Public Participation and Citizen Science in India: Roads Not Taken

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Science, Scientists, and Society

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Abstract. Science policy in India has historically been the domain of experts with little consultation and peoples' participation. While the new Indian Science, Technology and Innovation Policy offers promise with themes for equity and inclusion, there is a need to fundamentally rethink the contract between science and society and the role of public participation in science in India. People's Science Movements in India have pointed to many such possibilities in the past but often views outside the formal scientific establishment receive little attention. Insights from a citizen's manifesto and ongoing debates on citizen science in India show how the relations of science and democracy can be reworked that has implications for India's science policy. These experiments represent possible roads not taken and highlight the need for greater plurality in alternate futures globally. The critical knowledge dimension of inclusion needs to also be more open to dissenting scientists who have pro-actively engaged with society to shape an alternate science.

Introduction

Science policy in India has been seen by critics to be out of sync with the democratic aspirations of its citizens. Historically science, later technology and now innovation have been the domain of experts with little dialogue with citizens. With the change of governments, the rise of the techno-scientific elite has only strengthened with time. Recent marches for science by scientists against a revivalist turn, the growing spread of citizen science in India, or the plethora of competitions to tap into the innovative potential of its citizens, though welcome,

does little to raise critical issues on science and democracy.[1] The role of the citizen in ideating is welcome but often not in questioning science or the scientific establishments.

The ongoing consultations around the drafting of India's new Science Technology and Innovation policy (GoI 2020) have a welcome and explicit mention of being inclusive and bottom-up.[2] 'Equity and inclusion' is one of the 21 thematic sub-groups and there is explicit mention of 'a disconnect between science and society at large with limited scope for citizen engagement' (GoI 2020: 43). In this paper, I would argue that while the intent of being inclusive is welcome, there is a need for Indian Science and Technology (S&T) policy processes to be more democratic and inclusive that might require a rethinking of the social contract of science in India. In part 1 of this paper, I explore this uneasy social contract of science through a few recent events that reflect the everydayness of how science and expertise are practised in India and how the space for alternative imaginations of science continue to be low in popular narratives of science.

A closer look, however, would indicate that the lives of a few dissenting scientists, who represented different political worldviews but had a critical and yet constructive scientific imagination, could help root more inclusive processes of thinking and doing science in India. In part 2 of the paper, I look at recent discussions on citizen science movements in India and suggest the importance of public participation in science. In exploring roads not taken, it might be necessary to have a non-linear reading of the history of public participation in science in India that in a sense predates India's popular science movements involving conversations on knowledge and democracy. I explore attempts by citizens in drafting a science policy in India – *Knowledge Swaraj* – and suggest ideas for a more democratic science policy where India could look at leading ideas on the social contract of science. A re-reading of Gandhi's views on science suggests that far from being a Luddite, based on readings of *Hind Swaraj*, Gandhi had several conversations on the knowledge that enabled a re-reading of the role of the expertise, the importance of a plurality of knowledge forms and the search for 'cognitive justice.'

Independent India has seen a different form of creative expression of citizen science through different kinds of peoples' movements and a search for alternative science more rooted in the Indian ethos. The paper would suggest that a closer look at some of these dissenting visions of science in India could help us chart a newer trajectory that might merit closer attention by scholars of citizen science, science, technology and society studies (STS) or innovation studies. Ideas on responsible innovation or citizen science are useful pegs to anchor discussions on science and democracy in India.

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[1] On the march for science rallies see https://scroll.in/article/846405/march-for-science-why-thousands-of-indian-scientists-will-take-to-the-streets-on-august-9. Also more recently https://www.thehindu.com/news/national/letter-from-india-march-for-science-to-the-prime-minister-narendra-modi/article31397462.ece. For some awards by DST see https://dst.gov.in/whatsnew/prize-awards

[2] The draft has been shared for comments and is available at https://dst.gov.in/draft-5th-national-science-technology-and-innovation-policy-public-consultation

The Uneasy Social Contract of Science in Contemporary India

I take few events in India, from October 2018–January 2019, to reflect on the changing and uneasy relationship of science and democracy in India. The first, widely covered by the press, relates to the controversy over the annual jamboree inaugurated by the Prime Minister of India, the 106th Indian Science Congress. At the Congress were controversial and speculative remarks made by some scientists, including a university vice-chancellor, about stem cell research prevalent in the popular mythological epic – the Mahabharata. The criticism of the event ranged from a strong call to end the 'mockery of science' and the spread of pseudo-science and irrationality from the All India Peoples Science Network[3] to institutionalising processes internally to enable science to regain respect.[4] Others, like Avijit Pathak, have argued for a social audit of science that would make it more humble and a call for scientists to be more reflexive.[5] Subsequent science congresses have been thankfully free of these controversies though some scientists had petitioned the president and organisers to desist from unfounded claims.[6]

At one level, the Indian Science Congress provides an opportunity to reflect on science-society relations annually. Much has indeed changed in the last few decades. The popular social science journal, *Economic and Political Weekly (EPW)*'s editorial at the turn of the century (EPW 2001) on the Science Congress had a different flavour. The call then was a science with a stronger 'grass-roots concern;' on the process of empowerment and of the need to augment science and technology in development. Following the 2019 Congress, the editorial (EPW 2019) reflected on the insecurities of the science establishment and the need for more scientists at the top echelons to speak up. At the turn of the century, Michael Gibbons (Gibbons 1999) heralded science's new social contract with society, where he saw increasingly society 'speaking back' to science and the need for constructing narratives of expertise and bringing together different 'knowledge dimensions.' Governing science in the 21st century requires understanding the complexity of the scientific endeavour and its relation to society. As has been pointed out by science studies scholars in Europe, it requires 'taking knowledge seriously' (Wynne et al. 2007). A vibrant (European) knowledge society, they suggest, must be built on 'collective experimentation.' In fact, many scientific projects and discussions on science and innovation are now opening up possibilities of dialogue where scientists are expected to reach out and participate in 'Responsible Research and Innovation' (Stilgoe et al.

