Ministry of Housing and Urban Affairs
Government of India

National Institute of Urban Affairs

Smart City
MISSION TRANSFORM-NATION

iscf
Ministry of Housing and Urban Affairs

ISCF *DIGEST*

Volume 4 // October 2021 - March 2022

India Smart Cities Fellowship Program

Introduction

People's processes and systems organically evolved are at the core of a resilient society. With the unprecedented urbanization underway in the past two decades, there has been a substantial rise in acute events threatening communities' survival and coexistence within their natural habitat. Geographically and culturally diverse Indian subcontinent observes a wide array of stresses; natural and man-made like cyclones, floods, droughts, locust attacks, social constructions manifesting in the form of ecological diversity and gender repression, the slow, perpetual disaster of air pollution, and more.

As rightly reflected by Helena Norberg-Hodge in Ancient Futures: Learning from Ladakh, "The old culture reflected fundamental human needs while respecting natural limits. And it worked. It worked for nature, and it worked for people. The various connecting relationships in the traditional system were mutually reinforcing, encouraging harmony and stability." This brings the need for deliberating over the evolving indigenous wisdom and traditional techniques of sustenance communities to adopt in their constant exchange and dialogue within the natural world, being a participant.

This series of work subsequently investigates Grassroots Narratives of Disaster Resilience in the Indian Subcontinent. The theme explores various disasters and everyday challenges that inevitably characterize Southern Urbanism, like cyclones and floods, climate change-induced migration, and gendered housing paradigms, among others. It captures the various efforts of the communities and other responsible institutions in once again reviving the livability, natural world, community and habitation as an intertwined whole.

The Team

Editorial Team

Nabamalika Joardar
India Smart Cities Fellowship Manager

Monika Thakur
Advisor

Nikhil Sanjay Shah

Prasanna Bhangdia

Rashi Jain

Shonit Nayan

Tarini Gupta

Design Team

Abhishek Chatterjee

Akruti Murhekar

Roshni Gera

Sarayu Madhiyazhagan

Table of Contents

Unpacking Discourses

01
Building Disaster Resilience through Self-Constructed Homes in Urban India
Divya Chand *Page 01*

02
Building Resilience through Addressing Rural-Urban Migration in Context Climate Change in India
Dr. Manoranjan Ghosh *Page 07*

03
Role of Art: Communication of Climate Risk & Disaster Resilience - A Curation
Prakriti Saha *Page 10*

04
Kedarnath: Development at What Cost?
Swati Pradhan
Vasudha Sharma *Page 15*

Creative Corridor

05
Heritage and Development: A Tale of Coexistence
Satarupa Roy *Page 19*

06
The Big City & the Disaster of Anonymity
Ritika Rajput *Page 20*

07
Journey of a Water Droplet
Kaustubh Mirajkar, Ojaswini Bansal, Sarayu Madhiyazhagan *Page 21*

Fellowship After-hours

08
Title Building Winter School 2021: Pandemic & the Southern City I
Divya Chand *Page 25*

09
Research Paper Publication on Urban air quality
Dr. Manoranjan Ghosh *Page 26*

10
Research Paper on Thin Film Solar Cells
Shivam Dave *Page 27*

Testimonials

11
Sai Varsha Akavarapu *Page 28*

1 Building Disaster Resilience through Self-Constructed Homes in Urban India

I was introduced to Hazra Banu as the beneficiary of a microfinance house-up-gradation loan in September 2019. She lives with her joint family, in a household that fluctuates from 5 to 10 members in an unplanned neighbourhood of Ahmedabad, India. The family used to rent this plot of land from a local landowner until 8 years ago, when they bought it off him. The house used to be a rickety single-story structure with a tin roof before the recent upgrade, to the current double storied house with four large rooms and a kitchen.

When the family decided that they could afford an upgrade in their living conditions, they considered buying and moving into a 6-storey apartment complex in a fancier neighbourhood. This idea was soon abandoned, as they did not want to lose their piece of land, proximity to their family and friends in the neighbourhood, access to their porch and terrace, and a room on the ground floor so the elders in the family did not have to climb stairs. So, it was decided that a larger house be built on the same plot of land. A local contractor in the neighbourhood was identified who happened to be a family connection from the same religious community.

Taking inspiration from a neighbour's new house and combining it with the family's aspirations, a layout was prepared and construction began under the supervision of Hazra Banu herself. The men of the family were 'too busy with their work' to look over construction. Work progressed slowly as the family moved in with relatives, the contractor crossed the initial estimate mid-way through the project. It was at this time that Hazra Banu approached the field workers active in the neighbourhood about the housing up-gradation loan. When the loan from the micro-finance trust was sanctioned, its employees assessed the quality of the construction that was taking place and suggested changes to improve light and ventilation. They also indicated the resilience

From the balcony of her first-floor bedroom, Hazra Banu shows me the neighbouring houses to illustrate what her house looked like a year ago. Ahmedabad (September 2019)

standards that the new structure had to abide by. With the loan and technical assistance, the house was upgraded. A neighbour declared to me proudly that Hazra Banu is like a 'feminist heroine' for women in the neighbourhood. The all-female microfinance trust was added to her agency. Along with getting the biggest house in the street built with little involvement from the men of the family, she is a leader organizing women and giving speeches at local events about the need for women to assume agency over their households. The new house is now a social space in the daytime, for friends and neighbours to gather and socialize, when the men are at work. Speaking to homeowners like Hazra Banu shows how most self-constructed houses in urban India, though emerging from similar peripheral processes, are all distinct and personal. They are held up by strong kinship-based networks

and dense small-scale economies. In the context of the rapidly growing unplanned neighbourhoods, there are larger stronger houses they aspire to be, yet they are beacons of hope and growth for other more precarious houses. They embody the Indian homeowner's dream of a pucca and resilient house that grew as the family grew to accommodate its wishes and needs.

The diagram below maps out the steps of self-construction and various actors who are potentially involved. This seemingly linear process is made possible through a web of social and governmental processes. The homeowner plays the central role as they design the layout, fund the construction with their savings, procure materials and services, and supervise the construction on site. Friends and family are the basis for the lateral network through which decisions are made. They often provide credit finance, references to contractors or other actors, social security, a temporary place to stay and store materials, and influence decision making at each stage, including the architectural design and construction practices. Local contractors often end up playing the role of architect or an engineer as

