists, and fishermen in Koodankulam, or the brother of a cancer patient in Jaipur who gauged the level of cell tower radiation in his house based on the peacocks' return to his garden. My attempt is to locate an epistemically active conception of environmental publics that is phenomenologically complex enough to accommodate cultural imaginaries (even when they are castigated as "traditional" and "unscientific"), "to make room for the unknown along with the known" (Jasanoff 2007), and to emphasize actual experiences of uncertainty and shared coping with them.

Introduction

1 Air pollution was still a serious environmental concern as of 2015; see Sehgal and Bennett (2016). Beyond vehicular pollution, Dewali firecrackers are one reason for the poor air quality. Another reason is crop burning in states surrounding Delhi. Despite a temporary ban on firecrackers in November 2017, air pollution in Delhi has again reached "public health emergency" levels. See "Delhi Air Pollution a 'Public Health Emergency,'" *The Wire*, November 7, 2017, https://thewire.in/195106/delhi-air-pollution-public-health-emergency-says-ima-kejriwal-suggests-shutting-schools-days/. The *hawa badlo* (change the air) campaign was launched. Its website is http://changetheair.org. While some particulate matter (PM 2.5) can make air look hazy, not all air pollution is visible, especially that caused by nitrogen dioxide.

2 A *TV9 Maharashtra* show on cell towers, broadcast on November 3, 2011, labeled the danger as *khamosh khatra*: see "Mobile Tower and Children: Silent Killers—Prof Gisish Kumar and Juhi Chawla—TV9," YouTube, posted October 28, 2013, by NesaRadiationSolns, https://www.youtube.com/watch?v=XEM5xsOoka4.

3 Gabrielle Hecht, in her book *The Radiance of France* (2009b), discusses how national identity in post–World War II France became associated with grand technological projects of nuclear power. In India, postcolonial national identity became increasingly entwined with mastering the science of the atom.

4 Throughout this book, I have used *Koodankulam* and *Kudankulam* interchangeably as both spellings have been used in many places while discussing the nuclear reactor.

5 If the Indian nation has its own kind of modernity, then science, duly inflected by cultural processes, had a role to play in it. The "multiple modernities" thesis postulates that "each nation or region produces its own distinctive modernity in its encounter with the allegedly culture-neutral forms and processes," including science, technology, and industrialization, as part of societal modernization (Gaonkar 2002, 4).

6 The Non-Proliferation Treaty is an international treaty whose member nations vow not to expand nuclear weapons and to cooperate with other members for peaceful nuclear energy production.

7 See the Indus Towers web page: http://www.industowers.com/who_we_are.php.

8 (Nuclear) energy and information transmission (cell antenna signals) might be considered separately nowadays, but in the late nineteenth century, as Ghislain Thibault (2014) notes, "information and energy" were "part of the same ecology and their separation was artificial" (96). Even as the electromagnetic spectrum came to be understood as the medium of information transmission, the electromagnetic radiation in that spectrum is part of energy phenomena.

9 The atom bomb joined photography, X-ray, and cinema as new technologies of light, and this light (and radiance) was associated with totalitarianism and alterity, "with knowledge and its destruction, and with the visible and the invisible" (DeLoughrey 2009: 478; Lippit 2005). This paradox of light, both in its physicality (particle and wave nature) and metaphorical usage (illuminating and blinding) can be extended to think of how radiance (and radiation) is a double-edged sword. More on this follows in the book.

10 Refer to research by Elisabeth Cardis and the Interphone Study Group (2010) on brain tumor risk in relation to mobile phone use. While this book focuses on cell towers, apprehensions about mobile phones causing cancer, since they maintain communication with cell towers through EMFs, surface in the public sphere. The possible harmful effects of mobile phones erupted into the American public sphere when on January 21, 1993, David Reynard told CNN's Larry King that his wife Susan Reynard died of brain cancer caused (or accelerated) by cell phone use (Kurtz 1996). Anxieties about health effects of contemporary media technologies is not recent and did not start with cell phones. Susan Murray (2018) writes about the discourses of possible danger from proximity of television screens to human bodies in the 1950s and '60s. Around 1967, it was found during routine testing that specific large-scale-screen models of GE color TV sets were emitting X-ray radiations beyond desirable threshold levels. From there, a swift response to this revelation lead to better regulatory protocols and vigilant checking. As television historian Lynn Spiegel (1992) has noted, in the mid-1930s, owing to confusion about broadcast technology, there were public fears about the contaminating effects of the electric space of television spreading into the real physical environment. Complaints about harmful effects of mobile phones and cell towers are not restricted to cancer but include nausea, memory loss, headache, and muscular pain. I discuss particular cases of electro-sensitives who claim to be hypersensitive to the electromagnetic fields emitted by cell towers and wi-fi routers in chapter 4.

