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# Status for Ecorestoration of Wetlands as Well as Herbal Potential and Biodiversity Conservation Along with Bank Sides of Kali Nadi in Aligarh District

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**ABSTRACT:** Forty years back, what was a blessing for people across 1200 villages, has now turned into a curse. ‘Kali Nadi’ (black river), which starts from the Antwara, a district in Muzaffarnagar and ends at Kannauj, is now known as a cause of cancer, skin disease, heart failure, infertility and many such more deadly medical conditions.

Sometime in the year 1960, a tributary of the Ganga was the only sources for day-to-day work. The 498 km long ‘Kali Nadi’ which passes through Muzaffarnagar, Meerut, Hapur, Khurja, Bulandshahr, Aligarh, Farrukhabad, Kasganj, till Kannauj, was the main source of water and used to cater to more than 1200 villages on both sides of the river.

**KEYWORDS:** Kali Nadi, Aligarh, biodiversity, conservation, ecorestoration, wetlands

## I.INTRODUCTION

Today, Kali Nadi is supposed to be one the most highly-polluted rivers of North India, according to an independent survey conducted by Raman Tyagi, of the NGO Neer Foundation that works exclusively to save the Kali Nadi. The first layer of the water bed is severely-affected, especially in and around a one kilometre radius of the river bed. Clean, pure water no longer remains; only sewage, industrial, chemical and slaughter house waste can be found in the river. “The sad part is the water of Kali Nadi is not only taking lives in the form of cancer and other deadly diseases, but it is also finishing the future generations too. Because of pollution and toxicity there is killing of gametes thus leading to infertility. If the speed remains the same than by 2050 more than half of the population will be infertile.” The number of patients from areas in and around the Kali Nadi is almost double as compared to other areas. “Usually, patients of these areas suffer from bladder and oral cancer.[1,2,3]

This includes patients having urinary, throat and mouth cancer. The main reason is polluted water. Boiling or using of any reverse osmosis (RO) systems cannot purify the water. Even animals are not spared. “We have lost a sizeable number of cattle. These includes buffaloes, cow, bulls and goats, etc. In last eight to ten years, the death toll has reached 700,” says Munnavar.

Efforts for rejuvenation, though undertaken by the government, hasn’t improved the situation yet. Raman Tyagi says, “After running from post to pillar for our drive to save the Kali Nadi, it has been adopted by the Central Government under its Namami Ganga programme (It has an objective of effective abatement of pollution, conservation and rejuvenation of the Ganga). In 2016, the Modi government gave the approval of adopting Kali Nadi. 200 bigha of land, approximately 50 acres, has been provided by the government in Antwara for developing a lagoon, along with including a water table and rainwater collection point.

But the reality is only official adoption is there but no work has started yet. There is complete silence in this regard.”[4,5,6]

Along with human and animal life being affected by the Kali Nadi, occupations like farming are facing a severe crisis as well. A US-based NGO, the Water Collective, had visited villages along the Kali Nadi. In their visit across eight villages, they found various instances of discoloured, impurities-filled water, and villagers suffering from chronic and fatal diseases.



## II.DISCUSSION

Three riparian plant species viz. *Cynodon dactylon* (L.) Pers., *Saccharum bengalensis* Retz. and *Parthenium hysterophorus* L. were selected from the riparian zone of Kali river at Aligarh to conduct the surface runoff experiment to compare their conservation efficiencies for soil, water and nutrients (phosphorus and nitrogen). Experimental plots were prepared on artificial slopes in botanical garden and on natural slopes on study site. Selected riparian plant species showed the range of conservation values for soil and water from 47.11 to 95.22% and 44.06 to 72.50%, respectively on artificial slope and from 44.53 to 95.33% and 48.36 to 73.15%, respectively on natural slope. Conservation values for phosphorus and nitrogen ranged from 40.83 to 88.89% and 59.78 to 82.22%, respectively on artificial slope and from 50.01 to 90.16% and 68.07 to 85.62%, respectively on natural slope. It was observed that *Cynodon dactylon* was the most efficient riparian species in conservation of soil, water and nutrients in surface runoff.[7,8,9]