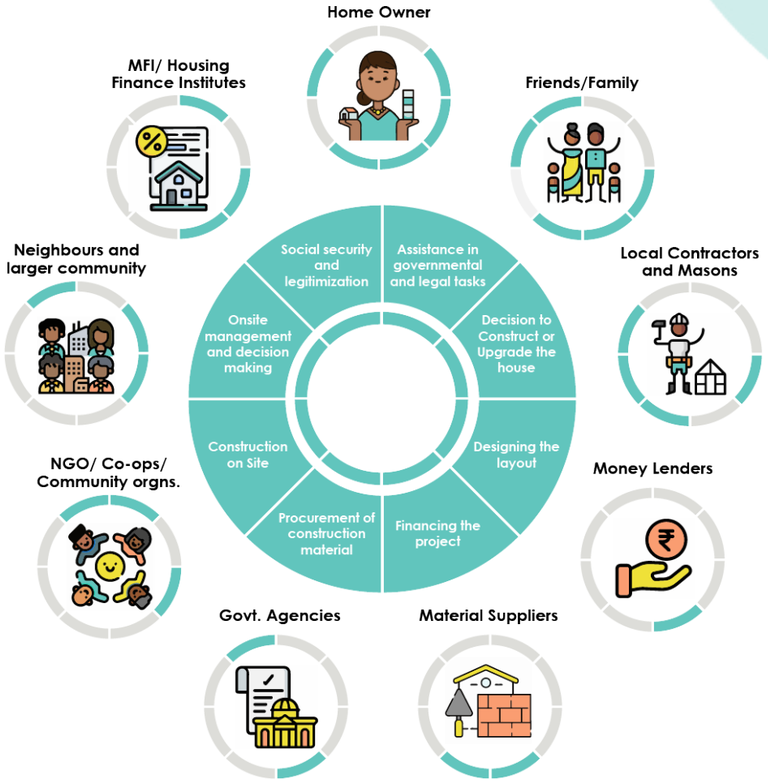
From the balcony of her first-floor bedroom, Hazra Banu shows me the neighbouring houses to illustrate what her house looked like a year ago. Ahmedabad (September 2019)

well. In many cases, it is just the mason playing all 3 roles. They procure material and work in tandem with the owner to get the house built. Material suppliers provide construction resources and finance through credit systems. Government agencies may carry out neighborhood-scale up-gradation drives and provide network services to self-constructed houses. Documentation activities undertaken by the state provide legitimization to auto-constructed areas. NGOs bridge various gaps of finance, knowledge, and political influence. Neighbors and the larger community greatly influence construction, design, and finance decisions by setting a localized status quo. Local leaders help provide social security and legitimization of construction, by interfacing the state, political lobbying, bringing in information, and championing certain actors. Micro-finance institutes or housing finance companies provide construction finance loans for self-construction and up-gradation projects, to homeowners who may not have access to state and private banks. The government, through PMAY, also offers beneficiary-led construction loans for landowning residents.

Like Hazra Banu, across the Global

South, inhabitants act with a specific temporality and agency in the production of their space. It is extremely common for owners to play a central role in building their own homes relying on social relations to acquire funds, materials, and services, and dictating how their houses are built incrementally. Though affordable, resource-efficient, and serving a market not addressed by formal private real-estate players, this mode of housing comes with inherent heterogeneities. Homes created are always a unit-scaled effort and can be structurally unsound, unhygienic, cramped, and vulnerable to disasters. In setting priorities in the construction process, every homeowner balances a complex set of non-monetary, as well as monetary criteria which they have to make trade-offs between. It emerges from the research that obstacles are not simply economical, and informality does not merely imply bad construction quality, even though these are often important aspects.

In such a scenario, the imposition of building standards and an authoritative regime as opposed to self-construction would only create new spaces of tangential action. The



Process and Actor-network map for self-construction of houses in India; based on interviews and secondary study, especially (van Noppen et al., 2011)

context demands a new design brief for better housing: enabling resilience does not merely mean provision of stronger houses, but rather provision of the means to create more resilient lives in the city. These means could be legal, social, financial, or technical in nature. What works to make a practice successful in enabling resilience is to acknowledge the peripheral nature of this housing, work with a new design brief, a problematic reframing of the housing problem as a lack of access to knowledge and resources, not a lack of houses in the city. Conserving the lateral social networks and local micro-economies in the existing housing delivery configuration is key and demands the expansion of conventional roles and interdisciplinary partnerships. To make urban homes disaster-proof, designs need to encourage incrementality ensuring resilience in each upgrade. Housing practices have to work to maximize the agency of the homeowner and let the residents inform their operations, instead of the other way around. The service of providing good design and technical assistance for disaster resilience has to be facilitated rather than sold as expertise.

References:

Bhan, G. (2019). Notes on a Southern urban practice. Environment and Urbanization. https://doi.org/10.1177/0956247818815792

Caldeira, T. P. (2017). Peripheral urbanization: Autoconstruction, transversal logics, and politics in cities of the global south. Environment and Planning D: Society and Space, 35(1), 3–20.

Jaglin, S. (2014). Regulating Service Delivery in Southern Cities: Rethinking Urban Heterogeneity. The Routledge Handbook on Cities of the Global South.

Van Noppen, A., Backman, J., Ferrario, M., Naik, M., Mehra, R., & Yenghkom, V. (2011). Self Construction: Enabling safe and affordable housing in India. New Delhi: Micro Home Solutions.

Turner, J. F., & Ward, C. (1977). Housing by people: Towards autonomy in building environments. London: Marion Boyars.

INHAF (2020, July 15). Rethinking Cities: Multiple Channels for Producing Urban Housing. Retrieved July 15, 2020, from https://www.youtube.com/watch?app=desktop