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[3] Another scientist claimed a new gravitational theory that was better than Newton or Einstein that he named after the Prime Minister and Minister of Science and Technology, as the "Narendra Modi waves" and the "Harsh Vardhan effect". https://www.newsclick.in/indian-science-congress-mockery-science. See also https://www.analyticsindiamag.com/cows-can-turn-food-into-gold-14-other-isc/

[4] https://www.thehindu.com/opinion/op-ed/regaining-respect/article25943533.ece

[5] See https://thewire.in/the-sciences/does-the-indian-science-congress-acknowledge-the-need-to-be-reflexive

[6] See https://www.thenewsminute.com/article/no-unfounded-claims-please-scientists-organisers-indian-science-congress-2020-115228

2013; Pandey et al. 2020; Prasad 2020) or citizen science initiatives with a view to regaining faith in science among citizens.

In the Indian context, there have been a few recent studies on the need for taking citizen's views seriously. Within meteorology, Dash 2020 has pointed to how the discipline serves state interests than opening itself to public assessment. Public controversies over techno-scientific projects do provide interrogation of scientific expertise as has been witnessed in how fighting nuclear energy was earlier seen as a fight for Indian democracy too (Bhadra 2013). Varughese 2020 argues for the need to go beyond the 'social distribution of expertise' in non-western contexts. In his examination of two scientific controversies, he suggests the potential for fostering alternative social imaginations and more viable and inclusive mechanisms for techno-scientific decision-making. While these potentials of public engagement are often during a controversy or after a policy is announced or rolled out, the realm of policymaking in India remains largely with the scientific establishment and an elite few (Abrol 2013; Prasad 2014). While there appears to be evidence of close to 300 consultations with different experts in the new STIP 2020 early criticism of the draft suggests that consultations have been insufficient and not involved people as much as they potentially could.[7]

It is only it appears, in excesses of the kind of the ISC 2019 that society seems to speak back. The poignant death of Prof. G D Agrawal in October 2018 points to the insularity and indifference of the scientific establishment to scientists who spoke back. G D Agrawal, or Sant Swami Sanand as he was called in his last few years, died on October 11, 2018, after being on a continuous 111 day fast to get the Government of India and the Prime Minister to pass the Draft National Gangaji (Conservation and Management) Bill 2012. He wrote three letters to the Prime Minister urging him to ensure the '*aviralata'* or the unrestricted flow of the Ganges that would enable it to be pure and never got a response.[8] Agrawal, through his fast, was hoping to exert pressure for the bill to be passed. Agrawal's demise is poignant for it appears his voice was ignored by both the right-wing nationalists who found his environmental demands too radical and the left-based people's science movement who found his appearance and the use of religious metaphors taboo.

The real measure of Agrawal's work sadly emerged only after his death. As a citizen scientist, Agrawal was India's first technically qualified environmentalist and served as the first member-secretary of the Government of India's Central Pollution Control Board (CPCB) after a distinguished career as the head of the Department of Civil and Environmental Engineering at the Indian Institute of Technology (IIT) Kanpur. He carried out several Environmental Impact Assessments (EIAs) when the field was nascent and at CPCB was influential in shaping India's pollution control regulatory structure. Widely respected, he was a mentor to many

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[7]   See https://dst.gov.in/indias-top-thought-leaders-provide-their-vision-and-ideas-draft-stip for details of the consultative process. For a critique on the policy process not being 'authentic' but a policy 'for the Department of Science and Technology (DST)' see https://aipsn.net/2021/01/30/on-the-draft-stip2020-need-for-a-people-centered-and-future-oriented-stip-based-on-reality/.

[8]   In 2015, it appeared that the Government would enact a Bill to save the Ganges https://www.downtoearth.org.in/news/draft-a-bill-to-protect-ganga-pmo-tells-environment-ministry-43515. However, the promises were not fulfilled as is evident from the final letter by G D Agrawal to the Prime Minister. https://thewire.in/rights/read-gd-agarwal-final-letter-narendra-modi-saving-ganga

members of the Peoples Science Movements like Anil Agrawal, the founder of the Centre for Science and Environment; Dunu Roy, the founder of the *idushak Karkhana* experiment in Shahdol in the 1970s and the Hazards Centre later in Delhi; Arvind Gupta who received the Padmashree for his work on science popularisation and Ravi Chopra the founder of Peoples Science Institute in Dehradun. Many of them were his students who went on to lead movements for an alternate view on science-society relations beyond the official Science Policy statements of the technocratic elite.

G D Agrawal's journey could also be read as India's tryst with science and technology in post-independent India. As a young engineer, he was involved in the building of a 'temple of modern India,' the Rihand dam. His doctoral stint at the University of California at Berkeley, however, exposed him to the links between science and democracy and he founded the Front for Rapid Economic Advancement of India (FREA) that saw science and technology as chosen instruments for India's progress. G D Agrawal was one of the scientists who had friends and students from all spectrums. Even as he offered technical insights, he learnt from many of his innovative students' experiments. The first community-based environmental impact study in India at Shahdol in the 1970s was one of them, where he had helped engineers like Dunu Roy to measure the impact of the effluent discharge of Asia's largest paper mill on people's health much before any environmental legislation was in place in India. As Roy recalls,

"As Arvind (Gupta) later confessed, "I was too much in the 'left' mode to understand and appreciate a gentle soul like G D"; but Sudhindra remembers G D saying, "I don't agree with you guys, but I love you."

