E-Governance Model for Ganga Rejuvenation: A Retrospective Analysis with Solutions

Acharya Balkrishna[1], DR. SRIMOYEE BANERJEE[1], Sourav Ghosh[1], and Vedpriya Arya [1]

[1]Affiliation not available

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Acharya Balkrishna[1, 2], Srimoyee Banerjee[1], Sourav Ghosh[1], Vedpriya Arya[1,2]

[1] Patanjali Herbal Research Division, Patanjali Research Institute, Haridwar, Uttarakhand 249404

[2] Department of Applied and Allied Sciences, University of Patanjali, Haridwar, Uttarakhand.

*Corresponding Author

Patanjali Herbal Research Division, Patanjali Research Institute, Haridwar, Uttarakhand 249404

sourav.ghosh@prft.in

Introduction

Through the implementation of e-governance, governments have substantially empowered themselves in terms of openness in operation, people engagement, information distribution, and increasing the speed of communication during the previous two decades. According to the World Bank, 'e-Governance' refers to the use of information technologies (such as Wide Area Networks, the Internet, and mobile computing) by government agencies that have the potential to revolutionize relationships with citizens, corporations, and other arms of government. Less corruption, improved transparency, greater convenience, income growth, and/or cost reductions may be achieved as a result . e-Governance is a decision-making process that involves the use of ICT in governance systems. It ensures broader and deeper participation and involvement of citizens, institutions, NGOs, and businesses in the government system. In today's democratic period, e-governance is a participatory method (Satyanarayana, 2004). E-government is concerned with communities and participants outside the organization, whereas e-governance is concerned with administration and management within an organization, whether public or private, large or small . In India, e-Governance is a relatively new notion. The launch of the National Satellite-Based Computer Network (NICENET) in 1987, followed by the District Information System of the National Informatics Centre (DISNIC) program to computerize all district offices in the country, for which free hardware and software were made available to state governments, provided the necessary impetus for e-governance. While the developed world and certain Asian countries have moved swiftly, India continues to lag in satisfying rising public aspirations. Massive population expansion, cultural diversity, acute poverty, and widespread illiteracy pose several challenges to government service delivery processes. The Government of India (GoI) is moving away from traditional modes of governance toward technological engagement in the governance process. The Government is currently in the transition phase, smoothly unleashing the power of ICT (Information and Communication Technology) in governance. E-government is the implementation of e-governance or the modernization of the government's procedures and operations through the use of ICT tools in order to transform the way it serves its constituents. . There are numerous e-Governance programs in place today, both at the center and the state levels. The

Department of Electronics and Information Technology and the Department of Administrative Reforms and Public Grievances formulated the National e-Governance Plan (NeGP) in 2006, with the goal of making all government services accessible to the common man, ensuring efficiency, transparency, and reliability of such services at affordable costs, and realizing the basic needs of the common man. Digital India was established in 2015 with the goal of digitally empowering the country.

Its essential components are as follows: establishing a safe and stable digital infrastructure. Second, digitally offering government services and establishing universal digital literacy. Some of the successful efforts include "Aadhaar," UIDAI-issued unique identification number that acts as confirmation of identity and address based on biometric data. It is being used to bring numerous benefits to members of society. Aadhar can be used to e-sign documents. Next, "myGov.in" is a national citizen engagement platform where people may exchange ideas and participate in policy and governance issues. "UMANG" is a Unified Mobile Application that gives users access to national and state government services such as Aadhar. Finally, there are services such as "Digital Locker," PAN, Employee Provident Fund, and so on. Citizens can use Digital Locker to digitally store vital documents such as mark sheets, PAN, Aadhar, and degree certificates. This lowers the need for physical documents and allows for easier document sharing.

In addition to the foregoing, state-level e-governance efforts include "E-Seva" (Andhra Pradesh), which allows for the payment of utility bills as well as the issue of certifications, licenses, and permits. The "Khajane Project" (Karnataka) digitalized the state's treasury system. "FRIENDS" (Kerala) is a one-stop-shop for paying taxes and other financial obligations to the state government. The "Lokvani" Project (Uttar Pradesh) is a one-stop-shop for addressing disputes, maintaining property records, and delivering a variety of critical services.

