Fluid landscapes

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'The hills of Delhi, though not attractive in themselves, give a pleasant view across the Jamuna, and in clear weather allow, it is said, even a glimpse of the Himalayas'[1]

A line of sight linking of Delhi to the Himalayas, more than 300 kms away is fanciful, but metaphorically apt. For here, a glacier gives rise to the mighty river Yamuna, the largest tributary of the Ganga. A lifeline of the city of Delhi, it serves the water needs of its 17 million inhabitants. As it flows through, it forms a cusp along with the Ridge. Today, it also forms part of Delhi's boundary between the adjoining state of Uttar Pradesh while entering the city from another state, Haryana. Early lithographs show the river as a quiet water-front, flanked by the massive 17th century Mughal Red Fort, dotted with a few people and some boats. It is a far cry from the dense view one sees today.

The Himalayas, where several major rivers originate, were formed by the intercontinental collision of the Asian and Indian plates.[2] The massive Indo-Gangetic basin, and its Yamuna sub-basin, evolved during the Miocene period, which gave rise to the water carrying paleochannel through the modern Indian states of Himachal Pradesh, Uttar Pradesh, Haryana and Rajasthan. The Yamuna finds extensive mention in the *Rig Veda* (1700 to 1100 BC), and in folklore relating to the Hindu god Krishna.[3] It is believed that the ancient city of Indraprastha (app. 1400 BC) was built on its banks (the site of the Old Fort in Delhi). Successive human settlements came up (up to 17th century AD) along the river bank in Delhi, or around the extensive hydrological network formed by the river. Water security continued to be key, and the currently in-use Western Yamuna Canal, was built by Firoz Shah Tughlaq (14th century) and later extended to Delhi by the Mogul emperor Shah Jahan in the 17th century. Several historic monuments that

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* www.toxicslink.org and raviagarwal.com

1. For a detailed account of the 'hills', the other defining natural feature of Delhi, see Ravi Agarwal, 'Fight for a Forest, the Delhi Ridge', in Mahesh Rangarajan, M. D. Madhusudan, Ghazala Shahabuddin, *Nature without Borders*. Orient Blackswan, New Delhi, 2014 and a previous version in *Seminar* 613, September 2010. *A Gazetteer of Delhi 1912.* (p. 2). Reprinted by Vintage Books, Haryana, 1992.

2. For a detailed account see, Inder Bir Singh, 'Geological Evolution of the Gabga Plain – An Overview', *Journal of the Paleontological Society of India*, Vol. 41, 1996, pp 99-137. (Accessed at http://www.palaeontological society.in/vol41/v13.pdf on 25 June 2015.)

3. In Hindu mythology, Yamuna is the sister of Yama – the god of death, and the daughter of Surya – the sun god. The river waters represent Yamuna's tears, as she cries when her brother is banished to the underworld.

were built along the riverbank, now exist close by, as the meandering river has shifted course several times.[4] The Yamuna has been part of Delhi's history for well over a millennia, though it is only in the last fifty years that it has been transformed so drastically. Despite its romantic historic and temporal landscapes, the river's most contentious narrative is currently in the process of being written.

Today the modern megapolis dumps more than 3.8 million litres of mostly untreated sewage every day into the river. The city accounts for more than 80% of the total pollution load of the entire length of the river. Also, its freshwater flow here is often not more than a trickle as competing demands of industry, energy, drinking water and agriculture, leave little left over for a flow, and in many places the river is dry during the summer months. Besides, climate change signals greater likelihood of glacial meltdowns and erratic monsoons in the near future. Meanwhile, developers encircle the exposed flood plains, eager to grab the land, awaiting in a vulture like fashion the river's final demise. Not surprisingly, the stinking, dirty, dying river is best avoided by the people of Delhi. The degradation of such a major natural feature raises fundamental questions about the future of the natural features our cities. Is the script pre-written in the model of urbanization?

The change has been fast, accelerating as the city becomes 'global'. As recently as the 1970s, the river still existed as a natural feature. Birdwatchers bore witness to this, as it was common to visit sites like Wazirabad, the Tibetan market, ITO bridge, or the Okhla barrage for an early morning nature outing. Records show even rare species like the now locally extinct Siberian Crane, on the 300 sq km Najafgarh *jheel*, which was drained in the 1960s.[5] Most of these sites have now either been drastically concretized or turned into fly-ash dumps. The marshes and stretches of tall grass are gone, replaced by a city skyline, along with flyovers, tarred roads and dark polluted waters.