...It was in the same spirit that he came to guide me (Roy) through World Wide Fund for Nature's first (and last) workshop in 1990 to develop low-cost pollution monitoring techniques that would be useful for communities. The week-long workshop attracted an array of scientists, community organisers, activists, and trade unionists, and he was hugely influential in taking environmental science to the grass-roots.[9]

GD's interest in experimenting with community-based impact assessment continued at the Banwasi Sewa Ashram at Sonbhadra where he would keep prodding science activists like Roy on "Where is the people's movement?" Agrawal embraced 'sanyas' in 2011 and chose to dedicate his last years to rejuvenating the Ganga and embarked on having a dialogue with other Sanyasis on ways to use science to make Ganga pure. It is a strange irony that while the Indian scientific community actively participated in the ISC 2019, an event that evoked religious metaphors, they were silent and refused to dialogue with an environmental, and in today's parlance, a citizen scientist who was keen to revive a river, the holy Ganges, scientifically.

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[9]   Quoted in Prof A G Rao's Newsletter 10, 22nd November 2018. http://www.agrao.in/images/Newsletter/NewsLetter10HomagetoGDr.pdf

Acting on G D Agrawal's suggestions might have been politically challenging given the commitment of the Indian state to large-scale developmental projects on the river involving significant investments. The February 2021 glacier burst at Uttarakhand, unfortunately, reminds us of the importance of environmental flows of the Ganges in the fragile Himalayan region that G D Agrawal was fighting for.[10] G D Agrawal was a champion of peoples science and worked closely with the Peoples Science Institute at Dehradun. His cause however found little support from Peoples' Science Movement (PSMs). India's PSMs have for too long been split along a modern-traditional or left-right divide. It is thus unsurprising that the All India Peoples Science Network, - a strong coalition of PSMs across India that is active in movements for the 'Global March for Science,' and rightfully condemns the murder of Gauri Lankesh by forces of intolerance - has nothing to say about another fellow citizen scientist, Prof. G D Agrawal's demise, due to the negligence of the state.[11] I would argue hypothetically that if the Patriotic and People Oriented Science and Technology (PPST) Bulletin,[12] the other side of the Peoples' Science Movement, were active they might have equally not remembered the work of the peoples' health activist Amit Sengupta.

Amit Sengupta's death in Goa in December 2018 was sudden unlike Agrawal's that was imminent following his fast unto death. Trained as a doctor Sengupta chose not to pursue either private practice or join a hospital but was one of the pioneers of the Peoples Health Movement. One of the founding members of the Delhi Science Forum (DSF), Sengupta was keen on establishing scientific self-reliance in many spheres, particularly in pharmaceuticals. He was actively involved in documenting the health impacts of the Bhopal gas tragedy (1984) that the then government was keen to underplay and deny. The doctor was soon engaged in movements dealing with public health, the Indian drug industry, and broader issues of intellectual property rights (IPR) and patent laws. These led to the All India Drug Action Network (AIDAN) that brought many health-related groups into the mainstream of the PSM. His work extended to the Bharat Gyan Vigyan Jatha, a people's science festival that was a precursor to the All India Peoples Science Network (AIPSN) and was also involved with the World Social Forum (WSF). His work was increasingly focused on peoples' health movement with assemblies in Raipur and Dhaka before his untimely demise.[13]

"What probably differentiated him from others was that he was a medical doctor but deeply interested in engaging with movement like the farmers' movement and other development movements that look at inequities," said Bhan.

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[10]   See   https://www.indiaspend.com/indiaspend-interviews/well-being-of-the-himalayan-region-is-critical-for-all-of-india-725072   also   https://www.thehindu.com/sci-tech/energy-and-environment/the-hindu-explains-why-are-geologists-worried-about-a-slew-of-hydroelectric-projects-and-environmental-stress-in-uttarakhand/article33831867.ece

[11]   See https://aipsn.net/

[12]   For details on PPST see http://www.vidyaashram.org/ppst.html. The PPST Bulletin was an active voice for both a critique of modern western science and a champion of indigenous or traditional Indian science and technologies. The Bulletin was published from Madras in the 1980s.

[13]   See the letter to EPW (2018) from the AIPSN for more details. https://www.epw.in/journal/2018/48/letters/amit-sengupta-1958%E2%80%932018.html

"Amit was also great fun. He used to laugh at me when I was depressed about the state of our country...I cannot remember the number of times we have marched together in demonstrations for public health issues, and against the ferocious Hindutva nationalism we confront...-[14]

The journeys of Agrawal and Sengupta were diverse. Agrawal, an academic turned environmentalist, spent his later years with a mission to clean the Ganga. He was Gandhian in outlook and inspired by Indian religious traditions and he attempted, albeit unsuccessfully, to get the State to act. A free-flowing Ganga, he argued, was critically linked to its sacredness and thereby a scientific approach would be to connect the dots and stop destructive development through big dams upstream.

Sengupta too used his technical expertise to bring about social change. He connected the individual health of poor patients to the larger systems of transnational companies. His path of social mobilization was left of centre and his strong links to the Peoples Science Movements enabled him to present a national and global case for greater public investments in health and education by the State. Their domains were different and so were their approaches. However, I suggest that in their lives there was some commonality. Both worked from outside the establishment, engaged with people, situated their scientific knowledge within society and the larger networks that shape action and brought these insights to 'speak back' to the state. Both challenged western paths of development and believed in Indian solutions that could emerge from a more democratic engagement with people. The Indian state though for its part has been reluctant to dialogue even on issues, such as a clean Ganga – a stated objective and goal of the government.

One of the ways through which there has been a rethinking of the link between science and democracy is in the emerging area of citizen science movements. How does one look at citizen science in India given its growing popularity in the West? What is the role of peoples' movements in negotiating with a techno-scientific state with an insular scientific bureaucracy that is less open to discussions with citizens? In this paper, I argue that India's people's science movements traditions need to be seen more holistically for their contribution to the discourses on science and democracy and not get caught in internal battles of the left-right split.