In summary it can be said that there are four models for e-governance. The first one, is government to citizens (G2C) which is regarding the government services for the citizens. Payment of online bills, online registration of applications, copies of land record are few examples of this model. the second model is government to government (G2G) which are for services shared between the government. It may be horizontal meaning between different ministries of departments or vertical meaning between central to state government. Sharing of information between police departments of various states, government document exchange are a few examples of this model. Government to business (G2B model forms the third one. Sharing of information between the government and the private sector so to develop a bond takes place under this model. Collection of taxes, rejection and approval of patent, payment of bills and penalty all through the online mode are examples of this kind of model. The fourth one is named Government to employees (G2E) which is between the government and the government employees. Data submission from various government offices, filing of complaints by employees, appraisal of employees all examples of this model (Yadav and Singh, 2013).

In this current study, we have tried to cover the e-governance initiatives in India pertaining to Agriculture, Forestry, Sewage management and environmental flow of rivers. After a detailed discussion, we have come to how these initiatives may be utilized for better coverage and implementation of schemes pertaining to river Ganga and its banks. We have proposed how a convergence mechanism may be utilized for the cleanliness of the river with real-time monitoring as well as upliftment of farmers and other people dependent on the river.

e-Governance for Agriculture in India

The Ministry of Agriculture's, Department of Agriculture and Cooperation (DAC) agreed to adopt the National e-Governance Program (NeGP) in the agricultural sector in Agriculture, Livestock, and Fisheries as a Mission Mode Project (A-MMP). The A-MMP is designed to meet the demands of farmers through the dissemination of pertinent information to the community and other associated stakeholders & services for assistance through the many distribution channels available in their area. They will be able to make sensible decisions with its help. The project was to be first implemented in the states of Assam, Himachal Pradesh, Jharkhand, Madhya Pradesh, Maharashtra, Karnataka, and Kerala with a centralized portal for

implementation and management of services. The targeted categories of agriculture to be brought under e-governance include the following:

1. Information on pesticides, fertilizers and seeds
2. Information on soil health
3. Information on crops, farm machinery, and, training and Good Agricultural Practices (GAPs)
4. Information on forecasted weather and agro-met advisory
5. Information on prices, arrivals, procurement points, and providing interaction platform
6. Electronic certification for exports and imports
7. Information on marketing infrastructure
8. Monitoring implementation/evaluation of schemes and programs
9. Information on fisheries
10. Information on irrigation infrastructure
11. Drought relief and management
12. Livestock management

Agricultural Information System Network (AGRISNET) is a component under the scheme titled "Strengthening/promoting agricultural informatics & communications" under the Ministry of agriculture. The goal of the AGRISNET project is to build a long-term data bank of all agricultural inputs in the states containing entries for all necessary information on Agriculture and its linked fields and to gain access to them via a secure network. The project aims to link all agricultural offices up to the Block level with the state Department of Agriculture for improving information access as well as to provide advisory services to the farmers and related sectors through the usage of ICT.

As a result, e-agriculture refers to a new discipline that focuses on improving agricultural and rural development through improved information and communication systems. E-agriculture, to be precise, entails the creation, design, development, testing, and implementation of novel ways to use information and communication technologies (ICTs) with a primary focus on agriculture, in the rural domain (K. Venkateshwara Rao).

According to the Government of India's Planning Commission's Agricultural Strategy for the Eleventh Plan, the aim of 4% growth in agriculture can only be accomplished if land and water are fixed. Increasing the productivity per unit of scarce natural resources can only be achieved by putting better technologies to work. It is planned to use a variety of distribution methods, including Rural Knowledge Centers (RKCs), ICT-based delivery, farmer-to-farmer extension, non-governmental organizations, and the commercial sector (Behera et al., 2015).

Under the National Mission on Agricultural Extension and Technology, the Indian government wants to grow, enhance, and implement the Sub Mission on Agricultural Extension (NMAET). The NMAET's approval assures that all of the Department of Agriculture Cooperation's (DAC) IT programmes are compliant with the Mission. In addition, the Mission Mode Project of the National e-Governance Plan in Agriculture (NeGP-A) was launched in order to promote rapid growth in the agricultural sector through the use of ICT.