11 Kate Brown (2013), in her insightful book *Plutopia*, explains how medical radiologists in the Manhattan Project had preferred plutonium over radium, since the former emitted fewer gamma rays than the latter. And yet, the radioactive isotopes emitted by plutonium were able to insert themselves into biological processes inside the human body, including blood and bone marrow, with terrible consequences.

12 The information is from the NPCIL/Vigyan Prasar poster, published in leading English dailies in India.

13 This is a statement that Raminder Kaur (2013a) finds Robert J. Oppenheimer invoking from *Bhagavad Gita* to describe the sublime feature of the July 1945 atomic tests. In the late 1950s, the US Atomic Energy Commission undertook

a secret program called "Operation Sunshine" to measure radioactive isotope strontium-90 levels in humans, plants, and animals from militarized nuclear radiation (see DeLoughrey 2009). This blurring of boundaries between background radiation from sun and anthropogenic radiation from nuclear weapons and nuclear reactors is problematic.

14 Refer to the fact sheet on TRAI's Tarang Sanchar site: https://tarangsanchar.gov.in/emfportal.

15 Medical oncologist Siddhartha Mukherjee (2011) reassures us that, at the low power levels of cell towers and mobile phones, it has been epidemiologically difficult to establish that radio-frequency energy at nonthermal intensities causes cancer. That being said, scientific studies have not overruled the possibility that chronic exposure to cell antenna signals can stimulate chemical reactions that might aggravate or accelerate tumors or physiological (e.g., brain glucose) activity.

16 Discussing Bose's writings, Ashis Nandy (1972) notes that "Mahashakti" as "ultimate power" is "represented by the dominant mother-deities of Bengal" (40). On electro-sensitivity, that is, sensitivity of human bodies to electromagnetic fields at particular frequencies, read Lisa Mitchell and Alberto Cambrosio's (1997) early article on the invisible topography of EMFs.

17 Noortje Marres (2005, 2010) and Jane Bennett (2005) have stressed that, for Dewey, a public is not just another collective of individuals or a social community: "Dewey makes it clear that a public does not preexist its particular problem but emerges in response to it" (Bennett 2005, 100). In Marres's (2010) formulation, Dewey was interested in how social actors who went about their everyday lives had to break from their habitual ways and attempt to forge a public when they found themselves affected by the consequences of an issue or a problem that was beyond their control.

18 The term "environmental public" in other literature on this topic, like Robert Cox's (2010) *Environmental Communication and the Public Sphere*, is often used as part of "environmental public sphere(s)," "environmental public interest litigation," or "environmental public health." While I do include such uses of "environmental publics" because I am dealing with environmental controversies, I also use the term to stress the environmental or ecological aspects of infrastructures (in general, and radiant infrastructures in particular) and media networks/systems that cover such infrastructures.

19 In a special issue of the *LIMN* magazine in July 2016, Collier, Mizes, and von Schnitzler (2016) invoke the term "infrastructural publics" in a Deweyian sense to study social collectives that gather around infrastructural connections and flows and define technical standards. However, in addition to studying publics "called into being" by infrastructures, they are interested in publicness of infrastructures, that is, how the government (the public sector) has traditionally planned and constructed infrastructures for preconstituted publics. This interplay between public infrastructures and infrastructural publics is fascinating and something that I study in this book as well. That being said, my central preoccupation remains ecological/relational aspects of infrastructures and environmental impacts of radiant infrastructures.

20 In her recent book *Rethinking Media Coverage: Vertical Mediation and the War on Terror*, Lisa Parks (2018) offers a capacious definition of media coverage so that "coverage" does not become reduced to merely news stories but also includes satellite mapping and digital monitoring practices. In my own case studies, media technologies of biomedical imaging and radiation sensing technologies account for media's role not only in propaganda and publicity but also in mapping and monitoring. Intermediality helps to connect these different mediatic operations of publicity, monitoring, and mapping. I am also not suggesting via intermediality that mediations are ubiquitous or total. Intermediality points to (unstable) configurations of interlinked media systems (and issue-based publics), which are almost always shifting, contingent, and partial.

21 For Jill Bennett (2007), intermediality in contemporary art practice operates "between media" and cannot be subsumed within descriptors like "mixed media" and "appropriation" (434). In crossing media boundaries, there is more than just a play of language and sign system. That is, there are intersections of practices and technologies in intermediality.

22 For Herkman (2012), the term "intermediality—more than concepts such as "remediation" and "convergence"—helps explain the sociohistorical contexts within which media changes happen. While there are media technologies that are converging—for example, the smartphone of today can be seen as a convergence or even remediation of radio, television, and telephone—it is also the case that cultural forms and statuses of different media have not simply evaporated. For example, electronic television programs still maintain a hold on Indian masses even as social media is beginning to make a dent in the credibility of television channels. Furthermore, politically committed documentary films continue to be the medium for social justice and environmental justice campaigns in India, even though ad filmmakers are also getting interested in taking up such topics.