Contextualizing Citizen Science in India: Rethinking Science and Public Participation

The citizen science movements (CSM) in Europe and United States have gained significant traction and interest in the last decade. The Wikipedia entry on citizen science projects has

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[14]   See https://scroll.in/pulse/903879/one-of-the-strongest-pillars-dr-amit-sengupta-a-leader-of-the-public-health-movement-dies-at-60 for these tributes as also a link to his recent articles on public health. His obituary was also covered in the Lancet https://www.thelancet.com/action/showPdf?pii=S0140-6736%2818%2933174-X

300 entries with only nine from India.[15] Although citizen science projects began in 1899 the data for which the year of origin is available indicates that 177 of the 238 projects or 74% of the projects were initiated in the last decade (2010 to date) and over 91% since 2000. Citizen science is a recent but growing phenomenon worldwide. There are now regular conferences and institutional bodies such as the European Citizen Science Association (ECSA) that was launched in 2013 and has over 200 institutional and organisational members from over 28 countries. ECSA receives support from the European Union's Horizon 2020 programme and has organised two well-attended international conferences on citizen science.[16] ECSA has also come out with ten principles of citizen science, an output of one of its working groups. These principles include active involvement of citizens in generating new knowledge; projects with a genuine science outcome; both professional and citizen scientists benefit from the interaction; and several institutional processes on how citizens could be engaged in projects and their work recognized.[17]

The eight entries from India in the Wikipedia list of 281 citizen science projects interestingly have origins outside state science or public-funded universities. Sekhsaria and Thayyil 2019 reviewed citizen science projects on ecology in India indicating an increasing trend. Through CSMs there has been more involvement of the public in producing scientific knowledge outside of scientific institutions. CSMs go beyond traditional science communication with the public directly contributing to the production of knowledge. Potentially, CSMs reconnect professional scientists and the public in new ways, opening up opportunities for the public in creating science and in engaging in a more democratic debate on science and society (Strasser and Haklay 2018). A good review of citizen science projects is available by Strasser et al. 2018 where they suggest that rather than define citizen sciences it would propose to examine the epistemic practices and propose five typologies of citizen sciences. These are sensing; computing; analysing; self-reporting and making.

 Strasser and Haklay 2018 suggest that while definitions of citizen science exist with an entry in the Oxford Dictionary in 2014, these definitions do not provide an analytical lens that could describe or explain the multiplicity of practices. They identify four types of citizen science that also reveal relations between science and society. The first sees citizen science as a kind of scientific practice involving '(ordinary) citizens,' 'amateurs,' 'lay-people,' 'non-professionals,' or 'non-experts.' The second idea is that citizen science is about non-professionals producing knowledge. The third goes further and recognizes that citizen science is about producing scientific knowledge, i.e., the knowledge that can be recognized by a (professional) scientific community as following established scientific methods. The fourth, they suggest is present only in a few, is that citizen science should promote social and/or environmental justice (or 'make the world a better place'). It should not be carried out primarily for the interest of

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[15]   See https://en.wikipedia.org/wiki/List_of_citizen_science_projects.

[16]   For details on ECSA visit https://ecsa.citizen-science.net/about-us. As a participant-observer at the 2nd International ECSA conference in 2018 I noticed significant diversity among participants from across the globe and a vibrant atmosphere celebrating different ways of doing science. Indian participation was conspicuous by its absence.

[17]   See the ECSA 2015 document https://ecsa.citizen-science.net/sites/default/files/ecsa_ten_principles_of_citizen_science.pdf

science or scientists, but the underprivileged and the marginalized. This idea of democratising science, to use <u>Irwin 2015</u> understanding, is prevalent in large measure in the PSM and a sense unites the work of the late G D Agrawal and Sen.

Within India too there has been a newer thrust on citizens science projects (see <u>Sekhsaria and Thayyil 2019</u>). The advent of the Internet and India's significant lead in Information Technology or IT has shaped newer possibilities of decentring the process of data and knowledge generation and speedier dialogue on the generated data or knowledge. It is for instance much easier today for a citizen in Anand or neighbouring Vidyanagar to expand their scope of nature conservancy by aligning themselves to citizen science projects in India today than was possible a decade earlier. The National Centre for Biological Sciences, Bangalore, (NCBS) has been spearheading citizen science projects since 2007 through initiatives such as migration watch and season watch.[18] The 2018 Indian Science Congress reported rapid growth in citizen science initiatives in India that included an estimated 42 scientists and researchers working together in Indian Himalayan projects.[19] Indian scholars have also started publishing more on citizen science initiatives (<u>Datta et al. 2018</u>; <u>Vattakaven et al. 2019</u>).

There is indeed much to commend about these new developments in charting newer directions in science-society relations. Some of the principles, if followed, would enable better quality discussions in the ISC that is losing respectability, even as it is one of the few open events on science in India. I argue that welcome as these initiatives are and while there is much to learn from citizen science movements abroad and a strong case for better engagement in bi-lateral or multi-country projects (India was missing in the posters and presentations at the 2nd International conference ECSA), it is important to situate citizen science within the richer narratives of PSMs or Peoples Science Movements in India.

There has not been sufficient theorizing about these nascent initiatives. Are these new generation PSMs indicating newer ways of engaging with society or are they spontaneous entrepreneurial initiatives riding on new data possibilities in selected fields and domains? Is there a citizen science movement in India and if so, how has this changed science-society relations? What are the forms of public participation and do these have the potential for rethinking science and democracy in India? These are a few questions that I hope to explore in the following section.

