

UWR Rainwater Offset Unit Standard

(UWR RoU Standard)

Concept & Design: Universal Water Registry

www.uwaterregistry.io



Project Concept Note & Monitoring Report

(PCNMR)

Project Name: Rainwater Harvesting Bundled Ponds in Gonda district, Uttar Pradesh

UWR RoU Scope: RoU Scope 2

Monitoring Period: 2014-2024

Crediting Period: 2014-2024 (11 Years)

UNDP Human Development Indicator: 2 (India)

Table of Contents

A.1 LOCATION OF PROJECT ACTIVITY	3
A.2 PROJECT OWNER INFORMATION, KEY ROLES AND RESPONSIBILITIES	4
A.2.1 PROJECT ROU SCOPE	8
A.3 LAND USE AND DRAINAGE PATTERN	9
A.3.1 URBAN AND RURAL RESIDENTIAL	9
A.3.1.1 INTRODUCTION	9
A.3.1.2. Drainage System	11
A.3.1.3. River System	13
A.3.1.4. PHYSIOGRAPHY	14
A.4. CLIMATE	17
A.5. RAINFALL	18
A.6. GROUND WATER	21
A.7. ALTERNATIVE METHODS	23
A.8. DESIGN SPECIFICATIONS	24
A.9. IMPLEMENTATION BENEFITS TO WATER SECURITY	25
A9.1 OBJECTIVES VS OUTCOMES	27
A9.2 INTERVENTIONS BY PROJECT OWNER / PROPONENT / SELLER	28
A.10. FEASIBILITY EVALUATION	29
A.11. ECOLOGICAL ASPECTS & SUSTAINABLE DEVELOPMENT GOALS (SDGS):	29
A.12. RECHARGE ASPECTS:	32
A.12.1 Solving for Recharge	32
A.13. QUANTIFICATION TOOLS	34
A.14. UWR RAINWATER OFFSET DO NO NET HARM PRINCIPLES	37
A.15. SCALING PROJECTS-LESSONS LEARNED-RESTARTING PROJECTS	38
Annexure I	40
Annexure II	41
Annexure III	42
Annexure III	43
Annexure IV	44
Annexure VI	45

A.1 LOCATION OF PROJECT ACTIVITY

State	Uttar Pradesh
District	Gonda
Block Basin/Sub Basin/Watershed	Ganga Bain/ Ghaghra Sub Basin
Lat. & Longitude	27.13°N 81.93°E
Area Extent	4,003 square kilometres
No. of Villages/Towns	1,817 villages according to 2011 Census Data
No. of Villages/Towns	1,817 villages according to <u>2011 Census Data</u>



A.2 PROJECT OWNER INFORMATION, KEY ROLES AND RESPONSIBILITIES

District Ganga Committee (DGC) is responsible for the administration and oversight of the development or rejuvenation of **151 ponds** in Gonda District, Uttar Pradesh, under the **Mission Amrit Sarovar** initiative. DGC has appointed **Innovators Infratech LLP (IIL)** to act as project proponent (PP) for water credits on select Amrit Sarovars. Launched on **24th April, 2022**, under the **Ministry of Jal Shakti**, this mission aims to conserve water by developing or rejuvenating multiple Amrit Sarovars across Gonda districts, empowering local farmers with a dependable water supply that sustains agricultural productivity even in drought-prone regions.

Gonda, an important district in Uttar Pradesh, comprises four tehsils—Gonda, Colonelganj, Tarabganj, and Mankapur—with a predominantly agrarian economy that relies heavily on monsoon-fed water sources and groundwater. The district has long faced challenges related to water conservation, seasonal water scarcity, and groundwater depletion. The restoration of 151 ponds under this initiative plays a crucial role in enhancing water security, improving irrigation support, and promoting ecological balance in the region.