Stakeholders, particularly farmers, can access this project's services through a variety of channels, including government offices, kiosks, Krishi Vigyan Kendras, Kisan Call Centers, Agri Clinics, Common Service Centers, and web/mobile applications. All of these services particularly belong to the G2C model of e-governance. Aside from that, they can use the project's different Center and State Agriculture portals to access services. These portals ensure that processes are standardized and that data flows more smoothly. Data and Disaster Recovery Centers, block-level computer hardware components, project site preparation, project management software, development of various applications, customization, digitization, capacity building, and training and change management, among other things, are all included in the project. One of the project's main goals is to discover and adopt the finest e-Governance practices across the country, as well as to upgrade them to include other types of applications in order to create a national platform that is adaptable for the states. Under the (AGRISNET) scheme, which falls under the Central Sector Scheme

of 'Strengthening/Promoting of Agricultural Information System,' the program provides financial assistance to all participating states for all development activities that are not covered under the NeGP-A. However, if farmers require financial support from the government of India, the states must conform to the AGRISNET scheme's requirements.

The National e-Governance Plan for Agriculture is a Mission Mode Project funded by the federal government. During the 2010-11 fiscal year, Phase I of the project was implemented in seven different states around the country, in accordance with the 11th plan. The initiative has since been expanded to include the rest of the country's 22 states, as well as the seven Union Territories.

Pesticide registration, seed testing results, prices, and arrival details, GIS-based systems for prices and arrival details, pesticide, fertilizer, and seed information, and district-level agro-met alerts are among the major services covered by the plan. Farmers can use two different strategies to benefit from this project's services. The first strategy is through mobile applications. For this, various mobile applications have been developed. Some of them are Kisan Suvidha, Pusha Krishi, Crop insurance, Agri Market, and India Weather. The second way is through web applications. Some of the portals developed under this are Farmers' Portal, mKisan portal, Crop insurance portal, and Participatory Guarantee System of India (PGS) portal. The various mobile applications and web applications aim to disseminate correct information to the farmers at the correct time like weather conditions for upcoming days, availability of markets, information on crop insurance, etc (Thomas, 2022).

With respect to organic farming, the Ministry of Agriculture, Department of agriculture and Metal Scrap Trade Corporation Limited (MSTC) launched the 'JAIVIK Kheti' portal to promote organic farming globally. It is a one-stop portal where farmers can sell their organic products as well as promote organic farming and its benefits. It is an e-commerce portal as well as knowledge-sharing platform. Various case studies, videos, best farming practices, success stories, and other information on organic farming are a part of the knowledge repository. The e-commerce portal offers a whole range of organic produce for selling purposes due to which buyers can benefit by availing the organic products at cheaper rates at their doorstep. For the overall development and promotion of organic farming, the portal links stakeholders like regional councils, local groups, farmers, buyers, government agencies, and input suppliers. There are options of forward auction, price-quantity bidding, book building, and reverse auction mechanism for giving farmers the best option to get the best prices for their products which involves their efforts and hard work ((Jaivik Kheti, 2022). The Jaivik Kheti portal not only fits into the G2C model due to the transmission of information from the government to citizens, but also under G2B due to its setup for sale of agricultural products to farmers. The exchange of information between different government departments also makes it fit for the G2G model.

In the private sector, ITC has played a major role through e-governance in the upliftment of small and marginal farmers through the e-Choupal model. It is termed as one of the most successful system. In a ground-breaking step, ITC established e-Choupals, village internet kiosks that provided real-time, up-to-date, relevant information on weather, price discovery, Agri know-how and best practices, and other topics. The kiosks are staffed by qualified local farmers who assist the agricultural community in obtaining information in their own tongue. Farmers have been able to increase output, improve quality, control risk, and earn better prices by having suitable knowledge and services available virtually at the farm gate. e-Choupal minimizes transaction costs and assists farmers in fine-tuning crop varieties and qualities to shifting trends by developing a more efficient marketing channel. e-Choupal, India's largest internet-based rural intervention, has evolved into an ecosystem of services that cater to a wide range of rural needs, from Agri-extension and other farm-related services to retail outlets, insurance, and healthcare (ITC e-Choupal - Empowering Indian Farmers, 2022).