23 See Bagla and Stone's (2012) interview with Manmohan Singh.

24 In August 2012, then Indian prime minister Manmohan Singh had equated national development (including "energy security") with national security: "If we do not increase the pace of the country's economic growth, take steps to encourage new investment in the economy, improve the management of government finances and work for the livelihood security of the common man and energy security of the country, then it most certainly affects our national security." Refer to ET Bureau (2012).

25 The bill in its present form makes foreign nuclear suppliers liable, but only for any catastrophe that occurs within five years of the plant's installation. After that period, compensation for damage due to nuclear leaks or a nuclear disaster will be the responsibility of the sole nuclear operator in India, NPCIL.

26 It is important here to mention the cultural dimension of phenomenological encounters. Emotions or sensations felt by humans are not universal; they are specific, situated, and culturally inflected.

27 Nuclear physicist Surendra Gadekar first wrote about this in the April/May 1993 issue of India's only antinuclear journal at the time, *AnuMukti*. In the face of the Indian nuclear establishment's apathy, local communities and antiradiation activ-

ists have created their own epidemiological studies, such as the one published in *AnuMukti*. This study found many different pathways for radioactive pollutants to affect human bodies living around the plant. For example, radionuclides emitted by the plant could settle over the soil and find their way into the local produce eaten by the people there. Another vulnerable group identified were the casual workers at the plant (Gadekar 1993).

28 The project of ecological justice necessarily has a component of social justice in the "environmentalism of the poor." Amita Baviskar (2011) points to another kind of environmentalism, called "bourgeois environmentalism," which is practiced by Indian urban middle-class citizens. Such urban elites want governmental authorities to immediately address their concerns about "beauty and order" in the city even at the cost of poor people's "lives and livelihoods" (401–402). There is little hint of any activism that would try to build a mass movement. I shall discuss these different environmentalisms in greater detail in chapter 5.

29 A liberal public sphere consisting of bourgeois voluntary associations did appear in colonial India in the late nineteenth century, but these liberal public spheres were soon challenged by the crowd of the streets. The nationalist freedom fighter B. G. Tilak promoted Ganesh festivals as a way to conjoin varied, vibrant public cultures. Barton Scott and Brannon Ingram (2015) argue that, with the arrival of cinema and other mass media in early twentieth century, the crowd increasingly became the face of the public in India, displacing civic associations.

30 Chatterjee (2004) has contended that a majority of the population in India does not have access to formal means of engaging with the government. He is categorical that these population groups have a "political relationship" with the state based on informal associations that do not conform to the "constitutional depiction of the relation between the state and members of civil society" (38). He asks scholars to study the distribution of governmental benefits and the relationship between the state and population groups under the rubric of "political society" or the "politics of the governed."

31 Aparna Sundar (2010), writing about the civic engagements of rural fishworkers in South India, argues against Partha Chatterjee's tendency to suggest that civil society does not exist among subaltern rural populations. Ajay Gudavarthy (2012) has edited a collection of essays that celebrate and criticize Chatterjee's formulation of "political society."

32 It is certainly important to recognize that there is a reality out there and that facts have a currency in professional journalism (Zelizer 2006). So, objectivity as a journalistic value is still held in high esteem. That being said, several Indian journalists said "subjectivity" in journalism could mean many things, such as writing reports influenced by corporate and political funding or writing based on feelings and not facts. However, "objectivity" should not necessarily imply "neutrality." Shoma Chaudhury, a premier Indian journalist who writes for *Tehelka* magazine, said that to improve the quality of journalism, journalists should ascertain facts, speak to everyone involved, and then be ready to put their "moral weight behind that version of story." She was not happy with just "he said, she said" reporting. See Timmons (2012).

33 Circulation of issues across porous boundaries of various media publics suggests that there are more ways in which one can categorize and compare media publics rather than just the linguistic split public that Rajagopal delineates. In the nuclear energy issue, documentary publics indulge in remarkably different modes of media practice compared with mainstream television news publics. When I speak of "splits" here, I am trying to pay attention to the boundary crossings of media and the need to study the reconfiguration and transformation of those boundaries themselves.

34 National TV channels can also become hyperlocal if they have ordinary citizens act as journalists and report issues from their locality. CNN-IBN's *Citizen Journalist* is one such program. With the passing of the Right to Information Act and the rise of anticorruption movements (like the one led by Anna Hazare), Indian citizens have been asking for greater governmental accountability.