Before the project, these water bodies lacked proper delineation and structure. Now, they have been transformed into well-defined and functional water management systems. As the Project **Proponent**, Innovators Infratech LLP is responsible for:

- **Ownership and Rights:** Managing water usage within the project boundary while ensuring compliance with local governance structures.
- Legal Land Title: Ensuring that all project areas fall under government-designated schemes and are free from contested claims.
- **Regulatory Compliance:** Securing and facilitating the necessary permits and approvals for pond restoration and maintenance.
- **Project Implementation:** Overseeing pond excavation, deepening, and desilting to enhance rainwater harvesting, groundwater recharge, and overall water conservation.
- While **PP** does not undertake technical responsibilities, it ensures that the excavation, deepening, desilting, and other technical aspects of pond restoration are carried out by qualified agencies in accordance with the **Mission Amrit Sarovar** initiative's objectives.
- As a result of this initiative, the **151 restored ponds now have clearly defined margins and improved structures**, significantly boosting their **water retention capacity**. Beyond environmental benefits, the project has also **created local employment opportunities**, both during construction and for ongoing maintenance.
- By promoting water security and sustainable resource management at the community level, the Amrit Sarovar initiative is making a lasting impact on rural development and environmental conservation in Gonda and beyond.

Table 1 Information of Ponds

Gonda Amrit Sarovar					Gonda Amrit Sarovar					
Sr	Pond	Sarovar	Latitudo	Longitudo		Sr	Pond	Sarovar	Latitudo	Longitudo
No	No	ID	Latitude	Longitude		No	No	ID	Latitude	Longitude
1	1	120882	27.112575	82.4474		77	154	55718	27.17067	81.7777
2	2	106955	27.09202	82.5345		78	156	54560	27.04857	82.2563
3	4	54559	27.12903	82.482		79	158	42597	27.016943	82.2814
4	8	107011	27.09658	82.4912		80	164	54520	27.06083	82.1944
5	9	54470	27.07178	82.4364		81	167	44017	27.077455	82.1449
6	11	54568	27.07268	82.4778		82	169	53422	27.01956	82.3398
7	12	54518	27.06391	82.464		83	171	53266	27.12365	82.2359
8	13	54986	27.06473	82.5393		84	172	54078	27.07683	82.1598
9	22	34947	26.9311	81.9043		85	175	44092	27.04094	82.1922
10	25	34943	26.9084	81.9396		86	180	54640	27.071425	82.2135
11	26	117807	26.9003	81.8639		87	181	42033	27.0535	82.2607
12	29	121066	26.9272	81.8288		88	183	54604	27.13676	82.238
13	31	34939	26.9098	81.8566		89	184	54106	27.1117	82.2387
14	33	46218	26.9791	81.9109		90	187	102223	27.2207	82.1191
15	34	34946	26.8979	81.8929		91	190	43699	26.884907	82.1343
16	35	58974	26.93742	82.4672		92	192	26482	26.88675	82.2045
17	38	44016	27.00718	82.3461		93	193	43789	26.99205	82.2375
18	39	132654	26.97796	82.4636		94	194	26489	26.99119	82.2259
19	43	44278	26.96247	82.3673		95	195	52211	26.88232	82.1212
20	45	59293	26.98164	82.3502		96	200	55721	26.93959	82.1945
21	46	116669	26.9602	82.4033		97	201	121068	26.90355	82.2252
22	53	59108	26.99212	82.4295		98	203	26485	26.84604	82.1993
23	56	67343	26.98178	82.3612		99	204	52479	27.00146	82.2252
24	59	53657	27.03462	81.6654		100	206	26479	27.00299	82.2368
25	60	53625	27.01062	81.6778	1	101	207	61397	26.856244	82.1927
26	61	53645	27.08269	81.6531		102	210	52763	26.86102	82.2202
27	62	53642	27.100444	81.7069		103	211	72541	26.84279	82.2083
28	66	53634	27.038695	81.6334		104	216	61446	26.84501	82.2251
29	67	23920	27.1092	81.5967		105	220	54113	27.1962	82.0012
30	68	23922	27.11153	81.6115		106	221	104055	27.156304	82.0296
31	69	23924	27.12229	81.6448	1	107	222	43023	27.22899	81.9953
32	71	23926	27.07952	81.5869		108	223	132029	27.16963	82.013
33	72	45215	27.08926	81.7213		109	224	111976	27.241035	81.9913
34	73	23928	27.08904	81.7303		110	227	43136	27.2515	81.9868
35	74	23916	27.01347	81.6911		111	229	132046	27.198273	82.0286
36	76	54091	27.141228	81.7378		112	231	43440	27.163477	82.0603
37	78	53097	27.124388	81.7393		113	233	43208	27.207	81.992
38	79	53077	27.126929	81.7399		114	234	43346	27.185328	82.0326