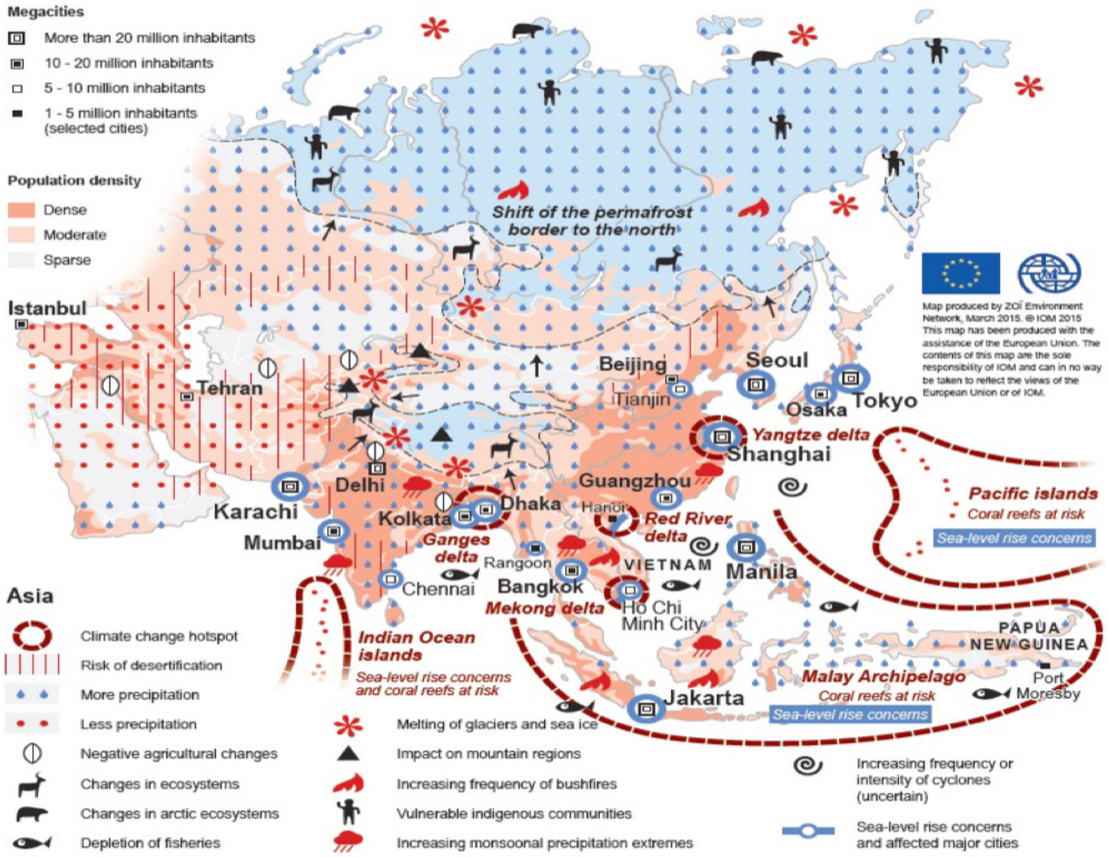
Divya Chand

2 Building Resilience through Addressing Rural-urban Migration in Context of Climate Change in India

According to the Census of India (2011), 68.84% of the total population reside in rural India, and out of which, 30.9% are living below the poverty level; besides, climate change is adversely affecting rural agricultural production and negatively affecting the overall livelihood opportunities (Ghosh and Ghosal, 2020). The above condition has been pushing the economically affluent groups and the impoverished rural populace towards relatively more attractive urban centres. The immigrant population of the particular urban centre makes the place more vulnerable and creates obstacles to building the adaptive capacity to climate change for the time being (Srivastava and Shaw, 2016). It is even more critical in the case of urban places which are already vulnerable due to their geographical location and ecological frugality, such as the Himalayan cities and coastal cities of the Indian Subcontinent. Moreover, climate change's adverse effects on urban ecosystems services and land-use patterns push the urban dwellers towards distress and community conflicts (Parves and Ilina, 2021).

Unfortunately, the Indian urban social safety networks are not well equipped to manage the climate vulnerabilities of urban populations themselves, and it is on a collapsing trend when it comes to the issue of rural migrated people in urban areas; it often emerges in the form of new set of risks as rural migrants in the begin to occupy precarious urban settings.

The widely acknowledged fact is that 'Urban Places' are sentinels of climate change, as well as a place where human life and livelihood have been transforming rapidly. Therefore, urban changes need to be understood through a multidimensional lens because of its uniqueness, extent, and manifestations of ways of living. India, being the world's fastest emerging economy, the country's urban physical infrastructure has been getting a thrust as a single



Map showcasing climate change hotspots & major urban locations in Asia,
Source: UN Environmental Migration Portal, 2015

standardised model of growth, but the country needs more sustainable and resilient infrastructure owing to its diverse topography, climate, and socio-economic conditions.

In response to this nexus between rural-urban migration and widely known facts and consequences of climate-induced rural to urban migration; we would like to provide an overview of strategies on how we can build more resilient urban places in India, considering the social, economic, and political dimensions of India's development trajectory:

Identifying the spatial hotspot of rural places, from where the climate stress induced displaced people are heading towards the urban area. Furthermore, create spatial and temporal databases capturing the

nature of migration; permanent or temporary along with the reasons for why, how, and where the communities migrate.

Enabling participatory relocation mechanism for climate-induced rural displaced people. For example, the urban fringe region or nearest safe, relatively less migration-affected cities with proper social safety, education, and livelihood opportunities.

Spreading awareness among migrants may also need to be developed about the migration saturated condition of certain parts of the city, such as few regions in the Mumbai city have already been saturated by the rural migrant in recent decades. Therefore, city authorities must focus at ward level migrated settlement strategy to address the carrying capacity of the region to ascertain dignified and liveable living conditions.

Ensuring human rights for the climate stress induced migrants and developing low-income housing programs for them would be beneficial as many cities in India lack adequate and affordable housing facilities. Additionally, such initiatives would augment the scope of climate migrants adequate scope, socio-political rights and voices with the city's democratic involvement.

Securing adequate institutional and prompt decision support systems for climate migrants, such as the major stresses in livelihood generation among the migrants. Addressal of critical questions such as; why have you considered this city, how do the flood, drought, and heatwave within this city affect your employment generation? What are the major economic sectors, climate migrants looking for livelihoods? How do the city's existing facilities affect climate migrants' daily activities and wellbeing and vice-versa (incapacity of the city)?

References:

Census of India. "Census of India Report", 2011.

Ghosh, Manoranjan, and Somnath Ghosal. "Determinants of Household Livelihood Vulnerabilities to Climate Change in the Himalayan Foothills of West Bengal , India." International Journal of Disaster Risk Reduction 50, (2020): 101706.

Parves, Masud, and Irina N Ilina. "Climate Change and Migration Impacts on Cities : Lessons from Bangladesh." Environmental Challenges Journal 5, no. May (2021): 1–9.

Srivastava, Nitin, and Rajib Shaw. "Enhancing City Resilience Through Urban-Rural Linkages." In Urban Disasters and Resilience in Asia, edited by Rajib Shaw, Akhilesh Surjan, Atta-ur Rahman, and Gulsan Ara Parvin, 113–22. Elsevier Inc., 2016.

Dr. Manoranjan Ghosh

3 Role of Art: Communication of Climate Risk & Disaster Resilience – A Brief Curation

"Art is not what you see, but what you make others see"

– Edgar Degas,
French Impressionist

In an emerging data-driven world, where numbers define human existence, a major divide prevails among those who can comprehend letters and numbers and those who cannot, but are impacted nevertheless. This becomes a concern when the incomprehensible information is indicative of threats that loom over life and the unaware remain unaware due to illiteracy and knowledge sharing in silos. Discourses concerning the risks of climate change have resulted in several policy level initiatives. Yet, in common opinion, a bottom-up approach through sensitizing the importance of climate risk at the grass roots can improve awareness manifold. Where education systems fall short in fulfilling this role in economies struggling with the basics-of-living, one imagines how 'communication' itself can be transformed to convey the urgency of the crisis on a mass level, irrespective of diction, dialect, literacy or boundaries.

Be it of cacophony or desolation, synthesis or dissemination, art has been a storyteller of the most ancient kind. It has illuminated us with histories of our existence and ignited imaginations of futuristic possibilities. A language without alphabets and thus an ammo of inclusive communication, various forms of art are becoming a canvas for expressing the plight of our planet.

Visual Art

On Canvas

The curation of cultural response to the climate crisis by Indian artists begins with the Gond artworks from Madhya Pradesh exhibited at the UN meet 2019 (COP25) in Spain. Dilip Shyam's shesh naag with the body of a tree trunk metaphorically depicts the world holding life within itself, while man advances to axe and

abuse the bounty of natural resources. The bold choice of colours is Dhawat Singh's way of conveying the importance of trees in balancing out the ill-effects of human activities and sustenance of biodiversity.

Visual Art - Gond Painting, Dilip Shyam

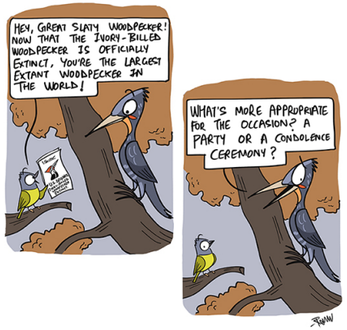
Canvas on street

The scale of the canvas has a huge role in making a statement, and so a spotlight on Indian street art becomes essential. The Climate Art Project weaves art, science and environment to express the need for exigent measures to address the climate crisis. Visual artist Andreco undertook 'Climate-05-Reclaim Air and Water - Delhi' to 'raise awareness on global warming and to disseminate the nature-based solutions and the best practices for Climate Change adaptation and mitigation'. The mural displayed at the Lodhi Art District has been made using 'air-ink', a colour made from the smog and is themed around air pollution. The composition illustrates the chemical elements, graphs and charts based on the research by IPCC, NEERI and CSE. A second exhibit in the same area depicts the catastrophic effect of global warming shows a deflated earth and a drowning hand by the American street muralist Gaia.