River Kali, in the western gangetic plains, is posing serious threat to riparian communities by contaminating shallow riparian zone groundwater. To manage groundwater contamination, this study attempts to investigate the nature of groundwater-river water interaction, during February to April 2018, along a segment of river Kali near Aligarh in western Uttar Pradesh, India. River discharge was measured at three locations in two phases. Hydraulic heads in mini-piezometers were observed twice weekly. Forty water samples were analysed for major ions, nitrate, fluoride, TDS, pH, EC. River discharges and river bank vertical hydraulic gradients reveal that river Kali is losing water to riparian aquifers. Hydro-chemical analysis shows discordance in the pattern of ionic concentrations of river and groundwater, a distinct clustering of river and groundwater for both sampling periods. Ionic concentrations in groundwater with distance from channel indicate potentially clogged riverbed conditions that reduce the interaction of river water with riparian groundwater.[10,11,12]

The distribution of heavy metals viz., Cd, Co, Cr, Cu, Fe, Mn, Ni, Pb and Zn in the water, sediments, plants and fish samples collected from the Kali Nadi (India) have been determined. The studies have shown that there was considerable variation in the concentration of heavy metals from one sampling station to the other which may be due to the variation in the quality of industrial and sewage wastes being added to the river at different places. The orders of the concentration of heavy metals in water, sediments, plants (*Eicchornia crassipes*) and fish (*Heteropneustes fossilis*) were Fe > Zn > Cu > Mn > Cr > Ni > Pb > Co > Cd; Fe > Zn > Mn > Ni > Cr > Co > Cu > Pb > Cd; Fe > Mn > Zn > Cu > Ni > Co > Pb > Cr > Cd and Fe > Zn > Mn > Ni > Pb > Co > Cr > Cu > Cd, respectively.

*Pallisentis indica* Mital and Lal, 1976 was originally described from *Channa gachua* Hamilton (Channidae) in Kali Nadi River, Aligarh, India. The parasite was later placed in the subgenus *Brevitritospinus* Amin, Heckmann, Ha, Luc, and Doanh, 2000. Our collection from the spotted snakehead *Channa punctatus* Bloch & Schneider in another locality of the same stream in Aligarh produced many specimens with variable traits, revealing new structures that have never before been described in the Acanthocephala, especially relating to the ducted trunk spines. The proboscis has 4 circles of 10 hooks each, with hooks in the anterior 2 circles being considerably larger than those in the posterior 2 circles. Y-shaped trunk spines are ducted in 2 regions separated by a spineless zone. The anterior collar spines are in complete rings of 9-17 circles of crowded spines and the larger posterior trunk spines are in 1 (posterior) to 41 (anterior) circles extending to level of cement glands in males posteriorly. Considerable variations from the original description and new structures are reported for the first time.

River Kali, in the western gangetic plains, is posing serious threat to riparian communities by contaminating shallow riparian zone groundwater.[13,14,15] To manage groundwater contamination, this study attempts to investigate the nature of groundwater-river water interaction, during February to April 2018, along a segment of river Kali near Aligarh in western Uttar Pradesh, India. River discharge was measured at three locations in two phases. Hydraulic heads in mini-piezometers were observed twice weekly. Forty water samples were analysed for major ions, nitrate, fluoride, TDS, pH, EC. River discharges and river bank vertical hydraulic gradients reveal that river Kali is losing water to riparian aquifers. Hydro-chemical analysis shows discordance in the pattern of ionic concentrations of river and groundwater, a distinct clustering of river and groundwater for both sampling periods. Ionic concentrations in groundwater with distance from channel indicate potentially clogged riverbed conditions that reduce the interaction of river water with riparian groundwater.

## III.RESULTS

If humans decide to revive the natural resources, nature supports; the forest region of village Antwada is a perfect example of this. The river Kali East (also known as Nagin river because of the serpentine route it follows) emanates from the ground aquifers of village Antwada and is one of the tributaries of river Ganga.



Originating from the forests of Antwada village in Jansad tehsil of Muzaffarnagar district, the river flows like a small stream for about 3 kms with clear waters. It had gone in oblivion during the past two decades since it was being used as a dumping ground with contaminants, untreated effluents and indiscriminate use of polythene from many sources disposed into it all along its course.