39	80	53257	27.11116	81.8308		115	235	43278	27.2027	82.0165
40	83	118010	27.199902	81.7196		116	241	55389	27.00076	81.7487
41	85	26475	27.105	81.7851		117	244	53346	26.96556	81.7694
42	86	26476	27.15323	81.8345		118	245	110015	27.09088	81.7574
43	87	26477	27.191392	81.6651		119	246	53395	27.08479	81.752
44	88	26478	27.189538	81.7304		120	249	102214	27.03457	81.8145
45	92	54738	27.31478	81.9876		121	250	55379	27.04717	81.8582
46	93	105408	27.36236	82.0834		122	251	41496	26.96827	81.7949
47	96	114549	27.23401	82.0078		123	252	44510	27.0239	81.8531
48	97	34933	27.26585	82.0792		124	254	41386	27.07101	81.7839
49	99	34925	27.24304	82.0368		125	255	44029	27.06788	81.8166
50	102	54449	27.29534	82.0758		126	256	131382	26.96198	81.8406
51	103	118234	27.28339	82.1475		127	257	66962	27.39339	82.0981
52	104	53909	27.24937	82.0747		128	258	66579	27.34505	82.0042
53	105	34924	27.29319	82.1239		129	259	104930	27.27264	81.8986
54	106	34928	27.34505	82.1292		130	261	54371	27.32251	81.9754
55	107	54665	27.33161	82.0456		131	265	136963	27.38256	81.9502
56	108	34929	27.22553	82.0459		132	266	54476	27.38069	81.9576
57	111	106161	27.3115	82.0095		133	267	68614	27.41192	81.9595
58	112	44403	27.35409	82.0665		134	268	54913	27.31424	81.8759
59	115	23892	27.05992	82.0127		135	270	137468	27.34114	82.0464
60	121	54051	27.05366	82.0763		136	271	55625	27.34786	82.0229
61	124	22296	27.08988	82.0491		137	272	54429	27.38063	81.9727
62	125	53996	27.13741	82.0688		138	273	68569	27.28788	81.9529
63	126	24798	27.11193	81.8617		139	275	53661	26.845937	81.937
64	128	23890	27.071003	82.079		140	277	46364	26.91733	82.0175
65	130	23882	27.09711	82.0633		141	280	53660	26.87014	82.039
66	132	54990	27.190447	81.8242		142	282	53501	26.87197	81.9889
67	133	56789	27.24004	81.847		143	283	53663	26.913664	82.0326
68	138	118378	27.26604	81.8308		144	284	53666	26.99528	82.0213
69	141	56854	27.23423	81.8836		145	288	105612	26.99614	82.0673
70	142	109749	27.24794	81.8205		146	290	132742	26.86092	81.9641
71	143	57085	27.25821	81.8662		147	294	53498	26.8681	81.951
72	145	114948	27.24954	81.8386		148	300	105571	26.985127	82.0531
73	146	55585	27.20453	81.8168		149	301	53673	26.866283	81.9873
74	148	57377	27.23325	81.6734		150	305	53490	26.935436	81.9526
75	151	109112	27.26728	81.8496		151	308	23908	26.977792	82.139
76	153	121268	27.31436	81.7369	1		•	•		