Street Art -
Delhi Climate Art Project

Comic Strips

When transformed into a light graphical language, art can help lure young learners towards subjects of climate change during early education, thus sowing seeds of a responsible citizenry. A series of comic strips takes art to a different level in Rohan Chakravarty's 'Green Humour'. His attempts to understand serious matters through comedy, cries aloud the ill-effects of climate change and the dire need in expediting conservation efforts.



Comic Art - Green Humour

Sculpture – Sand Art

A consistent pattern is observed in the sculptor Sudarshan Patnaik's portfolio about the importance of climate resilience. The Padma Shri awardee creates and curates consistently on the World Environment Day on the beaches of Puri, an open exhibition that engages a huge audience, thus reaching out to the local inhabitants & tourists while making a global statement. Tactility, temporality and the third dimension when included, allows the viewer to get closer to the art and hence the subject, with a more lingering impact.

Sand Art - Sudarshan Patnaik, 2019

Music - Oorali Band on Bus

Music

While visual art needs to be visited; another incarnation of art has the capacity to reach the audience when the audience cannot. In its intangible form as music, art can breeze into the wildest corners of the planet as its malleable nature accommodates every language and can impact generations.

'Shanti Samsara' by the renowned Indian composer Ricky Kej premiered in 2015 UN Climate Change Conference (COP21) in Paris in 2015. The Grammy awardee is also an environmentalist, creating awareness about the environment and positive social impact through the music he creates. His album, 'EK' , comprising 12 songs released in 2020, promotes environmental consciousness. Numerous musical collectives from southern India have been initiating 'climate concerts' to raise disaster resilience awareness. A new genre of music seems to be evolving with a consistent theme for song writing, and the melodies are composed to suit the different tastes in music.

Swarathma started the year 2021 with their Republic Day gig to inspire and celebrate India's Water Warriors. The band with the motto 'Music for change', has played in aid of Indian Youth Climate Network (IYCN) and supported Greenpeace in India to raise awareness about climate-change.

The travelling band from Kerala, Oorali Express converts their bus into a stage on various locations, and begin musical conversations with their audience themed around climate and caste while their sounds swing from folk to rock.

Films

With visual art and sound woven together, storytelling can transform ways of life. Art in the form of films is well known for its gigantic outreach for conveying messages irrespective of age or status.

In a musical video 'Chennai Poromboke Paadal', TM Krishna, the Carnatic doyen from Chennai is seen urging to save the Ennore Creek. The film was conceived through an article

by Nityanand Jayaraman, a Chennai based environmental activist, that was condensed by the lyricist Kaber from Tamil band Kurangan initially. Poramboke - the word refers to land that is reserved for communities to share and use. The film was shot along the Ennore Creek where 2,000 acres of the wetlands were likely to turn into real estate developments and the creek was likely to become a toxic fly ash dump.

Film - Climates First Orphan

'Climate's First Orphan' by Nilab Madhab produced by the British High Commission is one of the many impactful documentaries on climate change. The visuals of the wrath of the rising Bay of Bengal claiming five coastal villages and with it the existence of 20,000 villagers in the cyclone; hitherto a community tube well now seen next to the sea in coastal Orissa due the rising sea levels; and an old woman staring at the same sea, remembering where her home used to be, is a wakeup call no audience can misinterpret.

Conclusion

While policies do their part in mobilizing the governing machinery, the need for desperate measures to act against the catastrophic effects of climate change demands a widespread call to learn from local communities and indigenous wisdom. Devising disaster resilience methods and remedies at the grassroot levels will unequivocally strengthen the efforts of the planet warriors worldwide and opposite art based communication will always be the beginning.

Reference:

Visual Art

Retrieved from: https://www.asianage.com/india/all-india/051219/un-climate-change-meet-displays-gond-arts-of-mp.html

Retrieved from: https://timesofindia.indiatimes.com/city/bhopal/madhya-pradeshs-gond-art-to-be-highlighted-at-uns-climate-change-meet-in-spain/articleshow/72366235.cms

Retrieved from: https://artsandculture.google.com/exhibit/lodhi-art-district-st-art-india/NQKi787tb1GHJA?hl=en

Retrieved from: http://www.greenhumour.com/

Retrieved from: https://www.hindustantimes.com/lifestyle/art-culture/unep-praises-artist-sudarsan-pattnaik-s-work-on-world-environment-day-101622948999038.html

Retrieved from: https://orissadiary.com/un-environment-praised-sudarsan-pattnaiks-sand-art-on-world-environment-day/

Music

Retrieved from: https://www.thehindu.com/entertainment/music/ricky-kej-interview-2020-album-ek-and-environmental-missions/article32552331.ece

Retrieved from: https://www.swarathma.com/music-for-change

Retrieved from: https://www.hindustantimes.com/more-lifestyle/wake-up-songs-across-the-south-bands-are-using-folk-to-rock-the-boat/story-TCcb4EcKZyv1EAbqi7MQKO.html

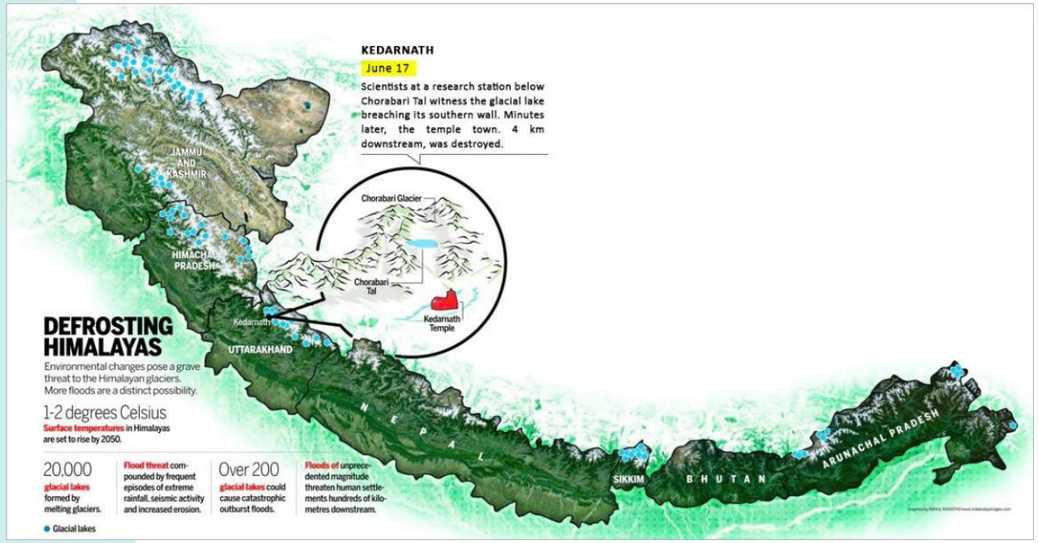
Film

Retrieved from: https://www.downtoearth.org.in/news/documentary-films-on-climate-change-8289#:~:text=Climate's%20First%20Orphans%20Set%20in,global%20warming%2Dinduced%20climate%20change