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[18] See <u>https://www.thehindu.com/sci-tech/science/citizen-science-projects-take-root-in-india/article4074447.ece</u> for some of the early reporting on citizen science in India. Also see <u>https://vncindia.org/conservation-research/</u> for the activities even in a smaller city like Vidyanagar near Anand, Gujarat.

[19] See <u>https://www.downtoearth.org.in/news/science-technology/citizen-science-is-growing-in-india-say-experts-59945</u> for details.

Science and Public Participation in India

There has been a tradition of public engagement with science and technology in India that has resonances in the freedom movement. Indian critiques of science and technology cover a wide gamut of responses – traditionalists, neo-vitalists, organic technologists, Swadesi nationalists, theosophists, Gandhians, Nehruvians and Leninist technocrats (Visvanathan 2006). Following independence, it was however the Nehruvian vision of statist science that has been the dominant force. Nehru had famously remarked at the ISC in 1937 that "The future belongs to science and those who make friends with science." Amongst the newly independent countries after the Second World War, India was at the forefront among developing nations through significant state investment that saw a rapid expansion of S&T institutions until the 1960s. These investments were to lead to rapid economic growth and poverty reduction and the goals of the scientific establishment remained largely unquestioned until the 1970s.

By the 1970s there was widespread disillusionment with the fact that the fruits of S&T were not reaching India's vast populace. Some pointed to the exclusion of scholars from humanities and social sciences in India's apex bodies and bemoaned the urban bias and rural neglect by scientists (Sharma 1976). The late 1970s witnessed the emergence of science activism rooted in a concern for the public. Attempts were made to bring different voluntary groups that were critical about the benefits of science not being directed adequately to the poor and science serving the elite under the broad rubric of a Peoples Science Movement (Jaffry et al. 1983).

A second stream, comprising largely of social scientists, began a more radical critique of science and its relation to violence and hegemony (Nandy 1988; Shiva 1991; Alvares 1992; Visvanathan 1997). This 'Alternative Science Movements (ASM),' evolved largely outside the perspective of modem S&T and had a greater affinity to Gandhi's ideas and thoughts on the development of Indian society (Guha 1988; Visvanathan 2006). Another coalition highlighted indigenous or traditional sciences and technologies under the broad banner of the Patriotic and People Oriented Science and Technology (PPST) developed a critique of modern civilization embedded in modern science and technological systems. Articles in the PPST bulletins of the 1980s and 1990s countered the claims of modern science being universal, value-free and the only source of legitimate knowledge and enlightenment.[20]

Nanda 1998 critiques of post-modernism and the Indian critiques of science had led to science wars between these strands of science and society movements. However, as pointed out by Varma 2001 and Rajan 2005 there are reasons to look beyond these mythical science wars and engage with the questions. While the two movements had different origins and disciplinary orientations, they are part of the diverse engagement of science and democracy in India as

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[20] The Bulletin also published research on lost or aborted indigenous traditions of medicine, health, irrigation, building technologies, history, politics, social organisations, and the foundations of modern sciences in India (Krishna, 1997). PPST organized the first ever "Congress on Traditional Sciences and Technologies of India" (CTSTI) at the Indian Institute of Technology, Bombay in December 1993. About 300 papers were presented at the Congress which housed over 800 participants (Bakshi, 1993).

well as a pursuit for alternate pathways for science in India. These debates on science and democracy are pertinent for ongoing discussions on citizen science in India. A strong and possibly unifying thread that could enable a dialogue between the tradition and modernity, the lives of Agrawal and Sengupta, is the frame of science in civil society (Prasad 2002; Prasad 2005).

The physicist and science studies scholar, John Ziman, makes a case for including technically unqualified individuals as active, responsible actors in the production of scientific knowledge as the context 'speaks through them.' Ziman sees the scientific enterprise in need of political correction if science were to remain a moral enterprise. Technoscience, he suggests, has made data technicians of many scientists and mute spectators to the knowledge drama rather than knowledge producers in the world. He argues for a greater role of civil society and the need for citizens to be included, along with scientific experts, in groups that draft and review research programmes and project proposals. These 'non-experts,' he believes, can not only open up or articulate the partisan interests motivating the research but also give the research process meaning in life-world terms (Ziman 2016).

Knowledge Swaraj and an Indian citizen science critique

One such conversation on science and democracy is the Indian manifesto on S&T – *Knowledge Swaraj*. The group involved in drafting the manifesto was a loose network 'Knowledge in Civil Society' (KICS) that had started as a conversation among activists and practitioners who perceived that their critiques of science were being deemed anti-science, and scholars with the broad orientation of STS whose disciplinary orientation involved a critical engagement with science. The manifesto was developed over two years (2009-11) and included a pilot where the ideas of the manifesto were explored through case studies in water, health, sustainable habitats, agriculture and climate change.[21] The manifesto questions the dominant narrative of Indian science that led to a powerful, even undemocratic at times; science and technology establishment that has privileged the all-knowing scientific expert over the citizen.[22]

The Knowledge Swaraj manifesto draws inspiration from, though does not quote, Gandhi's *Hind Swaraj*. It recognizes Gandhi as a citizen scientist whose 1909 manifesto has often been read and seen as anti-science and Luddite. A closer look at his views on science (Prasad 2001) and his quest for an alternative science (Prasad 2002) indicates that Gandhi sought to articulate an alternative that was based on a critique of western science and a rethinking of the man-nature relationship. While he was against vivisection and was a votary of the Indian system of medicine – Ayurveda, he was keen to bring back the agency of the scientist and urged Indian

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[21] The manifesto is available at http://kicsforum.net/kics/kicsmatters/Knowledge-swaraj-an-Indian-S&T-manifesto.pdf and the pilots at http://www.indiawaterportal.org/sites/indiawaterportal.org/files/Piloting_%20Knowledge_%20Swaraj_A%20hand%20book_%20on_Indian_%20science_and_%20technology_%20KICS_%20(2011).pdf