How 'functionally' nature is treated is apparent from the way the landscape of the river is divided. Till the point where Delhi's waterworks are located, the river has no major drains, the water seems normal, and the countryside is rural. Right after the waterworks, the river becomes a black mess of sewage. A hypothetical walk along the 52 km distance the river traverses the city – from Palla village to Jaitpur – reveals social and ecological narratives in transformation. From Palla, for about 22 kms downstream, the river still flows through a semi-rural countryside. One can see vegetables, fodder and flowers being cultivated by villagers living in the adjoining villages like Jagatpur, Hiranki and Mohamaddpur. At Hiranki, for example, acres of yellow marigold fields present a stunning view. The village's inhabitants are from Punjab, and claim to have been there for over two hundred years.[6]

Near Mohamaddpur, buffaloes bathe in the river below newly made high-tension interstate transmission lines, which span across the river. Children can be found swimming everywhere. One can see *puja* being performed in small temples along the riverfront. There are fishermen, who live on their large thatch covered wooden boats. They are seasonal migrants from Bihar, licensed to fish, a practice initiated by the British.

This instability of the landscape is obvious. In fact, the changing riverfront is a microcosm of similar changes taking place in many other urban centres across India. Already the rural areas are being transformed. Near Jagatpur, one sees hectic bulldozer activity to create a biodiversity park by the Delhi Development Authority (DDA). The village of Jagatpur, going by the rows of brick and mortar multistorey housing being developed, can no longer be called a village in the traditional sense. It is possessed by the pulse of the approaching city, and its residents are no longer farmers but have jobs in the city. Cars and motorcycles dot the small road on the embankment flanking the river. Their relationship to the river is already lost here; it is considered a nuisance.

The transformation is complete at the Wazirabad barrage. It is also where the main waterworks of Delhi and the nerve centre of its water supply is located. On the other side of the Wazaribad barrage the river stops being one; it marks the beginning of the urbanized city. The river waters are replaced by sewage from the massive Najafgarh canal, which deposits the untreated filth of the residents of West Delhi into the dying river. From here till Jaitpur, about 30 km away, continuing the walk is virtually impossible. The banks are intercepted by fences, *nullahs*, private boundaries, government structures, bazaars, cremation grounds, temples and gurdwaras, bridges, parks and some agricultural activity (which is still alive in the later sections, but not for long). In a flash, one can see a dark urbanization overtake a natural ecology that sees the

4. See A.K. Grover and P.L. Bakliwal, 'A Study of a Section of Yamuna River through Remote Sensing: River Migration and the Floods', in Upinder Singh (ed.), *Delhi: An Ancient History*. Social Science Press, New Delhi, 2006.

5. See Usha Ganguli , *A Guide to the Birds of the Delhi Area*. ICAR, Delhi 1975.

6. Ravi Agarwal, Have you Seen the Flowers on the River? Khoj, New Delhi, 2009 (accessed at www.raviagarwal.com on 18 July 2015).

river only as a repository of waste and sewage.

The river was not always as functionally restricted as it today. It had interwoven ecological, cultural and economic ties to the city. Water bodies and water channels (many now lost) abounded in the city, and connected it to the river. The hilly ridge and the river formed a complex water system fed by monsoon run-offs. Jheels – small and large – marshes, canals and nullahs, not only served as waterholes for animals but also provided water security to people. The canals were storm water drains, which carried monsoon run-offs, but also provided the flooded river a way to backflow its excess waters to reduce the pressure on its banks. The green lined nullahs have now become sewage canals and subsequently covered as concrete pathways and roads to contain the stink. It is only recently that the courts, on the basis of citizens' petitions, put a halt to such practices.

The economic ties to the city are also changing. For example, marigold flowers were sold in Chandni Chowk, the historic wholesale market square in Old Delhi. Unfortunately, the two hundred year old flower market has been shifted to a distant, hard to access, new location at the Ghazipur landfill site. Ironically, the city in its attempts to 'beautify' has also lost a bit of its colour! It has lost culturally as well. Though the river remains a site for festivals and rituals, these are now restricted to a few spots. Pollution caused by large-scale idol immersions and pooja offerings is a concern, and some areas are being earmarked for such practices.