e-Governance for waste management in India

The ever-expanding human population and increase in industrialization have contributed to the production of huge quantities of waste. With this, it is the responsibility of the government to develop adequate facilities for proper waste treatment and its management. The Indian government has set up many sewage treatment

plants and even mandated private organizations to have their own treatment systems. This has caused a spurt in the number of treatment facilities but maintenance of these systems and proper monitoring are also of utmost importance. With the trend of digitalization in India, it is possible to bring these components in an aligned manner. The Digital India Mission, Swatch Bharat toilets with GIS tracking, consent management platform in the state of Tamil Nadu, National rural drinking water monitoring are some of the initiatives for sewage management under the digitalization trend (Wescoat, 2016; Reymond, 2020). Apart from these, there are other monitoring systems too (https://cpcb.nic.in/e-governance-portals/).

The Centralized Extended Producers Responsibility Portal for Plastic Packaging (EPR) has been set up to ensure the processing of plastic packaging waste through recycling, re-use, or proper disposal under the Ministry of Environment, Forest and Climate change, Government of India. There are a set of guidelines of the EPR. Producers, importers and brand owners (PIBOs) need to register themselves through the portal developed by Central Pollution Control Board. the PIBOs working in more than two states or union territories also have to register at the respective state pollution control board. The platform will aid in strengthening the accountability, traceability, and transparency of EPR Obligation fulfillment. The portal is expected to have seven modules that allow Plastic waste processors (PWPs) and PIBOs to register, issue certificates and exchange credits, monitor transactions between PIBOs and PWPs in real-time, levy environmental compensation, and provide system-generated reports, and make filing annual returns easier for stakeholders. The portal has two modules for the registration of PWPs and PIBOs. The registration od PIBOs and PWPs has started on 20th October 2021(Centralized EPR Portal for Plastic Packaging, 2022). There is also a dedicated portal for the registration of compostable plastics with detailed SOP and FAQs for the information of the applicant. This particular portal is majorly a part of the G2B model as it deals with the exchange of information between the government and businesses so as to ensure proper usage and disposal of plastics.

CPCB grants recognition to environmental laboratories as under section 12 and 13 of the Environmental Protection Act (EPA), 1986 to those who fulfill the requirements of "Guidelines for recognition of environmental laboratories under the environmental protection act, 1986". It is a completely dedicated and separate portal for online applications following the guidelines, requirements and protocols given on the portal. After registration and application, the applicants can view the progress status online (e-Application for Lab Recognition under EPA, 2022). India e-Track is a web portal launched by CPCB for obtaining environmental statistics. It is not in the public domain and requires sign in option by authorized users to obtain river basin-wise status of ETPs, STPs and CETPs (India E-track, 2022; Compliance Status of Grossly Polluting Industries, 2022)

The Library & Information Resource Centre of the Central Pollution Control Board (CPCB) named 'e-Granthalaya' is well equipped to provide lending and reference services to its officials. The Library offers a specialized collection of 10,000 information resources, which includes books, reference materials, publications, and internal technical studies. CPCB Library's major goal is to provide reference and referral services as well as information support to its users. Aside from the books and periodicals that are available for a set period of time, the CPCB library also receives newsletters, annual reports from state pollution control boards, and other institutions/academic institutions that work in the field of environment. The Central Pollution Control Board (CPCB) Library works to construct a collection by identifying, analyzing, selecting, processing, retrieving, and disseminating information to the Scientific Community and CPCB employees (e-Granthalaya OPAC: A Digital Agenda for Library Automation and Networking, 2022). There is also a separate portal for reviewing e-waste management by CPCB (E-waste, 2022). There are separate portals for the quarterly reporting of treatment, storage and disposal facilities and environmental air quality data entry system only for use by CPCB officials (TSDFs, 2022; CPCB | Central Pollution Control Board, 2022). Owing to its restricted nature of information sharing between different government departments and from government to employees the portal falls under G2E and G2G models of e-governance.