Figure 1 Images of Ponds

A.2.1 PROJECT ROU SCOPE

Project Name	Rainwater Harvesting Bundled Ponds in Gonda district, Uttar Pradesh					
LIM/R Scope:	RoU Sc	cope 2: Measures for	conservation and storage of excess sur	face		
own scope.	water f	or future requirement				
Project Proponent	Innovat	tors Infratech LLP				
Project Proponent Address	108, Ya Pradesi	ash Silver Heights, E h-226006	adshahnagar, Mahanagar, Lucknow, L	Jttar		
Project Aggregator	Yojan S	olutions Pvt. Ltd.				
Project Aggregator Address	17-18, Nilamber Bliss, Gotri Sevasi Road, Vadodara, Gujarat, India- 390021					
Date PCNMR Prepared	18/04/2	2025				
Type of structure	Rainwa	ter Harvesting and Rec	harge Ponds of Different Shapes			
Average Rainfall	<u>869 mn</u>	<u>n</u>				
Run off coefficient	0.3					
Evaporation & Absorption	20%					
losses	2070					
RoU Crediting Period	2014-20	024 (11 Years)				
			Total ROUs			
		2014	Total ROUs 120700			
		2014 2015	Total ROUs 120700 96947			
		2014 2015 2016	Total ROUs 120700 96947 145873			
		2014 2015 2016 2017	Total ROUs 120700 96947 145873 112770			
Total RoUs Generated For		2014 2015 2016 2017 2018	Total ROUs 120700 96947 145873 112770 120052			
Total RoUs Generated For the Crediting Period		2014 2015 2016 2017 2018 2019	Total ROUs 120700 96947 145873 112770 120052 164469			
Total RoUs Generated For the Crediting Period		2014 2015 2016 2017 2018 2019 2020	Total ROUs 120700 96947 145873 112770 120052 164469 194256			
Total RoUs Generated For the Crediting Period		2014 2015 2016 2017 2018 2019 2020 2021	Total ROUs 120700 96947 145873 112770 120052 164469 194256 231312			
Total RoUs Generated For the Crediting Period		2014 2015 2016 2017 2018 2019 2020 2021 2022	Total ROUs 120700 96947 145873 112770 120052 164469 194256 231312 169799			
Total RoUs Generated For the Crediting Period		2014 2015 2016 2017 2018 2019 2020 2021 2021 2022 2023	Total ROUs 120700 96947 145873 112770 120052 164469 194256 231312 169799 159668			
Total RoUs Generated For the Crediting Period		2014 2015 2016 2017 2018 2019 2020 2021 2021 2022 2023 2024	Total ROUs 120700 96947 145873 112770 120052 164469 194256 231312 169799 159668 170226			
Total RoUs Generated For the Crediting Period		2014 2015 2016 2017 2018 2019 2020 2021 2022 2023 2023 2024 Total	Total ROUs 120700 96947 145873 112770 120052 164469 194256 231312 169799 159668 170226 1686072			

A.3 LAND USE AND DRAINAGE PATTERN

A.3.1 URBAN AND RURAL RESIDENTIAL

A.3.1.1 INTRODUCTION

The **land use classification** and **drainage network** of Gonda District is essential for the successful implementation of the **Amrit Sarovar Initiative**, which aims to **restore and maintain 151 ponds** for **rainwater harvesting**, groundwater recharge, and sustainable water conservation.

Gonda is a town in Uttar Pradesh which serves as administrative headquarter of Gonda district. The total area of Gonda District is 4,003 km² including 3,952 km² rural area and 51 km² urban area. There are 4 Tehsils part of Gonda District for administrative purposes. When it is about the rural area of Gonda District, Gonda has 1817 villages according to <u>2011 Census Data</u>.

Gonda is the largest tehsil in Gonda district by area covering 1174.61 km² and Mankapur is the smallest tehsil in Gonda district by area covering 726.121 km². It is the largest tehsil by population while Mankapur is the smallest tehsil by population in Gonda district.

List of Tehsil in Gonda District

Gonda district is divided into several Tehsils or tehsils for administrative convenience. There are 4 tehsils in Gonda district. Each tehsil is headed by a Tehsildar, who is responsible for revenue administration and law and order.



Figure 1: Tehsil of Gonda

Table 2 Demographic Details of Gonda District

Tehsil	Area(km²)	Population
<u>Colonelganj</u>	1,032.7	855,636
<u>Gonda</u>	1,174.6	1,169,971
<u>Mankapur</u>	726.1	646,490
Tarabganj	1,069.6	761,822

Reference: https://cgwb.gov.in/cgwbpnm/public/uploads/documents/1684142132359107627file.pdf

In Gonda district, Uttar Pradesh, the land use pattern is predominantly agricultural, with over 85% of the land under cultivation, supporting a significant portion of the population engaged in farming. The district's landscape includes diverse micro-agro climatic zones such as Uparhar (upland), Tarhar (lowland), Tarai, and Majha (Diara land).