[22] Sharma (Sharma 1976 1996) presents an account of the significant personal costs of dissenting with the scientific and nuclear establishment in India.

ayurvedic practitioners to learn from the spirit of sacrifice and experimentation of western scientists. He reinvented traditions and saw the ashram as a 'scientific and prayerful experiment.' His attempts to rethink and experiment with institutions could be seen as ways to reconfigure science and democracy. His institutions were premised on re-engaging scientists with the needs of India's development. This is evident in the way he established, for instance, the All India Village Industries Association in 1934 that had prominent scientists such as J C Bose and Sam Higginbottom on its Board. The Charkha prize, announced by him in 1928 is another example of a conversation on science and democracy. In his discussions with manufacturers of the spinning wheel, Gandhi sought to carve out an alternative space of science in civil society.

Public participation in science was a feature of much of the experiments in the Khadi movement even after Gandhi's demise. Among other things were institutional innovations such as a technical journal in Hindi, *Ambar*, from 1948-1964 and several *saranjan sammelans* (instrumentation conferences) that were organised and had wide participation from different parts of India. This was the period when modern Indian scientific institutions were being established and these experiments could be seen as the early stages of the citizen science movements in India.

Knowledge Swaraj (KICS 2011) seeks to re-establish a critical scientific tradition in India that seeks self-rule of its science and technology and that was being seen in many peoples science and social movements across India. It argues against the tyranny of the expert in contemporary science policy in India and for a knowledge democracy that draws its agenda for research and technology on the richness of Indian culture and the needs of the Indian people. It is a pro-science manifesto that favours a new form of science. The manifesto begins with interrogating expertise by challenging the expert vs. layperson dichotomy. It argues that citizens have different kinds of expertise that scientific expertise needs to dialogue with.

The manifesto questions the tenuous link between knowledge and democracy in India and presents a newer vision of a science-society contract that is rooted in trusteeship. It makes a plea for reinvigorating the ideals of gift-giving and hospitality, a newer socialisation of research and technology that seeks to translate a vision of a non-violent science built on ideas of science for sacrifice. It calls for holders of knowledge to become trustees rather than exclusive owners.

The manifesto foregrounds the values of sustainability, plurality, and justice. The Manifesto's understanding of sustainability is long term, with emphasis on universal human rights with access to food, health and education, and a focus on reduction of vulnerability of the underprivileged. It argues that societies would be vulnerable without the plurality of knowledge. Recognizing plurality begins by the realization that there are multiple knowledge systems and the need for skills and mindsets for an engagement across differences, recognition of different kinds of experts as opposed to the conventional division of experts and non-experts. Democracy as a theory gives voice and as a practice, it allows for

participation; but it is still incomplete if it does not allow for alternatives that challenge the *status quo* and celebrate the innovation at the margins.

Taking knowledge democracy seriously implies a new form of justice-cognitive justice. Cognitive justice recognizes the right of different forms of knowledge to co-exist. It goes beyond tolerance or liberalism to an active recognition of the need for diversity. It demands recognition of knowledge: not just as a method, but also as a culture and a way of life. Cognitive justice recognizes the diversity of time beyond the instant time of global financial markets and local industrial manufacturing plants; and the need to value other varieties of time such as tribal time, body time, and festival time. The manifesto presents the case of newer democratic experiments that reflect the values mentioned above and urges policy-makers to be more open to experiments on S&T from civil society for ideas for the future. Given the complex and uncertain world environment, the manifesto does not seek to be a final document, but an offering to think, revise and co-create.

Citizen Science and Knowledge Swaraj: Rethinking Science and Democracy

An interesting insight from the 2018 floods in Kerala shows how such possibilities of citizen science could work. Over 400 lives were lost in less than a week of unprecedented heavy downpours that devastated the state of Kerala in August 2018. The unlikely heroes of the rescue mission were the over 1200 fishermen from the coasts of Kerala who travelled 120 km with their boats often in areas where the Army and other disaster management forces found difficult to enter. The Kerala Fishworkers' Union opened a control room to coordinate with other agencies and the fishermen pooled their resources and are estimated to have saved over a lakh lives and are estimated to have suffered a loss of Rs 3 lakh to their damaged boats. It is their experience of the outburst of the Ochi cyclone a few months earlier that led them to be prepared.[23] They used their traditional knowledge and experience in a modern context. The ruling Left Front government had not only recognized their efforts but has also announced schemes for the fisherfolk to be recruited as coastal wardens and creating rescue volunteers in every district.[24]

The citizen science initiative of the fisherfolk has inspired citizens and social entrepreneurs such as Lakshmi Menon to start a FriendShip campaign to recognize the work of the 4,000 fisherfolk who rescued close to 65,000 people. [25] Another initiative that has interested the

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[23] See Doolnews reports on the flood https://www.doolnews.com/keralas-own-army-our-heroes-kerala-flood-rescue-999.html and https://www.doolnews.com/manu-v-devadevan-writes-about-kerala-flood258.html

[24] See Thomas Isaac's twitter https://twitter.com/drthomasisaac/status/1035702435010961408andhttps://indianexpress.com/article/india/kerala-floods-fishermen-relief-rescue-operation-5317511/ and https://www.developmentchannel.org/2018/09/01/role-of-fishermen-in-kerala-flood-disaster-management-hailed/ for the wide recognition of the work of fishermen.

citizens of Allapuzha is the CANALPY (or Can Allepey) project where citizens are involved in a canal rejuvenation project through participatory sanitation planning. The project has evolved through an engagement of scientists with citizens and encouraging local people and youth to take initiative and to design support management institutions and solutions for a sustainable future with canals.[26]

I would argue that it is often in these stories from the field, rather than academic debates, that a newer engagement of science and democracy is possible. The Kerala rescue mission shows instances of recognition of cognitive justice and the plurality of knowledge systems in India that would make a sustainable future possible. Was the Kerala rescue mission a citizen science experiment or experience? Would our current understandings and boundaries ignore such possibilities in India where the scientific knowledge of 'lay' citizens, the fisherfolk, has been used to provide solutions with the state enabling the same? What would this mean for the governance of science and technology and would such possibilities be only restricted to disasters? The fisherfolk as citizen scientists seem to point to newer directions and new knowledge beyond the fantastic claims made during the ISC 2019.