There is a separate dashboard showing the suitability of river ganga water for various purposes. It collects data from various points along the river and based on the specifications shows the real-time status (SUIT-

ABILITY OF RIVER GANGA WATER, 2022). This is government data which is in the public domain for the information of the citizens and hence can be fitted under the G2C model. A snapshot of the dashboard is shown below in figure 1.
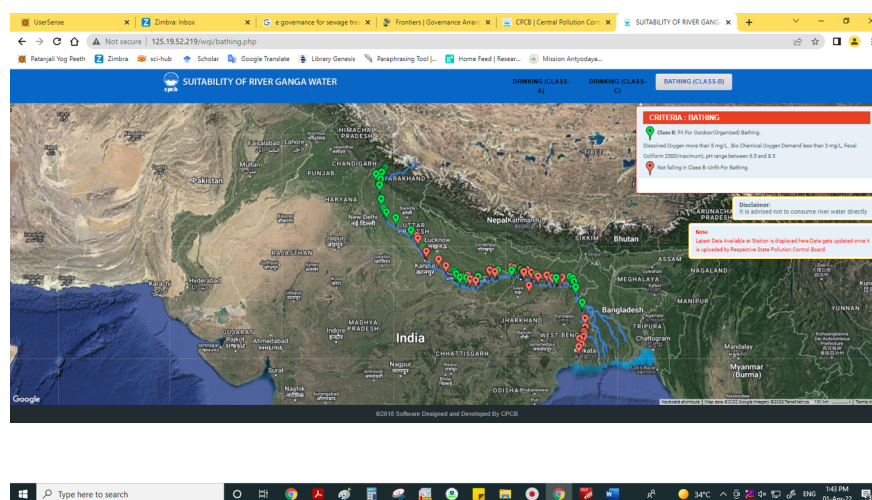

Figure 1: A snapshot of the dashboard showing the suitability of Ganga river water for different purposes.

CPCB-eSamikSha is a real-time, on-line system for tracking follow-up action on decisions made during presentations to the CPCB Chairman by various Divisions/Zonal offices/State Boards. Each decision's follow-up action should be updated by the concerned Divisions/Zonal offices/State Boards as soon as the status changes, or at least once a month. A log-in/password allows different users, such as CPCB Divisions/Zonal Offices/State Boards/MOEF, to securely access the system (CPCB-eSamikSha, 2022). Apart from these, the CPCB Sanyojan is a portal for submission of annual reports mandated under acts and rules. Here the different State Pollution Control Boards (SPCBs) can share their success stories so that others can adopt them and implement them as and when necessary (SPCB Sanyojan, 2022). Both of these are the concepts from the G2G model of e-governance.

e-Governance for Forest monitoring in India

Forests play an important part in any country's social, cultural, historical, economic, and industrial development, as well as in maintaining its ecological balance. Forests meet the demands of a diverse range of people. The premium on forests can be explained by identifying them as primary producers and defenders of a variety of natural resources. They share characteristics with many other resource systems, such as agriculture, animal husbandry, watershed, biodiversity, and energy, making sustainable, efficient, and fair governance problematic. Forests supply us with a diverse range of goods and ecological functions. They are an abundant source of biodiversity. A vast number of underprivileged people who live in and around forest areas rely substantially on these woods for a living. We must maintain a healthy forest cover in terms of both size and quality, and we must use it in a sustainable manner. Forests give numerous benefits to a wide range of people. If not effectively managed, the variety of users can lead to conflict and resource depletion. The term forest governance was established to encompass the concept of democracy as well as the participation of non-state actors in decision-making surrounding the allocation and use of scarce forest resources. .