There is a need to question the ecological value of such changes. Should the river be reduced to a mere 'aesthetic' view rather than seen as reflecting an integrated idea of human-nature coexistence? For example, while the flower growers have an economically sustainable lifestyle, those living at Jagatpur at best 'tolerate' the river. The co-dependent relationship with nature has been lost. As evident from the shifting of the flower market, and the gradually transforming landscape of the riverfront, the city itself is being gentrified and increasingly becoming an 'aesthetic' project rather than a living space for all.

At the heart of an ongoing civil society struggle (Yamuna Jive Abhiyan) for over a decade has been a fight for the river to be recognized as an ecological space and not merely a water channel.[7] Land use is key to the ecological functions it can perform. While an ecological space is based on the idea of coexistence that recognizes the value of nature, should the river merely be seen as a water channel, it would then be imagined to perform only a hydrological function. Such a technological view of ecology has unfortunately been institutionalized. Various institutions of the city, which control the river, claim it as either land or water. For example, all the land is owned and controlled by the Delhi Development Authority (DDA), while the Flood and Irrigation Department controls water flows. Neither is invested in the idea of a wetland or flood plains, which can be both water and land. This sharp divide between land and water, does not value the ongoing biological, hydrological and cultural interactions, which take place on the flood plains.

The concretization of the flood plains, and its channelization are of great ecological concern. Of late, Delhi has been slated to be transformed into a 'world class' city, and mega projects are being proposed.[8] Even though the river and its flood plains are designated as zone 'O' in the DDA's master plans (where construction activity is not permitted), yet these zones are often changed without due process, and in secrecy.[9] The Akshardham temple as well as the Commonwealth Games Village, constructed in the middle of the flood plains in central Delhi, are two examples where the riverfront has been violated, and huge construction allowed by creating new embankments.

In fact, the Commonwealth Games drastically changed the larger topography of the river front. A new highway was constructed parallel to the river adjoining the old Yamuna Bridge which cordoned off a large chunk of the flood plains, effectively releasing more land for development. New metro stations and buildings have come up, and a temporary millennium bus depot built for the Commonwealth Games, has refused to shift out despite court orders. In hydrological terms, studies show that the flood plains can recharge up to 70% (600-900 million cubic meters) of the city's annual water needs.[10] If the river is channelized or the flood plains built upon, this water will be permanently lost. Such understanding is new and not a part of institutional plans. Efforts to channelize the river first came to light in the 1970s, but

7. Yamuna Jive Abhiyan is a civil society group campaigning to save the river. For more details see http://www.peaceinst.org/publication/book-let/YJA%20-%20MOU.pdf (accessed on 10 June 2015)

8. Alexander Follmann, 'Ultra Mega Projects for a World-Class Riverfront – The Interplay of Informality, Flexibility and Exceptionality Along the Yamuna River in Delhi, India', *Habitat International* 30, 2014, Elsiver, pp. 1-10.

9. See, Restoration and Conservation of River Yamuna. Final Report of the Expert Committee submitted to National Green Tribunal, New Delhi, September 2013.

10. V. Soni, A.K. Gosain et. al, 'A New Scheme for Large-Scale Natural Water Storage in the Floodplains: The Delhi Yamuna Floodplains as a Case Study', *Current Science* 96(10), 25 May 2009.

are still in play. Despite a recent ruling in a public interest litigation,[11] in which the National Green Tribunal (NGT) prohibited fresh construction in the 9700 ha flood plains, the issue is far from settled, simply because it is so deep rooted, and the price of land has increased astronomically.

The question of the extent of freedom a natural feature like the Yamuna river can be allowed to have in a city, remains. However, the models resorted to are almost always those of European rivers like the Thames, Elbe or the Rhine, which flow in temperate climates through different topographies and are not monsoon dependent. The river in Delhi has, for example, a very minimalist gradient (0.4 m over a 50 km stretch), is comparatively shallow and hence prone to flooding over a large area. One response has been to make more barrages and water diversion canals to control the flow, rather the work with the natural flow of the river, even though these cannot be used during heavy rains.