The recent pandemic that has affected millions of lives across the world has shown similar stories of local initiatives and science movements. The dominant narrative assumes that it is only a vaccine that can solve the problem. However, citizens and local governments cannot wait indefinitely for these magic bullets. In fact, it is the local capacities of citizens supported by the state that has come in handy in Kerala again. Community participation combined with a strong public health system and clear risk communication helped Kerala tide over the Covid crisis. Prior experience with the Nipah outbreak that had neither treatment nor vaccine available, came in handy (Sadanandan 2020; Rahim and Chacko 2020). As observed by Kurian, 'As rich, muscular hospital systems across the world—which have opted for a spaghetti western-style standoff with the coronavirus—are quickly getting overrun, perhaps there are lessons to be learned from the nimble-footed, **community-oriented**, cautiously aggressive approach that Kerala opted for, with great initial results in terms of slowing the spread and limiting deaths' (emphasis added).[27]

Other parts of India too have built on the importance of communities and public participation during Covid as local institutions backed by science have been developing local solutions for Asia's largest slum, Dharavi (Golechha 2020). In an increasingly complex and uncertain world not utilising the potential of citizen's participation in scientific activities would actually make the world more vulnerable. As highlighted by Kumar, 'India's 'social capital' — its citizens, civil society, corporates and academia — are its strength during a crisis.'[28] As Amartya Sen warns us, the war metaphor and scientific magic bullets, are likely to be counterproductive. 'Listening is central in the government's task of preventing social calamity — hearing what the

[25]   See https://yourstory.com/herstory/2019/08/social-entrepreneur-gratitude-kerala-floods-fishermen.
[26]   See https://canalpy.com/mission/ also https://canalpy.com/winter-school-2018/ for more details.: Re
[27]   Also see Oommen Kurian in https://www.theguardian.com/commentisfree/2020/apr/21/kerala-indian-state-flattened-coronavirus-curve

problems are, where exactly they have hit, and how they affect the victims...governance can be greatly helped by informed public discussion.'[29] Participatory and deliberative democracy are important elements that cannot be wished away as we plan a new scientific future and policy.

Conclusions

This paper has reviewed public participation and citizen science in the Indian context. These ideas, I suggest, need to be looked at within the rich history of PSMs in India and specifically, the role played by dissenting scientists. Citizen science is not just a tool for scientific communication or involving citizens in data collection. The role of the citizen in idea generation is welcomed but often not in questioning science or the scientific establishment. Citizen science in India should also aim for rethinking the relation between science and society. Within the Indian context citizen science experiments needs to be broadened to include the Indian PSMs and need to be seen as part of ongoing efforts to rework the contract of science and democracy. We have also shown how ideas of an alternate conception of science and democracy and greater public participation in science even predate India's independence and have been largely ignored in India's quest to modernize and build its scientific and technological manpower post-independence. As India reworks its science and innovation policy towards greater inclusiveness and equity the experiences of PSMs and experiments in public engagement of science can provide useful insights. One such quest has been for science beyond the state and the market.

There has been a recent revival of public participation in science through citizen science initiatives. While India can learn from the vibrant movements on citizen science internationally, it could also contribute to these discussions by bringing the critical element of citizen's knowledge in preparing the world to cope better with climate stresses like floods and even the Covid 19 pandemic. There is indeed a case for transforming many citizen science initiatives into citizen science movements in India and for the scientific establishment to pro-actively explore responsible innovation in the Indian context. However, any research programme should go beyond being merely celebratory and be open to contestations and controversies that I argue is inevitable in the Indian context given the plurality of knowledge systems. I suggest that researchers should seek dissenting views both from within the scientific establishment and from outside. Academia has an important role to play in creating spaces for dialogues on knowledge rather than being the handmaiden of the State.

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[28]   See   https://indianexpress.com/article/opinion/columns/india-coronavirus-community-kitchens-helathcare-workers-covid-19-monitoring-6374637/   also
        see https://www.livemint.com/opinion/columns/opinion-how-odisha-and-kerala-are-leading-from-the-front-in-war-against-covid-11587810374135.html
[29]   See https://indianexpress.com/article/opinion/columns/coronavirus-india-lockdown-amartya-sen-economy-migrants-6352132/

References

1. GoI. 2020. *Science, Technology, and Innovation Policy.* New Delhi, Ministry of Science and Technology.

2. EPW, 2001. Editorial. Science: Grassroot Concerns. *Economic and Political Weekly*, 36(1): 6.

3. EPW 2019. Editorial. Ancient India,Modern Science, and Insecurities. Economic and Political Weekly, 54(2): 9.

4. Gibbons, M. 1999. Science's new social contract with society. *Nature*, 402(6761supp), C81.

5. Wynne, B. Felt, U., Callon, M., Gonçalves, M. E., Jasanoff, S., Jepsen, M., & Tallacchini, M. (2007). *Taking European knowledge society seriously*. Report of the Expert Group on Science and Governance to the Science, Economy and Society Directorate.