Climates First Orphan; Retrieved from: https://www.youtube.com/watch?v=OkF1Lq3F9pk

Prakriti Saha

4 Kedarnath: Development at What Cost?



Ecologically fragile backdrop of Kedarnath Town,
Source: Asit Jolly, Kedarnath calamity a proof of long ignored threat by melting Himalayan glaciers, 2013

Climate change has an adverse and irreversible impact on the environment in the regions with high-mountain glaciers. In the regions with high mountain glaciers, the formation and expansion of proglacial lakes have occurred from the rapid melting of snow. This, when coupled with high rainfall, poses a risk of dammed lake outbursts resulting in floods. It has disastrous impacts on the local communities and the ecological sustenance- based sustainable livelihoods as these floods due to the virtue of the terrain no longer remain levelled flood but sweep across terrains.

The case of Kedarnath, a temple town, is no different. The town is located in the Rudraprayag district of Uttarakhand, on the western tip of the central Himalayas in the Mandakini river valley which has a catchment of 67km2 up to Rambara, of which 23% is covered by glaciers. The elevation varies from 2740 and 6578 meters above sea level in the valley. Owing to its geographical location, Kedarnath is highly vulnerable to risks associated with high magnitude earthquakes, moderate occurrences of flash floods, and frequent landslides. Moreover, being situated on the outwash plain of Companion and Chorabari glaciers, Kedarnath is close to the source of Mandakini River and encircled by the Saraswati River which is a tributary to Alaknanda subsequently (Figure 1). These streams overflow their banks every year. The heavy footfall of the pilgrims and their subsequent movement facilitated by over-built hard infrastructure around the temple has disturbed the course of Saraswati River. The river now flows directly behind the town of Kedarnath. Additionally, houses in Kedarnath have been built downstream, at Rambara and Gaurikund on old colluvial or fluvial sediments that are loose and prone to landslides and river cuttings. Finally, the 370% increase in the tourist influx, over a period of 11 years from 2001-2012, exceeded the carrying capacity of the hilly town. Needless to say, the 2013 floods were deleterious for Kedarnath.

Heavy rains along with the rupture of a proglacial lake Chorabari caused flooding of the Saraswati and Mandakini rivers in Uttarakhand's Rudraprayag region on the 16th and 17th of June 2013. A prolonged heavy downpour of 375 mm rainfall in the valley resulted in 375% more than the per day benchmark rainfall of normal season, and surrounding areas resembled a 'cloud burst' which together damaged the banks of the Mandakini River for 18 km between Kedarnath and Sonprayag, affecting the villages of Rambara, Gaurikund, Silli, Kund, Bheeri and Sonprayag and 60 others adjoining Kedarnath and 4200 villages in total. Over 10,000 people were injured, 1800 people went missing, 6000 lives were lost, out of which 1050+ were residents. Several animals were also lost, thereby affecting the livelihood of animal owners. The area of flash-flood debris flow and the Mandakini River increased by 575% & 406% respectively. The disaster destroyed 2252 structures in the valley including 154 damaged bridges and 1520 km of damaged roads amounting to a total loss of 20,000 crores.

Post the disaster, various strategies for disaster risk mitigation in the valley have been formulated. The Tourism Disaster Management Committee (TDMC), composed of various stakeholders including the

gram panchayat and community tourism representatives has been set up. In addition to that, developing a well-informed community based on the "need to know" desire is one of the essential aspects of the TDMC, since communities capable of planning and responding to disasters will significantly reduce the loss of life and resources. The sources for public awareness and engagement include TV, radio, lectures and& hands-on training, etc. Furthermore, creating awareness for tourists upon arrival and imparting knowledge on the various hazards and the possible mitigation strategies has been incorporated In the planning and preparation phase. Lastly, a disaster museum based on Kedarnath's 2013 deluge has been established in Dehradun, however, its presence in Kedarnath could have acted as a powerful tool to educate tourists on disaster preparedness, 'Dos and Don'ts' etc.

Language and Cultural differences are common in famous pilgrimage centres but they can become a barrier during the disaster period. To bridge the language and cultural gaps under emergencies local wardens are trained for communication and cultural understanding during emergency evacuation and response situations. To involve the entire community, the resident communities will be assigned roles for disaster response as they have very good knowledge of the area. For example, the priests being effective influencers can spread knowledge related to disaster response to pilgrims. Specifically for earthquakes, Community Emergency Response Teams (CERT) are designated to increase community resilience through first response capability by community members.

Nearly seven years after this Kedarnath incident, scientists and environmental stewards have warned that the geographical and climatic conditions at Kedarnath are ripe for another disaster. Their claim is based on the extensive rehabilitation work taking place in Kedarnath including road widening, construction of ghats and retaining walls on Mandakini and Saraswati rivers, construction of residences for the Purohit community, construction of 'Samadhi Sthal' of Adi Shankara and a museum, expansion of the platform of the shrine from 1500 sq.m. to 4125 sq.m. and, clearing of the 12 ft debris spread across 270 meters from the shrine location. How the works are being undertaken is a grave cause of concern considering the fragile ecology of Kedarnath. We are repeating the same mistakes again!

As a result of increased anthropogenic activity, the risk of man-made induced natural disasters has recently grown in the area. This tendency is likely to continue in the future as the magnitude of tourism activities increases, activities such as tourism instead of pilgrimage become more popular. The development of man-made structures obstructs the natural flow pathways of the channels, causing the flow to deviate from its normal course. With the increasing trend of urbanization coupled with the due to an increase in the number of pilgrims and other tourists, visitors, and other developmental activities in the near vicinity, assessment of carrying capacity of the area to reduce the impact of development on the ecology & hydrology of the area, to promote sustainable & resilient land use planning, remains a major challenge to be addressed. Even though the focus has now shifted towards the pro-active approach of disaster management rather than a reactive approach, a lot needs to be done on the ground in a participatory manner to prepare for another calamity that may be on the way. To make Kedarnath resilient, it should be treated as an eco-sensitive zone with planning based on strong regulations and development with minimum environmental impact followed by strict monitoring for the construction of dams and other industrial and commercial activities with capacity building at the micro-level.

References:

Allen, S. K., P. Rastner, M. Arora, C. Huggel, and M. Stoffel. 2015. "Lake Outburst And Debris Flow Disaster At Kedarnath, June 2013: Hydrometeorological Triggering And Topographic Predisposition". Landslides 13 (6): 1479-1491. doi:10.1007/s10346-015-0584-3.

Dobhal, Dwarika P, Anil Gupta, Manish Mehta, and Deen Dayal Khandelwal. 2013. "Kedarnath Disaster: Facts and Plausible Causes". Current Science 105 (2).