Particular	Uparhar (Up Land)	Tarhar (Low land)	Tarai	Majha (Diara land)
Coverage	Part of the block :- Jhajhari, Pandrikripal, Wajeerganj, Rupaideeh & Paraspur	Part of the block:- Colonelganj, Tarabganj, Katarabazar, Belsar, Paraspur & Haldharmau	Part of the block:- Mujehana, Iteathok, Rupaideeh, Manakapur, Bhabhanjot, Chhapia	Part of the block :- Colonelganj, Tarabganj, Belsar, Paraspur, Navabganj
Soil Type	Sandy, Sandy loam & Loam soil	Clay loam, loam, sandy loam which are rich inorganic matter	Clay, clay loam & silty clay (plain and forest land)	Silty clay, clay & sandy loam (These lands are found in the river side of - Tedhi, Sarju & Ghaghara)

Table 3 Land & Soil Type of Gonda District

Land use is based on the nature of topography, its structure and geometry, availability of resources, historical importance, people's lifestyle, flora and fauna. Agricultural land scattered throughout the district while plantation can be seen in north-western part of the district. High density settlements can be seen in the central part of the district. The land use/land cover data of the study area is showing rapid urbanization. Block wise data of land utilization under the standard heads of land uses are given in table 3.

There has been a notable increase in agricultural land and built-up areas over the years, reflecting broader trends in land use dynamics observed in similar regions. Additionally, Gonda is home to forested areas, such as the Tikri Reserved Forest, where changes in forest cover have been studied to understand land use shifts. Below table and map is provided for understanding these changing patterns.

Table 4Land Use pattern of Gonda district, Uttar Pradesh

SL No.	Block	Total Reported	Forest	Uncultivable	Current Fallow	Other Fallow	Land Other than agriculture	Grassland	Gardens, trees and shrubs
					Area (I	lectare)			
1	RUPAIDIH	29343	388	222	1281	954	4272	77	311
2	ITIATHOK	25030	711	326	891	110	3567	107	367
3	PADRI KRIPAL	15929	0	217	1024	1160	2348	81	221
4	JHANJHRI	23751	168	373	1153	720	4678	101	927
5	MUJHENA	24692	707	367	1034	712	3347	93	448
6	KATRA BAZAR	28440	2	275	1028	1060	3612	90	966
7	HALDHAMAU	23185	1	202	1048	962	2335	96	324
8	COLONELGANJ	24897	0	230	1140	1051	2278	67	384
9	PARASPUR	29671	11	390	1117	837	4507	209	348
10	BELSAR	23173	9	240	1036	633	2612	206	277
11	TARABGANJ	24852	0	503	990	663	3423	225	1238
12	WAZIRGANJ	15141	117	149	561	452	1358	207	513
13	NAWABGANJ	33054	5516	527	863	1389	5127	110	514
14	MANKAPUR	29381	4040	671	561	1457	4671	77	310
15	BABHANJOT	23392	700	512	536	1316	2372	23	387
16	CHHAPIYA	21874	480	473	414	1822	2441	80	359



Figure 2 Land use/ Land cover map of Gonda district

A.3.1.2. Drainage System

Gonda district in Uttar Pradesh faces significant drainage challenges, particularly during the monsoon season. The district is prone to flooding and waterlogging due to several factors. One major cause is the substantial rainfall it receives, varying from <u>797.13 to 1375.73 mm</u> annually, which can lead to flash floods and waterlogging.

Additionally, the siltation of rivers and drains reduces their capacity to carry water, exacerbating flooding. For instance, 33 drains are choked and silted, interrupting the flow of rainwater. Unplanned urbanization without adequate drainage planning also contributes to waterlogging issues, such as deforestation, which increases runoff and reduces the natural absorption of water. Poor drainage management, including inadequate maintenance of drainage systems, leads to their failure during heavy rainfall.

The main rivers flowing through Gonda play a crucial role in its drainage system but also pose a risk of flooding. The **Ghaghara River**, formed from the united waters of the **Kauriala**, **Saryu**, **and Chauka rivers**, is the primary river affecting drainage patterns. The **Saryu River** joins the **Ghaghara** in Gonda and is another significant river contributing to the district's drainage system. The **Kuwano River** flows along the northern border, further influencing the district's drainage.