6. Stilgoe, J., Owen, R., & Macnaghten, P. 2013. Developing a framework for responsible innovation. *Research Policy*, 42(9), 1568–1580.

7. Pandey, P., Valkenburg, G., Mamidipudi, A., & Bijker, W. 2020. Responsible Research and Innovation in the Global South: Agriculture, Renewable Energy and the Pursuit of Symmetry. *Science, Technology and Society*, 25(2), 215-222.

8. Prasad, C. S. 2020. Constructing Alternative Socio-technical Worlds: Re-imagining RRI through SRI in India. *Science, Technology and Society*, 25(2), 291–307.

9. Dash, B. 2020. Science, State and Meteorology in India. Dialogue – Science, Scientists, and Society, 3(1).

10. Bhadra, M. 2013. Fighting Nuclear Energy, Fighting for India's Democracy. Science as Culture, 22(2), 238–246.

11. Varughese, S. S. 2020. Expertise at the 'Deliberative Turn': Multiple Publics and the Social Distribution of Technoscientific Expertise. Dialogue – Science, Scientists, and Society, 3(1).

12. Abrol, D. 2013 New science, technology and innovation policy: A critical assessment. *Economic and Political Weekly*, 48(9): 10-13.

13. Prasad, C. S. 2014. Revisiting Science's Social Contract. *Seminar*, 654, 55-61.

14. Sekhsaria, P., and Thayyil N 2019. Citizen science in ecology in India: A preliminary mapping and analysis. Delhi: DST Centre for Policy Research, Indian Institute of Technology Delhi.

15. Strasser, B. J., and Haklay, M. 2018. Citizen Science: Expertise, Democracy, and Public

Participation. Citizen Science, Excerpt of the second part from the Swiss Science Council (SSC) policy analysis 1/201876. https://wissenschaftsrat.ch/images/stories/pdf/en/ SWR_PolicyAnalysis_CitizenScience_INHALT_EN_excerpt.pdf

16. Strasser, B. J., Baudry, J., Mahr, D., Sanchez, G., & Tancoigne, E. 2018. "Citizen Science"? Rethinking Science and Public Participation. *Science & Technology Studies*, 32, 52–76.

17. Irwin, A. 2015. Citizen Science and Scientific Citizenship: Same Words, Different Meanings? In Schiele, B., Marec, J.L. and Baranger, P. (eds) Science Communication Today – 2015. Nancy: Presses Universitaires de Nancy, pp29-38.

18. Datta, A., Naniwadekar, R., Rao, M., Sreenivasan, R., and Hiresavi, V. 2018. Hornbill Watch: A citizen science initiative for Indian hornbills. *Freshwater Science* 14(3), 6.

19. Vattakaven, T., Surendran, H., and Rajagopal, P. 2019. A decade of the India Biodiversity Portal: Planning ahead with technology to enhance citizen science participation in India. Biodiversity Information Science and Standards, 3, e37202.

20. Visvanathan, S. 2006. Alternative Science. *Theory, Culture & Society*, 23(2–3), 164–169.

21. Sharma, D. 1976. Growth and Failures of India's Science Policy, *Economic and Political Weekly*, 11(51): 1969-71.

22. Jaffry, A., Rangarajan, M., Ekbal, B., & Kannan, K. P. 1983. Towards a People's Science Movement. *Economic and Political Weekly*, 18(11), 372-376.

23. Nandy, A. 1988. Ed. Science, Hegemony and Violence. Delhi: Oxford University Press.

24. Shiva, V. 1991. The Violence of the Green Revolution: Third World Agriculture, Ecology, and Politics (Penang, Malaysia: Third World Network).

25. Alvares, C. A. 1992 Science, development and violence: The revolt against modernity. Oxford University Press, USA.

26. Visvanathan, S. 1997. A carnival for science: essays on science, technology, and development. Oxford University Press, USA.

27. Guha, R. 1988. The alternative science movement: an interim assessment, *Lokayan Bulletin*, 6(3), pp. 7–25.

28. Nanda, M. 1998. Reclaiming Modern Science for Third World Progressive Social Movements, *Economic and Political Weekly*, 33(16): 915-922.

29. Varma, R. 2001. People's Science Movements and Science Wars? *Economic and Political Weekly*, 36(52), 4796–4802.

30. Rajan, S. R. 2005. Science, state and violence: An Indian critique reconsidered. Science as Culture,

14(3), 265–281.

31. Prasad, S. C. 2002. Exploring Gandhian science: A case study of the Khadi movement. Doctoral dissertation, Indian Institute of Technology, New Delhi, India.

32. Prasad, S. C. 2005. Science and technology in civil society: The innovation trajectory of spirulina algal technology. *Economic and Political Weekly*. 40: 4363-4372.

33. Ziman, J. 2016. Science in civil society. Imprint Academic, Exeter.

34. Prasad, S. C. 2001. Towards an understanding of Gandhi's views on science. *Economic and Political Weekly*. 36(39): 3721-3732.

35. KICS. 2011. Knowledge Swaraj: An Indian Manifesto on Science and Technology. Knowledge In Civil Society (KICS), Hyderabad, India. http://kicsforum.in/kics/kicsmatters/Knowledge-swaraj-an-Indian-S&T-manifesto.pdf

36. Sadanandan, R. 2020. Kerala's response to COVID-19. *Indian Journal of Public Health*, 64(6), 99.

37. Rahim, A. A., and Chacko, T. V. 2020. Replicating the Kerala state's successful COVID-19 containment model: Insights on what worked. *Indian Journal of Community Medicine*, 45(3), 261.

38. Golechha, M. 2020. COVID-19 Containment in Asia's Largest Urban Slum Dharavi-Mumbai, India: Lessons for Policymakers Globally. Journal of Urban Health : Bulletin of the New York Academy of Medicine, 1–6.