The Forest Survey of India (FSI) is a government of India institution that is under the Ministry of Environment and Forests. Its primary mission is to conduct surveys and assessments of the country's forest resources. It began in 1965 as an FAO/UNDP/GOI project named the Pre-Investment Survey of Forest Resources (PISFR). PISFR's activities were expanded in response to growing information needs, and it

was renamed Forest Survey of India in 1981. PISFR's major goal was to determine the availability of raw materials for the establishment of wood-based industries in specific locations of the country. The National Commission on Agriculture (NCA) suggested in its 1976 report the establishment of a National Forest Survey Organization to conduct a regular, periodic, and thorough survey of the country's forest resources, which led to the establishment of FSI. Following a critical examination of FSI's activities, the Government of India amended its mandate in 1986 to make it more relevant to the country's fast changing needs and ambitions. "e-Green Watch" is a key e-governance effort of the FSI, India .

The e-Green Watch is a user-friendly web-based tool that is transparent, dependable, and accountable. It is an integrated e-governance platform that enables the detection of temporal changes for effective online monitoring and evaluation of respective States' Compensatory Afforestation Fund Management and Planning Authority (CAMPA) forestry sector activity. It is a comprehensive strategy to facilitate the automation of various management procedures associated with the utilization of CAMPA and other money supplied by states under various centrally sponsored schemes for plantation and other forestry-related works. The application can display the categories of Compensatory Afforestation, Diverted Land, Plantations, Other Plantations, and Assets on Google Earth images and the FSI portal. Andhra Pradesh, Karnataka, Madhya Pradesh, Sikkim, and Tripura were chosen as pilot states for the initiative. Currently, 27 states/UTs are affiliated to the e-Green Watch portal. The approach for systematic monitoring of ongoing plantations is urgently needed for financial accountability and the adequate success of plantations and other projects on the ground. The National Informatics Centre (NIC) conceived and developed the e-Green Watch portal, and it is actively involved in the creation, maintenance, and upgrading of the portal's technologies. FSI is analyzing and monitoring polygons uploaded by SFDs/UTs to the e-green watch site and downloaded in kml (Keyhole Markup Language) format. This particular system fits under G2G, G2C and G2E models of e-governance due to the sharing of information between government departments, upload of data by the employees for the information of the public. The e-green watch technique includes the following points (Figure 2):
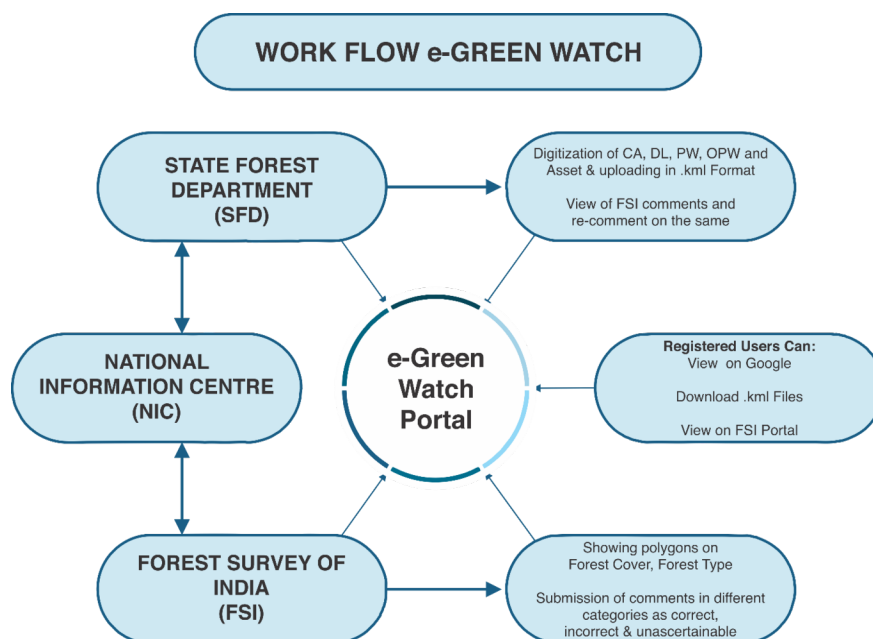

Figure 2: Work flow of e-green watch portal

Major Finding of Forest survey report

The entire forest and tree cover of the country is 80.9 million hectares, accounting for 24.62 percent of the country's geographical area. The total forest and tree cover of the country has increased by 2,261 square

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kilometers since the previous assessment in 2019. The increase in forest cover is 1,540 square kilometers, and the increase in tree cover is 721 square kilometers. .