Flooding has a significant impact on Gonda district. In 2013, 237 villages in 10 blocks were affected by river floods and waterlogging, covering an area of 77,965 ha. This not only interrupts overall development but also causes substantial economic losses. To mitigate these issues, several measures are being implemented. Desiltation of ponds is crucial to increase their storage capacity and reduce waterlogging; ponds were suggested for desiltation. Additionally, constructing embankments to protect areas from river overflow is essential; embankments were proposed to mitigate flood risks. Afforestation is also important, as planting trees reduces runoff and enhances soil absorption. 7,740 ha of land with high moisture content is suitable for afforestation. Renovating existing drains to improve water flow is another key strategy.



Figure 3 Waterbodies and drainage in Gonda district

Improving drainage in Gonda district requires a comprehensive approach that includes these measures. By addressing these challenges, the district can reduce the impact of flooding and waterlogging, enhancing overall development and sustainability.

Initiatives like the Amrit Sarovar scheme, which focuses on constructing or rejuvenating water bodies to enhance groundwater recharge and support rural water security, can further support these efforts by promoting sustainable water management practices.



Figure 4 Improvements of drainage and waterbodies and mitigation of flood and waterlogged areas, Gonda district

https://www.ijset.in/wp-content/uploads/2016/01/10.2348.ijset1115152.pdf

A.3.1.3. River System

Gonda District is predominantly influenced by the **Ghaghara River Basin**, which is a vital component of the region's hydrological and agricultural framework.

The Ghaghara River, originating from the Himalayan glaciers near Lake Mansarovar at an elevation of 4,800 meters, flows through Nepal before entering India at Kotia Ghat. It forms the southern and southwestern boundary of Gonda District, while its tributaries like the Saryu and Kuwano further contribute to the drainage system.

The district lies within the Ghaghara alluvial plains, characterized by quaternary alluvium consisting of sands, clay, and kankar. This terrain supports extensive agricultural activities, with about 90% of the cultivable land under irrigation through state and private tubewells and canals. The district has a total irrigation area of 263,672 hectares out of 293,983 hectares of cultivable land, highlighting its dependence on groundwater and surface water resources.

The climate in Gonda is sub-humid, with an average annual rainfall of approximately 869 mm, primarily received during the monsoon season from June to September. This rainfall supports both surface water systems and groundwater recharge. The Ghaghara River Basin plays a crucial role in sustaining agriculture in the district by providing water for irrigation and drinking purposes. Additionally, modern irrigation initiatives

such as drip irrigation for sugarcane cultivation are being introduced to enhance water conservation efforts and crop yields. These measures reflect the importance of the Ghaghara River Basin in shaping the socio-economic and ecological dynamics of Gonda District.



Figure 5 River Map of Gonda District

Watershed Code					
Sub-Basin Name	Watershed Code				
Ghaghara	C2AGHA01 to 76				

Figure 6 Watershed Code of Ghaghara basin

A.3.1.4. PHYSIOGRAPHY

Physiographically, the region is divided into two main units: **upland plains** underlain by **older alluvium** and **lowland plains** underlain by **newer alluvium**.

Geomorphology

Geomorphologically, the district can be grouped into **two units** i.e., **Older Alluvial Plain (OA) and Younger Alluvial Plan (YA)**. Each unit possesses several landforms, such as Paleochannels, Meander-scars, oxbow Jakes, back-swamps, Flood plains and sandbars. The details of units and landforms are discussed as follows:

1. Older Alluvial Plain: It is flat and gently sloping towards south and southeast. It is mainly situated away from the drainage lines; it is composed of old unconfined alluvial material of varying lithology and consisting of various fluvial geomorphic landforms as stated above. It differs from younger or newer alluvium in predominance of clayey material.

2. Younger Alluvial Plain: It is flat and considerably more sloping towards drainage lines. It is mostly sandy in nature and composition. It is extensive in deposition adjacent to the drainage lines. It is characterised by development of present and old flood plains and terraces of different chronological order besides other landforms as stated above. A short description of each landform present in the above units is given as follows:

The older alluvium occupies the north and eastern parts, while the newer alluvium covers the central, western, and southern areas, forming low-lying, slightly undulating tracts deposited by rivers such as the **Kuwano, Tirhi, and Ghaghra** in more recent times. Notable geomorphic features include **sand bars** along riverbeds like the Ghaghra, which consist of sand deposits of varying sizes produced by fluvial action.