According to the elderly residents of Antwada village, there is an ancient mythological story about the origin of this river. Once upon a time, a saint lived across the village in a hut near a *Mahale* tree. An ardent follower of river Ganga, he would go to Ganga in Shukratal every morning to bathe. When he got old, it became difficult for him to travel the distance.

So one day after bathing at the river Ganga, he prayed that he could not come again as it was no longer possible for him to travel this distance every day. He urged that if Holy Ganga wished for him to bathe in Ganga every day, then it will have to come to his place at Antwada. Unable to bear the agony of not being able to follow his daily practice of bathing in the river, he could not sleep the whole night.[14,15,16]

Next day, a bull is believed to have hit at the *Mahale* tree near the saint's hut. Because of the bull's actions, a group of snakes residing in the tree came out. One of the female snakes went towards the south direction. It is believed that a water stream followed her wherever she moved. Hence, the river is also known as "Naagin River". It is thus believed that the origin of this river is from that tree, and the saint bathed in this stream every day until his death.

From another perspective of science, the groundwater level of the area around Antwada village is much higher than other regions (even today at 10 feet) so that water flowed naturally from that point. The water flowed in a stream, and when other streams joined it, it became a river. The farmers over the years covered this stream and started farming on it.

Thereafter, it was turned into a dumping drain with all sorts of garbage flowing. The river which gave life to others was dying to get its own life back. Along its 300 kms long-flowing stream, it is being used as a drain and has become poisonous. It is also one of the main contributors of pollution in the Holy River Ganga when it merges with it at Kannauj.

The Kali river flows through eight districts of Uttar Pradesh before its confluence with Ganga river at a distance of 598 kms from Antwada. The river has over 1,200 villages situated on its bank, and the highly populated and predominantly rural catchment entirely depends on the Kali river as a water resource for domestic, agricultural and industrial use. At the originating point, the river is seen as a freshwater drain, but after flowing for about one kilometre, it takes the shape of a river, with water accumulating from different aquifers.

Key industries, including sugar processing units and their associated alcohol manufacturing distilleries, paper mills, dairies and tanneries discharge their effluents in this river. Besides, Kali river receives a large volume of untreated sewage from thousands of major and minor habitations around it, domestic waste water-flow and dead animals are also dumped in the river.

Due to this mismanagement of a vital water resource, its physio-chemical qualities have deteriorated so much that it has affected the groundwater too. The polluted river carries waterborne viruses and bacteria and is responsible for the ill health of the people. However, the marginalized community residing within the catchment area is bound to consume the highly polluted water. The residents are left with no option other than to fend for themselves or die of neglect.[11,12,13]

The major pollution problem diminishes at Aligarh as no industrial waste is added between Aligarh and Kannauj where it meets Holy Ganga at Mendiganj Ghaat at Gangaraj village. It was the awakened consciousness of the residents of Antwada village who felt that for this dark journey of river Kali (East) and considered themselves responsible for the state of river Kali. Hence, a people's campaign to 'Clean River Kali' was launched.

Determined for the cause of the society, under the leadership of Raman Tyagi of NEER Foundation, the villagers were informed about the impact of a polluted river through several awareness programs during the past five years. They made wall paintings *in the villages with messages to save the Kali River*.

A documentary was produced highlighting the causes and extent of pollution in the Kali River and its harmful impact on the environment and human health. All the public representatives in the regions along the Kali River catchment are



being made aware of the present disgraceful situation of the river through letters. They are being requested to extend support to the organisation towards saving this river.

Representatives from various civil society organisations and students are being involved in the campaign on a mass level. International organisations working on river conservation such as FIAN International, FANSA, International River Foundation, World Environment Federation, India Water Partnership, WWF, Government of India, World River Forum, International Water Association and EARTHDAY.ORG are supporting the campaign. A coordinator has been appointed in each of the eight districts through which the Kali River flows, who are working to save the river.

The villagers of Antwada gathered and formed Nadi Raksha Samities (River Protection Committees). Based on these Samities (Committees), a Kali river Parliament has been formed. Health camps are organized in the villages to highlight their plight and support provided on medical facilities. The villagers were educated and sensitized not to drink the polluted water from the hand-pumps installed in the villages and not to irrigate their fields from the river water.[10,11]

They were regularly convinced to clean the river. As a result of community-led efforts to revive the river which included sending grievance letters to Pollution Control Board and Human Rights Commission, there is some hope. The Planning Department of the Uttar Pradesh government has now prepared a scheme worth 88 crores to make the Kali river pollution-free.