There has been an increase in forest cover in open forest, followed by deep forest. Andhra Pradesh (647 sq km), Telangana (632 sq km), and Odisha are the top three states with increased forest cover (537 sq km).

Area-wise Madhya Pradesh has the country's highest forest cover, followed by Arunachal Pradesh, Chhattisgarh, Odisha, and Maharashtra. Mizoram (84.53 percent), Arunachal Pradesh (79.33 percent), Meghalaya (76.00 percent), Manipur (74.34 percent), and Nagaland are the top five states in terms of forest cover as a proportion of total geographical area (73.90 percent).

Forest cover covers more than 33% of the geographical area in 17 states/UTs. Five states/UTs, namely Lakshadweep, Mizoram, Andaman & Nicobar Islands, Arunachal Pradesh, and Meghalaya, have more than 75 percent forest cover, while 12 states/UTs, namely Manipur, Nagaland, Tripura, Goa, Kerala, Sikkim, Uttarakhand, Chhattisgarh, Dadra & Nagar Haveli and Daman & Diu, Assam, and Odish

The country's total mangrove cover is 4,992 square kilometres. Mangrove cover has increased by 17 square kilometres since the previous assessment in 2019. Odisha (8 sq km), Maharashtra (4 sq km), and Karnataka are the top three states with increased mangrove cover (3 sq km).

Total carbon stock in country's forest is estimated to be 7,204 million tonnes and there an increase of 79.4 million tonnes in the carbon stock of country as compared to the last assessment of 2019. The annual increase in the carbon stock is 39.7 million tonnes.

Monitoring through e-green watch portal has certain technological limitations.

Although several technological advances in the past have alleviated the constraints and improved thoverall quality. The following work cannot be ascertained through satellite data:

- Civil Works such as repair, maintenance and widening of forest roads, repair works Forest quarters, buildings etc.
- Works like painting, whitewash, construction of boundary wall, barbed wire fencing, desilting of tank, polythene bag seedling, maintenance of plantation etc.
- Weeding and Hoeing works and replacement of plants.
- Artificial Natural Regeneration (ANR) and Natural Generation (NR) works, Gap plantations works cannot be ascertained through satellite imageries.
- Satellite data constraints such as satellite data insufficiency, lack of time series data of certain places on google earth.

e-Governance on Environmental-Flow monitoring of Rivers in India

As per a report on "Environmental Flows: State-of-the-Art With Special Reference to Rivers in the Ganga River Basin" as part of exercise the E-Flows are defined as "The temporal and spatial variations in quantity and quality of water required for freshwater and estuarine systems to perform their natural ecological functions (including material transport) and support the spiritual, cultural and livelihood activities that depend on them." Since the last decade, WWF-India and its allies have been fighting to protect the Ganga. While the work has been multifaceted, ranging from river flow difficulties to water pollution, climate change adaptation, and habitat and biodiversity conservation. During 2015–16, WWF-India, in collaboration with partners, conducted an action research study in over 2 million hectares of the culturable command area of two irrigation systems branching from River Ganga to understand the barriers to implementing Environmental Flows (E-Flows) in the critical stretch of river Ganga (between Haridwar and Triveni Sangam Allahabad). The team attempted to bridge the information gap about potential trade-offs for implementing E-Flows in a crucial stretch of the Ganga as part of this program. .

Science and implementation must inform environmental flow evaluations, which must be led by systematic monitoring and adaptive management. An effective environmental flow assessment must be science-based and supported by relevant stakeholders. The implementation of an environmental flow regime must include

regular monitoring of the effects of flow releases to verify and evaluate whether or not the desired environmental outcomes are being met, as well as an adaptive management framework that is flexible and capable of incorporating monitoring lessons by modifying the operations of flow release structures.