Government of Uttarakhand. "Strategic Plan for Risk Reduction: Kedarnath" Retrieved on January 3, 2022 from: http://covid19usdma.uk.gov.in/PDFFiles/T2%20Hotspot%20Plan%20(Kedarnath).pdf

Jolly, Asit. 2013. "Kedarnath Calamity a Proof of Long Ignored Threat by Melting Himalayan Glaciers." India Today. July 9, 2013. Retrieved from: https://www.indiatoday.in/magazine/nation/story/20130715-uttarakhand-tragedy-floods-alarm-for-himalayan-glaciers-764472-2013-07-05.

Mehta, Simi, and Amita Bhaduri "Lessons from the Uttarakhand Disaster." n.d. Indiawaterportal.Org. Retrieved on January 10, 2022 from: https://www.indiawaterportal.org/articles/lessons-uttarakhand-disaster.

Rautela, Piyoosh. 2013. "Lessons Learnt From The Deluge Of Kedarnath, Uttarakhand, India". Asian Journal Of Environment And Disaster Management 5 (2): 167. doi:10.3850/s1793924013002824.

Swati Pradhan

Vasudha Sharma

1 Heritage and Development: A Tale of Coexistence

Tughlakabad Fort, New Delhi and its adjacent village, 2021, Source: Author

Heritage and development can co-exist. The old parts of Delhi, aided by ongoing research and development activities, are slowly restoring the natural glory of an era gone by while keeping nature and built heritage of these places intact. The photograph shows the heritage setting of Tughlakabad Fort in New Delhi and its adjacent Tughlakabad urban village. The village, located adjacent to the 700-year old ruins of the fort effectively supports waste management through efficient collection and transportation of municipal solid waste, street sweeping waste, drain silt, green waste and the construction and demolition waste on a Public Private Partnership basis under the Dakshin Delhi Swachh Initiatives Limited. This, in turn, contributes to the localized community sensitized initiatives in waste management and ensures symbiotic resilience at the neighborhood level.

Satarupa Roy

2 The Big City & the Disaster of Anonymity

"This city, yeah! the noise here kills me." On a phone call, she was ranting about why she hates big cities. She continued, "I told you, big cities are hollow, they have crores of people, but you know no one knows no one here, city's people are self-centred...". She hated being in the city because perhaps she was born and brought up in a small village and did not know how it felt to be in a city, or it could be the intrinsic hatred that she developed for the big cities during the lockdown. She could not forget how our so-called megacities treated the migrants, especially labourers and workers. It broke her heart. She had left home and reached one of India's megacities, Delhi.

While at home, waking up with birds chirping, breathing in untainted air, enjoying ghee-dipped chapatis and matha (buttermilk) with fresh veggies, and spending time with her siblings and parents might spoil her. Now, she was alone in an unfamiliar city where air was filled with poison and noise, roads with cars and buses. She found it absurd that people did not talk to each other in a metro or bus; most just looked in their mobile phones. Observing her surroundings, she too tried to fit into the crowd and put on her headphones to listen to her favourite radio channel, Vividh Bharati, a song from Mumbai Se Aaya Mera Dost played and beautifully worded her feelings, the lyrics of the song went on…

"ganv me rangat hai khushiyo ke mele hai
shaharo me sab log rahte akele hai
ganv me har din dasahara-diwali hai
shaharo me sab kuch hai par khali-khali hai
sach teri baate hai ab maine mana re"

As the song played, she felt nostalgic and began to re-evaluate her decision of coming to Delhi, while also pushing her to ponder as to why villagers migrated to cities. The answer, however, was obvious and straightforward yet varied individually. Poverty, lack of economic opportunity, higher education, and land shortage act as push factors and throw people out of the village. Additionally, the aspiration for a 'better' life motivates them to move from one place to another. For her, her aspirations and desire to 'learn and earn' pulled her to the city. You know it; big cities have better educational institutes and job opportunities but lack compassion and sympathy. She wondered: if people living in cities were kind and compassionate, would they have let the migrant workers leave their cities?