Channelization was resorted to control rivers like the Rhine in the early 19th century to serve as single bed rivers (eliminating tributaries) for transport and commerce.[12] However, it is a misconception that the issue of channelization has been settled in Europe. There too the ills of such restrictions are under debate, since it has led to loss of biodiversity and created waterlogging on the other side of embankments. In some places rivers are being freed of these encumbrances, and allowed to flow free once more. Such models are important to learn from, but can hardly be copied blindly. Considering that even our urban planning is borrowed from European cities, it seems that we need to be more responsive to local urban economic transformations, ecology and culture before we decide upon appropriate interventions.

Channelization is often used as a flood control measure. Decadal floods linked to heavy monsoon rains in the upper reaches of the Yamuna have caused river waters to enter the city in the past. Backflows up the nullahs have also flooded people's homes far inland, despite embankments built along the river bank. Routinely they displace the poor who live on the banks of the river, and flood agricultural fields. In effect, the embankments are already a channelization of the riverbed, albeit to safeguard the city from floods. This is only partially effective as it does not solve the problem of waterlogging on the other side of the embankments and nullahs.

The issue of river pollution has used up resources and occupied policy makers, media as well as the courts. The fact that the river is very polluted has been established beyond doubt by every independent and government report. In fact, post Wazirabad, the river is visibly black, though it could contain invisible toxic chemicals and heavy metals even before.[13] The colour of the river has become a rallying point for action, mostly leading to technology based solutions. However, the technologies installed to solve this problem have not worked. For example, the 23 sewage treatment plants are either not operating or working well below capacity. Even if they were, much of the city is unconnected by sewer lines; sewage just flows freely into nallahs and the river. Over 1500 billion rupees have been spent in the various Yamuna Action Plans over the past decade, but the river remains dirtier than ever. Currently plans are afoot to construct a parallel diversion canal (interceptor canal) along the entire length of the river to trap all sewerage flowing in at a cost of over 25 billion rupees.

However, even the Central Pollution Control Board (CPCB) has acknowledged that this will not solve the problem.[14] It needs to be recognized that the problem of pollution is linked not only to sewerage infrastructure but to how water is used in the city and in agriculture. Measures like reducing waste water, ensuring local treatment before it is discharged in drains, recycling it, improving crop irrigation efficiency, measures to reduce sewage by using low water use toilets, and so on are critical. Most importantly, an adequate amount of fresh water needs to flow in the river in all seasons. The last requirement is a bone of contention, which no one seems willing to take head on.

What should an adequate water flow in the river be is a key question. Some of the terms used to define it are 'minimum', 'environmental', and 'ecological' flows. Such a flow determines not only the limits to water which can be extracted from the river, but also if the river can be dammed per se. Already, many stretches of the river bed are dry in the summer months, since water is diverted for irrigation, industrial and drinking water purposes. The river then becomes a stinking, crawling drain of only slush and sewage

11. See final order of the National Green Tribunal (NGT), issued in January 2015 on a case filed by Manoj Mishra and others for the Yamuna (accessed at http://www.peaceinst.org/projects/activities/NGT%20Judgement%20on%20Yamuna%20Case.pdf on 11 July 2015).

12. For a detailed account see, Mark Cioc, *The Rhine, An Eco-biography, 1815-2000.* University of Washington Press, Seattle, 2002.

13. 'Toxicity Load of Yamuna River in Delhi', Toxics Link, New Delhi, December 2014.

14. See Centre for Science and Environment (CSE), 'Review of the Interceptor Plan for the Yamuna', CSE, Delhi, May 2009 (accessed http://www.cseindia.org/userfiles/CSE_interceptor_analysis.pdf, on 10 June 2015).

water. The NGT has recently appointed an expert committee to determine this flow.[15] However, given that past directives of even the Supreme Court which mandated a 10 cumecs (cubic meters per second) minimum flow have been ignored, the ecologist's plea for a 70-80 cumecs flow seems far-fetched, even if sorely needed.[16] Some policy persons and technologists consider any water flowing from rivers into the oceans is 'wasted' and this negates the idea of the river per se or the water cycle they constitute.