India-WRIS Web GIS aims to be a 'Single Window' solution for comprehensive, authoritative, and consistent data & information of India's water resources, as well as allied natural resources, in a standardized national GIS framework with tools to search, access, visualize, understand, and analyze the data for assessment, monitoring, planning, development, and ultimately Integrated Water Resources Management (IWRM). In the year 2009, CWC, MoJS, and NRSC, ISRO, DoS collaborated on the project. The India-WRIS Web-GIS comprises 12 major info systems, 36 sub info systems, and 95 layers, all of which are divided into five primary groups based on requirements and data availability:

1) The Atlas of Watersheds

2) Layers of Administration

3) Projects involving water resources

4) Thematic Layers

5) Environmental Information

Basin, Sub Basin, Watershed, River, water-body, urban and rural population extents, Dams, Barrage/weir/anicut, canals, and command boundaries are some of the primary layers produced under India-WRIS. Depending on the theme, these spatial layers have a huge quantity of attribute data ranging from 5-100 years. The portal offers free downloads of all unclassified data from CWC's HO stations as well as CGWB ground water data. Surface water, ground water, hydro-met observations, water quality, snow cover, inter-basin transfer links, land resources, socio-economic characteristics, infrastructure, and other administrative layers all have specific Sub-Info systems (Central Water Commission, 2022). As per the status report on Implementation of minimum environmental flows in river ganaga (upto Unnao), published in July, 2020, the daat was collected through emails, sms as well as automatic sensors (Ministry of Jal Shakti, 2020).

Conclusion and Way Forward

The efforts of the government of India in E-governance are extremely laudable. The various initiatives brought about through E-governance have found great appreciation from critics and various studies and reports. The launch of the 'Digital India Mission' has further strengthened the enforcement of e-governance. There are many appreciable initiatives like dashboards of different ministries which show the work status over different years, various portals which give real time information. The availability of such systems has made things more transparent for the common public with more outreach of the beneficiaries for receiving adequate governmental aid. We have discussed the e-governance mechanisms in India, primarily focusing on Agriculture, Sewage management, forestry and the environmental flow of rivers. The current study focused on these areas as they are also critical components for the Namami Gange Program. Here we propose a convergence network of these four sectors for the well-being of Ganga basin dwellers and the maintenance of river water quality while incorporating the four models of e-governance.

The use of organic fertilizers in the Ganga basin should be promoted so as to reduce toxic pollutants which come through agriculture runoff upon using chemical fertilizers, mix with the river water and contaminate them. Accurate soil testing and digital mode of fertilizer recommendation would enable farmers to know the correct doses of fertilizers and pesticides to be used. GIS mapping-based prediction of crop yield should be the other component. In the next sector we propose actual sludge monitoring at the STPs. The monitoring of waste water treatment and its availability already exists as part of digital initiatives of the CPCB. Sludge generation, its treatment and reuse for various purposes could become the important aspect in this sector owing to the huge number of STPs commissioned under Namami Gange Program and the unmanageable amounts of sludge generated on a daily basis. The monitoring of e-flow of rivers also is existent. Along with this, in the third sector we propose geo-mapping and geo-fencing-based mapping of wetland areas near the

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Ganga basin. Online monitoring system that could govern the wetlands and determine the adequate e-flow in order to prevent drought, as well as floods, could become one of the most important aspects. In the fourth sector afforestation of plants in the Ganga basin is proposed. In order to minimize the wastage of money on afforestation programs which do not grow trees as per the agroclimatic zone, the GIS-based platform could be most valuable. Digital monitoring and suggestions based on agro climatic zones would enable in growing desirable species of plants which can minimize the problem of soil erosion. The GIS based system could also help in continuous monitoring of the status of afforested lands. The four models of e-governance should be taken up in close concourse so as to disseminate, monitor and upgrade the information and status of the river.

Thus, we come to the conclusion that many past initiatives have been undertaken for cleaning of Ganga River and have fared to different extents. With the advent of the era of information and communications technology and enforcement of the digital India program, it becomes of utmost necessity to use these tools to bring about the desirable outputs along with continuous monitoring. Digital initiatives under Namami Gange Program could be able to improve the current status in the different sectors. The efforts under e-governance should thus be undertaken for Namami Gange Program as envisioned in this manuscript for protecting the river and improving the lives of people dependent on it.

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