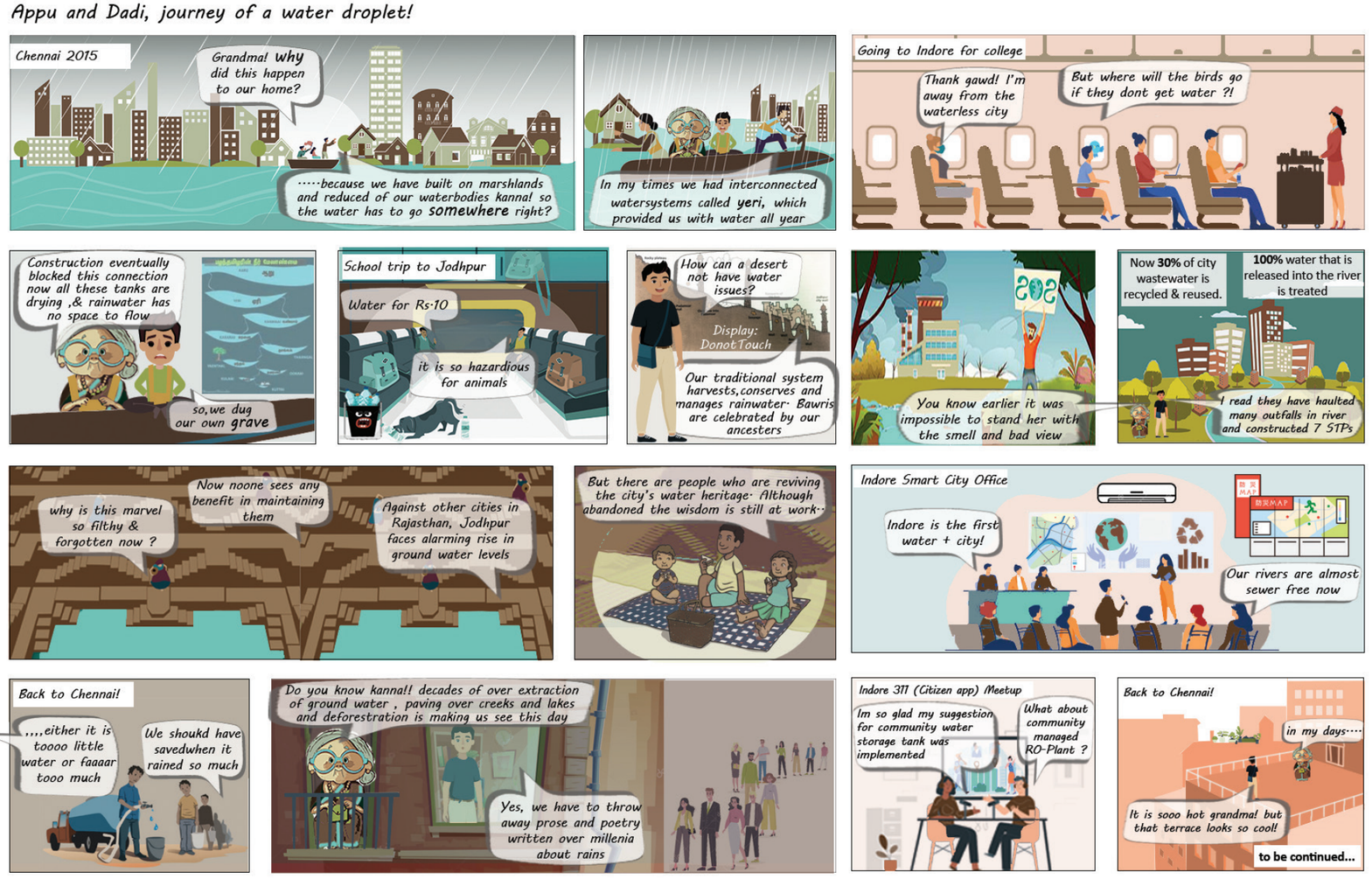
Ritika Rajput

3 Journey of a Water Droplet

Water, the source of all life on earth, has become a scarce resource, posing a threat to the sustenance of ecological cycles and our survival as a species. India is water-stressed, owing to recurring droughts and changing weather patterns. As many as 256 of 700 districts in the country have reported 'critical' or 'over-exploited' groundwater levels, according to the latest data from the Central Ground Water Board (Nathan, 2021). This symbolic journey of a water droplet explores and encapsulates an exchange of thoughts between a grandmother and grandson, focusing on catalytic interventions of humans in regards to the vital entity, water. The conversation highlights the calamitic conditions in the aspects of water, while also focussing on approaches essential for conserving this primal resource with live examples of Indian cities in varied geographical conditions.

Chennai has rich water reserves in terms of 3,600 water bodies, three river systems, and adequate rainfall, making it one of the contenders to be the water capital of Asia if the resource management is thoughtfully considered. Chennai had a traditional water network system, 'Yeri', considered as an engineering and management marvel. Yeris are non-functional today due to unplanned development and poor water management. Chennai observes both the extremities with regards to water floods and droughts. The city is more prone to droughts than floods which can be understood by the reduction in the area of water bodies from 12.6 square kilometres (in 1893) to 3.2 square kilometres (in 2017) (Sujith Sorabh Guntoju, 2019). The recent floods of 2015, along with six other floods since 1943, were termed as man-made floods due to unplanned urbanization and encroachments which worsened the risks and losses (Center, 2020).

Jodhpur, often considered an ancient masterpiece in terms of its water network, has a hot and arid climate with one of the most fascinating yet under-appreciated heritage of step-wells, known as 'bawris' or 'jhalaras'. Consequently, the city had a complex network of interconnected lakes at higher reaches and used to store



rainwater, which was then transported to city wells via aqueducts or percolated through underground stepwells. Even in present times, there are around 48 bawris observed at the neighbourhood-level across the city for drinking water, along with 98 underground wells, and eight jhalaras or rectangular-shaped stepwells. This system was, however, replaced in 1897-1898, after which the city received water from the Rajiv Gandhi Canal (Environment, 2014) from the Surpura Dam, which was then stored in two reservoirs. As a result, underground bawris are the most affected, as they do not seem to serve any purpose and are not maintained. The residents opted for the use of canal water resulting in alarming groundwater rise in at least 40% of the city due to bawris, contrary to the rest of Rajasthan which faces acute water shortage (Somvanshi, 2015).

Indore is a specimen of well-thought conclusive mechanisms, which had three major issues related to water quality, high cost, and seasonal scarcity due to depleting groundwater. To address these issues, a development advisory and think-tank TARU, worked in collaboration with the Indore Municipal Corporation by carrying out community context analysis (CCA) through community consultations, data collection and household surveys. Together they worked on community-managed RO plants to address water quality issues, community water storage tanks to solve issues of shortage and collection conflicts, rainwater harvesting and recharging, and individual water tank storage projects. They also worked on restoring two water bodies, Khajrana talab and Lasudiya Mori talab, demonstrating processes to revive a water body co-benefitting groundwater recharge, aesthetic enhancement, and cool micro-climate in the area (NIUA, 2014).

Indore is also the first water-plus city (Ministry of Housing and Urban Affairs, 2021) as per the Swacch Bharat Mission with initiatives of 1,746 public and 5,624 domestic sewer outfalls in 25 small and big nullahs being treated along with cleaning ponds and all water bodies and constructing 147 special types of urinals leading to no untreated water being released in the environment (Desk, 2021).

To address the pressing issues in terms of water in Indian cities, learnings from the traditional methods of the place to address these complex interconnected issues as with the example of Jodhpur city and the modern innovative solutions practised by Indore city can be instrumental in reducing the impact of these disasters and strengthening water security.

References:

Center, C. R. (2020). Water Systems. Retrieved from Chennai Resilience Center: Retrieved from: https://resilientchennai.com/water-systems/

Environment, C. f. (2014). Urban Rainwater Harvesting. Delhi: Center for Science and Environment.

Ministry of Housing and Urban Affairs. (2021). Water Plus Cities. Retrieved from Swachh Bharat Mission: https://sbmurban.org/water-plus

Nathan, M. (2021, March 19). India's water crisis: The seen and unseen. Retrieved from Down to Earth: https://www.downtoearth.org.in/blog/water/india-s-water-crisis-the-seen-and-unseen-76049

National Institute of Urban Affairs. (2014, June). Smartnet. Retrieved from Smartnet.niua.org: https://smartnet.niua.org/sites/default/files/resources/Doc%201_ACCCRN%20projects.pdf

Somvanshi, A. (2015, October 21). Down to Earth/ Gallery/ Water. Retrieved from Down to Earth: https://www.downtoearth.org.in/gallery/water/rescuing-the-stepwells-of-jodhpur-51552

Sujith Sorabh Guntoju, M. F. (2019, August 5). Down to Earth/ Blog/ Water. Retrieved from Down to Earth: https://www.downtoearth.org.in/blog/water/chennai-water-crisis-a-wake-up-call-for-indian-cities-66024

Kaustubh Mirajkar

Ojaswini Bansal

Sarayu Madhiyazhagan

1 Building Winter School 2021: Pandemic & the Southern City III

From the 26th to 28th November 2021, I participated in Hyderabad Urban Lab's online winter school titled "Pandemic & the Southern City". Over three days, in an interactive setting with urban scholars and practitioners including Lalitha Kamath, Gautam Bhan, Anant Mariganti, Bhashwati Sengupta and Prasad Shetty, we discussed frameworks to understand cities in the Global South and prospects of urban work in the post-pandemic setting.

The school had around 20 participants from across India and also from Brazil, Singapore, and Pakistan. It was a unique setting to collect and form a 'community of practice' from these similar yet diverse locales, and be reflective about our cities and the work we do within them. We began the weekend learning about the history of urban geography, how the quantitative revolution of the 1960s gave way to radical and critical geographies of the late 20h century. We learned how globalisation and new free markets led to the rise of World Systems research and the still persistent idea of world-class and global cities. This has given rise to inter-city comparison, something that the competitive federalism approach of the Smart Cities Mission also employs. Acknowledging that each city is unique and what is most important in our cities is what happens on ground led us to discussing Southern Urban Geography and the value of tacit knowledge and service systems in our cities. Recognising that top-down ways of measuring and analysing cities can be misleading we progressed through the next sessions reflecting on our own experiences of the previous lockdowns, how they affected our personal and work lives, and what we can learn from our collective trauma. Some of the topics studied were the challenges of 'staying at home' in dense low-income neighbourhoods where private lives are shared on the streets, the difficulties of participation in spaces of 'deep differences', how mapping can be used to bring to light spatial inequalities yet hide temporal ones, using thick narratives to mobilise stories and the importance of addressing the complexities of our cities instead of straightening them out. With these concepts and having shared our experiences of the pandemic, we acknowledged how the past couple of years and closing up of the field, made our practices more introspective and personal. This required questioning our own biases and studying the immediate contexts of our homes and communities.