Unfortunately, in all these dynamics, it is only the poor who have borne the brunt of any measure. From the viewpoint of those who made the waterfront their home, it has been all bad news. Yamuna Pushta, a colony of over 40,000 people (many living in brick houses), with functional health centres, schools and even a police station was brutally mowed down in a matter of weeks in 2004. The final nail in the coffin was an order of the Delhi High Court attributing the pollution in the river to these (and such) occupants. This was rightfully criticized as 'bourgeois' environmentalism.[17] A similar fate met other colonies. The old *dhobi* ghats below the Yamuna bridge, as well as the wastepickers disappeared, and were replaced by new roads and parks. The erstwhile Yamuna Pushta was ironically renamed 'DDA Golden Jubilee Park', and is today a large horticulture lawn with cultivated flowers and manicured lawns. The DDA has proposed a new riverfront development there, unmindful of the fact that the area is under water annually.

At the time of writing this article, the court has stopped all agricultural activity on the riverfront, especially for vegetables, as they were found to be contaminated by the toxic waters. The Delhi Development Authority has begun the process of eviction of an estimated 30,000 people.[18] Once again, it seems that no matter who causes the problem, its impact is borne by the most vulnerable. It brings home the fact that the idea of ecology is a deeply political one, and for it to be democratic and equitable, it needs to be examined from a ground up perspective.

River systems such as the Yamuna encompass planetary as well as human time scales. Historical accounts are, of course, relatively recent and in the case of the Yamuna, less than one thousand years old. Within this, it is only approximately over the past 50 years that more detailed socio-political accounts have become available showing an accelerated human impact on the river. Recent studies indicate that the Himalayan glaciers which feed the Yamuna and similar rivers could melt over the next 600-700 years, significantly reducing future water availability.

The European experience, documented from the early 19th century onward, reveals an ecologically destructive industrial-urban approach towards river systems. Even though of late there have been attempts to recover the biodiversity of rivers like the Rhine, it may already be too late. It appears that in a very short 'moment', the ecology of rivers has been systematically destroyed. Ecological models for the future need to seek other trajectories than the mere economic-technological approaches currently being suggested. They also need to, besides implementing immediate actions such as clean ups, incorporate longer time frames. This is necessary for understanding natural bodies such as rivers that have a planetary significance and follow another temporality.

The future of the river or similar natural bodies possibly lies in redefining a larger nature-human ecological relationship, which is not merely a 'functional' one. Nature as a resource, or as a geography to be conquered or even as a landscape to be admired, have been some driving ideas of our dominant relationship with it.[19] The complex web of life that rivers are part of needs to be better understood and possibly redefined as a collective between 'humans and non-humans'.[20] Rivers cannot be treated merely as a flood nuisance or used for dumping sewage. In practical terms, rivers should be allowed to flow freely, with adequate water and land, and without being excessively controlled. In many ways, rivers are like living entities to be respected as part of a fundamental cycle of water and life on the planet. If this is not done, it may well result in yet another form of self-inflicted violence, all in the name of a sustainable future. Ultimately, if allowed, rivers can exist without us, but can we?

15. See final order of the National Green Tribunal (NGT), fn 6. The NGT has also formed a committee headed by the Secretary, Ministry of Water Resources, Govt. of India to make recommendation on the issue of water flow.

16. Himanshu Thakkar, Ensuring Environmental Flows in Indian Rivers. Blog at sandrp.worldpress.com (accessed at https://sandrp.wordpress.com/2015/03/22/ensuring-environmental-flows-in-indian-rivers/ on 8 June 2015); also see V. Soni, S. Shekhar, et al., 'Environmental Flow for the Yamuna River in Delhi as an Example of Monsoon Rivers in India', *Current Science* 106(4), 25 February 2014.

17. Amita Baviskar, 'What the Eye Does Not See: The Yamuna in the Imagination of Delhi', *Economic and Political Weekly* 56, 10 December 2011.

18. Various news reports. For example see, 'DDA Bulldozes Farmers' Fields, Huts', *The Times of India*, New Delhi, 17 June 2015 (accessed at http://timesofindia.indiatimes.com/city/delhi/DDA-bulldozes-farmers-fields-huts/articleshow/47698279.cms, on 18 June 2015.

19. David Biggs, *Quagmire*. University of Washington Press, Seattle, 2010.

20. See Bruno Latour. *Politics of Nature*. Havard University Press. Cambridge, 2004.