On November 21, 2019, the villagers of Antwada scaled up their efforts from sporadic cleaning of plastic waste and plantation activities, to digging at large scale and cleaning the river themselves with voluntary labour. The honest approach of the villagers who donated 148 bighas of their farming land to revive the river, influenced many organizations to join hands. The Minister of State, Government of India, Mr Sanjeev Baliyan, has now adopted this village for development. Regular action plans are made to clean the river kilometer-by-kilometer until the community achieves the target of cleaning it up to Kannauj.

With the support provided by Raman Tyagi of NEER Foundation, Meerut, the community became aware and joined hands to revive their traditional heritage: River Kali. This dedication and integrated community approach of the villagers by providing manual labour, sacrificing their agricultural land and volunteering to form River Protection Committees and Kali River Parliament, established a sustainable model for the revival of the river. This community-managed model is worth replication in other parts of the country and even overseas, and India can feel proud to see the dream of Swachh Bharat Mission come true with such social approaches and efforts.

Looking at the unique approach adopted in Antwada village, EARTHDAY.ORG conferred the “Star Village” certificate on February 2, 2020, to the village. The day marked the commemoration of World Wetland Day, and it was an appropriate day to recognize the work of the lost wetland that has now been revived in Uttar Pradesh.

#### IV.CONCLUSION

In Aligarh district, there are a number of wetlands such as Sheikha jheel, Kali-nadi,Rati-ka-Nagla, Ash Dump Yard and Aama Khera which are good for waterfowl. However, Kali-nadi has the greatest potential to be developed as a bird sanctuary. This river is located few km from Aligarh on the Aligarh-Jalali road near Sheikha and Bhawan-Khera. Jalali village is about 3 km away, while Sheikha village is less than 1 km. The kali-nadi was divided into three parts, when the Lower Ganga Canal was constructed. Kali-nadi is a typical monsoonal wetland of the Gangetic plains. It gets most of its water from rainfall, but seepage of water from the adjoining canal has made it perennial. Before the canal was constructed, this jheel probably dried up during summer like other similar wetlands. Sheikha jheel is surrounded on three sides by natural vegetation. The submerged vegetation consists of *Hydrilla verticillata*, *Ceratophyllum demersum*, *Vallisneria spiralis*, *Potamogeton crispus* and *Najas*. Free-floating vegetation consists of *Salvinia* and *Azolla*, and in some places, *Eichhornia crassipes*. Rootedfloating vegetation includes *Nymphoides cristata* and *Nymphoides indica*.[15]

#### Key biodiversity

AVIFAUNA: About 166 species of birds are reported from Kali-nadi and its environs (Rahmani and Sharma, 1997). This wetland harbours more than 10,000 birds during the winter months. While = 20,000 waterbirds may not be found in kali-nadi at a time, more than 20,000 water birds use this wetland throughout the year, because large migratory flocks of waders are seen in March-April. Thus, the site would qualify for A4ii criteria. Many waders and ducks are