We ended the weekend by reimagining what an ideal city would be for each of us and then reflecting on ways to return to the world, to recognise the diversity of experiences of the pandemic each person has had and beginning to brainstorm possible pathways to recovery to tackle a post-pandemic future.

Divya Chand

2 COVID-19 - Strict Lockdown Impact on Urban Air Quality and Atmospheric Temperature in Four Megacities of India (Geoscience Frontiers, February 2022, 101368)

Apart from being a Fellow at the India Smart Cities Fellowship Program, I have actively been involved in writing research papers. One such paper which was later published analysed the impact of the COVID-19 lockdown on the urban air quality and atmospheric temperature in four megacities of India. The paper highlighted that the pandemic induced lockdown reduced the aerosol concentrations of particular matters (PM) i.e., PM10, PM2.5, carbon monoxide (CO), nitrogen dioxide (NO2), sulphur dioxide (SO2), ammonia (NH3) and ozone (O3), and the associated temperature fluctuation in Delhi, Kolkata, Mumbai and Chennai. Moreover, restricted emissions encouraged results in terms of urban air quality and temperature, for instance, the average air temperature in Delhi, Kolkata, Mumbai and Chennai has approximately decreased about 3°C, 2.5°C, 2°C and 2°C respectively. Furthermore, in comparison to previous years, the air pollutants levels and aerosol concentration (–41.91%, –37.13%, –54.94% and –46.79% respectively for Delhi, Mumbai, Kolkata and Chennai) has improved drastically during the pandemic induced lockdown.Subsequently, I was also a guest lecturer at an international webinar on contemporary issues and the role of geography. The webinar was organized by the School of Pure and Applied Sciences, Midnapore City College, West Bengal, India on December 23rd, 2021. The title of the talk was 'Visible and Invisible Determinants of Climate Change Vulnerability in Rural India'.

Authors:

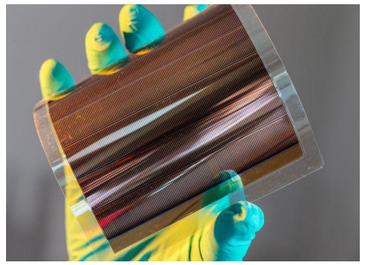
Subodh Chandra Pal, Indrajit Chowdhuri, Asish Saha, Manoranjan Ghosh, Paramita Roy, Biswajit Das, Rabin Chakrabortty, Manisa Shit

Dr. Manoranjan Ghosh

3 Research Paper on Thin Film Solar Cells

Shivam Dave, currently a Fellow at the India Smart cities Fellowship Program presented two research papers in the field of thin-film solar cells at the 28th National (Virtual) Conference on Condensed Matter Physics Conference organised by NIT-Silchar. The papers were later published s in a special issue of the Springer Proceedings in Physics, vol 269. Springer, 2021.

One of the papers, titled, 'Effect of Parametric Variation on Performance of NFA Organic Solar Cell: A Simulation Study' explored the unconventional Non-Fullerene Acceptor (NFA) based absorber layer PBDB-T:ITIC for organic solar cells. The study mapped the variation in performance due to changes in intrinsic variables of the cell, such as mobility of charge carriers, degree of defect density within the bulk and the interfacial layers and thickness of the absorber material used. The simulations were carried out using SCAPS-1D (Solar Cell Capacitance Simulator), -a one-dimensional software that solves the Poisson's equation and the carrier continuity equation for both electrons and holes to derive the results of the cell. The thickness of all the semiconductor layers were optimised to the best performance. The results indicated that the cell



Thin Film Solar Cell

performs better when mobility of the carrier is high and the defects within the charge transport layers and interfaces are low. Although,, it must be noted that the inferior crystallinity of organic materials often caps the efficiency of similar solar cells, further indicatingthat with better material deposition techniques, the gap can be bridged and better organic solar cells can be developed..

The second paper, titled 'Comparative and Numerical FAPbI3 based Evaluation Analysis Perovskite of MAPbI Solar 3 Cells' presented a comparative analysis of two perovskite absorber layers- MAPbI3 and FAPbI3. The influence of defect density and acceptor doping was analysed with respect to the basic performance parameters of the solar cell such as J-V, QE-λ, bandgap alignment and recombination rate. The analysis showed that the FAPbI3 cell performed better than the MAPbI3 counterpart.

Shivam Dave

Sai Varsha Akavarapu

'We live in an age of innovation, a practical education must prepare a man (human!) for work that does not exist and cannot yet be clearly defined'

– Peter Ducker

And the value of practical education cannot be overemphasised. To this extent, the India Smart Cities Fellowship Program has indeed broadened my horizon, deepened my connection to planning-in-theory and planning-for-people. At the Fellowship, through the companionship of the bright interdisciplinary and multidisciplinary thinkers from across the country and the stalwarts of the urban sector, we've come to realize some of the most pressing urban concerns of the country ranging from mobility, to participation, to disaster management. Disaster Management & Resilience has been my focal research interest, given the fact that India is a country that is prone to a diversity in natural and man-made disasters. Our discussions were centred around comprehending the gaps between planning-in-theory and planning-in-practice in disaster management. To what extent have the planning initiatives mitigated the 'disaster-prone' status of our country? Why have certain initiatives not borne the projected outcomes?

These constant nagging questions vexed and invigorated my team. What has to be done? and how does a State-Institution extend the 'welfare role' towards instilling resilience for disaster management through participation? After vigorous and unending discussions with stalwarts and experts in the field, my team and I ideated to develop a 'city preparedness monitoring and emergency response' dashboard to aid city administration in identifying the micro units (neighborhoods) in a city that are susceptible to high risk and have low resilience. Our intent was to develop a citizen-centric digital platform for automated risk communication and resilience assessment for efficient and targeted emergency response. Soon after identifying Shimla Smart City as our testbed/ pilot area for the project, we had first-hand exposure to the type and extent of impact of disasters that occur in Shimla.

While studying and analysing the city of Shimla to identify bottlenecks in terms of urban fire hazard, I've realized that the majority of the projects that are implemented, are often forgotten right after their culmination. A clear-cut monitoring and post-completion evaluation does not exist and thus, neither post-interventional efforts nor feedback loop exist. The consequences of which add risks to an already disaster-prone land mass. For instance, the entire area of Krishna Nagar (although a slum in the city, it has a fair share of infrastructure projects implemented under various schemes/ programs) is inches away from crumbling and is now prone to sudden urban fire hazards and landslides. Although we've tried to mitigate the above mentioned issues to the best of our knowledge by drawing attention to the lacunae through our dashboard, we also accept that these aspects of the implementation framework are yet to find a clear cut solution. The fellowship drew my attention towards the importance of inclusion and inclusion of project evaluation and feedback loop into further future planning, which is what I intend to focus on building going forward.

Reach out to us

iscf_goi

isfc.goi

iscfp_mohua

ISCFP MoHUA

iscfp@niua.org

https://smartnet.niua.org/iscfip/