35 In India, Twitter is dominated by upper-middle-class youth and is not representative of the wider Indian population. Furthermore, the issues supported through hashtags on Twitter become hierarchically trending based on ambivalent algorithms (Gillespie 2012). Nevertheless, Twitter is a place where politicians, journalists, and common people *seem to interact*. Journalists promote their shows on Twitter, and politicians publicize their policy-making schemes and believe Twitter to be an integral part of reaching out to the public. Common people can invoke or tag famous politicians and journalists. Influential journalists and politicians in India rarely follow back or respond to the invocations (and provocations) of ordinary citizens, but when they do, one gets to witness both performances of power and celebrations of digital democracy (Pal 2015).

36 Post-1985, with the advent of neoliberalization in India, media has been opened to private channels, a move that seemed finally to create the possibility of an independent press free from state interference and censorship. While there has been a greater diversity of programs and channels in the Indian mediascape since then, many commentators feel the scope for criticism has been crowded out by "commercial concerns that govern media organizations" (Chaudhuri 2010, 61). There has been growth of reality shows like *Bigg Boss* (Sony TV, 2006; Colors TV, 2007–) that have *aam janata*, or laypeople, as the main protagonists. Television shows have become more interactive, and audiences participate in these shows through Facebook, Twitter, and mobile messaging services. Yet Maitrayee Chaudhuri (2010) argues that, while the transformed Indian publics as represented in the media seem more ordinary, visible, interactive, and diverse, "they do not add up to a more critical public sphere" (62). These scholarly ponderings have led me to comparatively assess the outcomes of show formats that claim to afford audiences greater participation and interaction.

37 Here, Harvey, Jensen, and Morita (2016) are working through a key debate about the infra-ness of infrastructures. Bowker and Star (1999) have noted that the mundane standards and routines that make an infrastructure function are hardly attended to by users of their facilities. Only at the moment of the breakdown/splintering of infrastructures or through research by infrastructure scholars does one get an analysis of the hidden workings of infrastructures. More recently, Brian Larkin (2013) has noted that invisibility might not be the defining characteristic of infrastructures, because some infrastructures are indeed very noticeable and are

championed and publicized by the government. Harvey, Jensen, and Morita (2016) contend that it is one thing to glorify mediated images of satellites and another to understand the actual operations of satellites. I agree with them but disagree with their suggestion that media tends to emphasize only the former and not the latter.

38 Some of the debates and issues related to radiant infrastructures persist, making my archive of media objects, media events, and media genres related to these issues ever-expanding. At times, the issues are out of circulation for a while and then come back again. The catalysts and triggers that bring them back into the news vary: the announcement of a new policy measure with respect to cell towers, the opening of a film festival on uranium, a report of a cell tower antenna turned in the direction of a celebrity's balcony, steam spillage from a nuclear reactor, a viral tweet about a mishap in a nuclear power plant, or corruption charges related to buying nuclear equipment. The issues have continued to grab media attention because the objects' technical specificities lend them ontological indeterminacies, and their ability to attach discourses and institutions to them gives them long mediated biographies. Radiant infrastructures become part of the tales being told about their acquired *associates* (organizations and ideologies) as well.

39 I have avoided essentializing the differences between the two infrastructures and their respective environmental publics. I have refused to dismiss the agitation of wealthy urbanites against cell towers as just another case of NIMBYism ("not in my backyard"–ism). To not be able to sympathize with their heightened sensitivity toward EMFs would be a refusal to acknowledge a fellow human being's pain and sensorial knowledge. That being said, to fail to call out the state and the media on their hypocrisy and double standards when dealing with two different populations (wealthy urbanites and rural fishermen) would be irresponsible. Likewise, I cannot just treat the affected fishing community fighting against nuclear reactors in Koodankulam as collateral damage. They are people with remarkable vitality and agency, as demonstrated by their resilient protests.

40 Sheila Jasanoff's *Designs on Nature* (2007), as a comparative study, examines one technology (biotechnology) in three developed countries: the United Kingdom, the United States, and Germany. In contrast, my attempt in this book is to look at two different infrastructures within the same nation. My comparative project could have explained how cultural differences in India and the United States influence antinuclear activism, or I could have enumerated the similarities and differences between Indian and British ways of apprehending nonionizing EMFs from cell towers. Instead, I have chosen to compare controversies related to two infrastructures to suggest that radiation, India, and media are not a monolith. I have tried to stress differences internal to India, radiation, and media.

1. Debating Cell Towers

1 After new laws prescribing stricter regulation of cell tower signals were passed in late 2012, public anxiety about cell towers subsided for a bit only to rise up again in early 2015 with the call drops issue (Roy 2014).

2 The number keeps increasing; for a more up-to-date figure, consult the Indus Towers website: http://www.industowers.com/who_we_are.php (accessed July 12, 2015).