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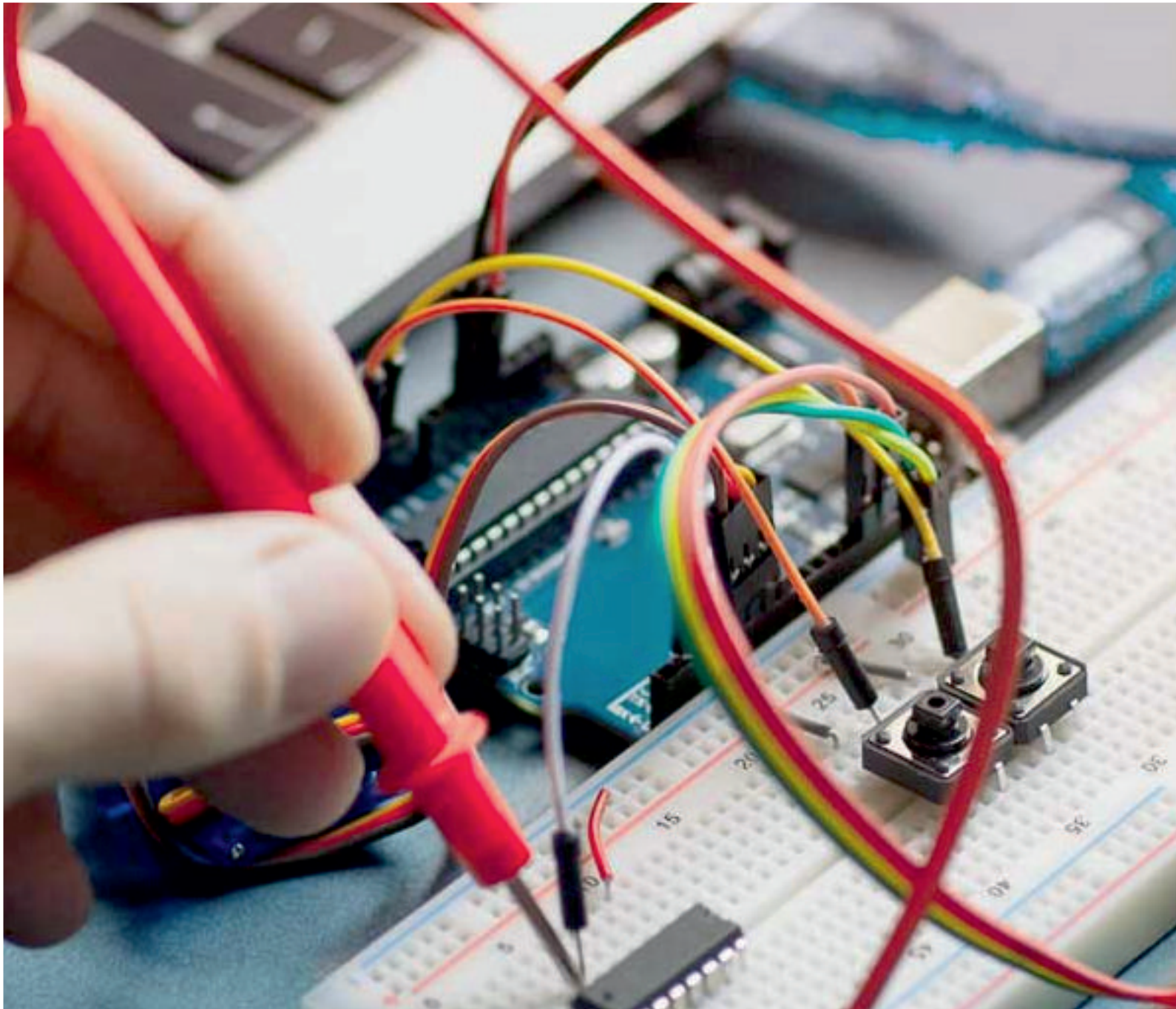
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also present in thousands, easily exceeding 1% biogeographic population threshold, recently updated by Wetlands International (2002). About 100-200 Sarus Cranes *Grus antigone* congregate in this small wetland, mostly in the dry months. According to Wetlands International (2002), 1% threshold of Sarus is 90. Choudhury et al. (1999) have also found Kali-nadi and the surrounding areas extremely important for the conservation of Sarus crane. During their surveys, they found 30 adults and 10 juveniles. Sighting of Near Threatened Black-necked Stork *Ephippiorhynchus asiaticus*, sometimes with juveniles, is not uncommon in kali-nadi. Nests of Grey Heron *Ardea purpurea*, Little Cormorant *Phalacrocorax niger*, Little Egret *Egretta garzetta*, Cattle Egret *Bubulcus ibis* and other species are found on the large *Ficus* and *Dalbergia* trees. A pilot bird ringing project was initiated in 1988 and several birds with Russian rings were recaptured (S.H.A. Yahya pers. comm. 2001).

OTHER KEY FAUNA: As kali-nadi is surrounded by agricultural fields and villages, no large wild mammal of conservation concern is found in the area. Only Bluebull or Nilgai *Boselaphus tragocamelus*, which is considered sacred by many people, is found. Occasionally, Blackbuck *Antelope cervicapra* is seen in the drier area on the other side of Aligarh-Jalali road.[16]

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