Flood plains are extensive, low-lying, flat areas adjacent to the Ghaghra River, characterized by thick deposits of unconsolidated alluvial materials near the river margins that thin out towards the valley slopes. Additionally, **ravines** and both **younger and older alluvial plains** are observed, reflecting a diverse landscape shaped by river dynamics and sedimentation processes. The region's topography is also influenced by the holy rivers Saryu and Ghaghra, which pass through it, contributing to the soil composition primarily made of fluvial deposits



Figure 7 Geomorphological Map of Gonda District

(Reference:<u>https://cgwb.gov.in/cgwbpnm/public/uploads/documents/1684142132359107627file.pdf,</u> https://www.cgwb.gov.in/old_website/District_Profile/UP/Gonda.pdf, https://gonda2.kvk4.in/)

Soil

The district is mostly covered by Loamy soil. Soil in the district exhibits a wide variation in composition, texture and appearance. The ridges are occupied by soils locally known as "Bhur" or "Silty Sand". "Matiyar" or "Clay Soils" occurs along topographic lows and "Dumat or Loamy soils" in the level lands. Clay is dominant in the areas where "Reh" (Usar) prevails. Along the river valleys, a very fertile soil called "Dumat" is prevalent which is the youngest. Generally, the soil is fertile in nature. Soil may be divided into following types depending on the physiography of the region.

a) Coarse Loamy

Coarse textured poor water holding capacity, low in organic matter, good aeration, and poor nutrients retaining capacity.

b) Fine Loamy

Fine textured, moderate aeration, high moisture and nutrients retaining capacity, soil particles sticky when wet, dries out slowly and moderate aeration.



ngure of <u>son map of Sonda District, ottar Pracesn</u>

Sandy Soil: Characterized by low organic matter content, sandy soil has a high infiltration and percolation rate, making it well-draining but less fertile.

Sandy Loam: A nutrient-rich and fertile soil type, sandy loam offers a balanced texture that supports healthy plant growth.

A.4. CLIMATE

(i) Type of Climate

The climate of Gonda district is characterized by a distinct seasonal contrast within a sub-humid environment. The district receives an average annual rainfall of **approximately 869 mm**—though some sections of the report reference slightly lower figures due to dataset variations—with nearly 90% of the precipitation falling during the southwest monsoon season (June to September).



Figure 9 <u>Climatological Map of Gonda District</u>

This intense rainy period provides ample water for **deep percolation and groundwater recharge**. In January, the climate is at its coolest, with mean daily maximum and minimum temperatures of about 22.9°C and 8.3°C, respectively, while May is the hottest month, experiencing daytime temperatures of roughly 39.9°C and night-time lows around 25.6°C. Overall, the monthly averages hover around 31.7°C for maximum and 18.5°C for minimum temperatures. Additionally, the district experiences high morning relative humidity averaging 68%, which drops to about 56% by evening, and generally mild winds at an average speed of 4.8 km/h that tend to pick up during summer.

Despite the hot and dry summer conditions, the substantial monsoon rainfall, combined with a significant evaporative demand (with potential evapotranspiration estimated at 1422.7 mm), ensures that moisture availability remains higher than that of arid or semi-arid regions—clearly supporting the sub-humid classification.

Reference: https://www.cgwb.gov.in/old_website/District_Profile/UP/Gonda.pdf

A.5. RAINFALL

Gonda district receives an **average annual rainfall of 869 mm**, with most of it (around 90%) falling during the southwest monsoon season from **June to September**. This heavy rainfall helps recharge groundwater and supports agriculture. However, rainfall varies from year to year.

Data from 1981 to 2021 shows that 55% of the years had below-normal rainfall, while the remaining years had normal or above-normal rainfall. The highest recorded rainfall was 1585 mm in 1984, while 1997 and 1998 experienced severe drought due to very low rainfall.

Overall, Gonda's climate is sub-humid, with high humidity in the mornings except during summer. Winds are generally strong, especially in summer, with an average speed of 4.8 km/h. The district also experiences **high moisture loss due to evaporation**, with a potential **evapotranspiration of 1422.7 mm**. While rainfall is generally sufficient, fluctuations in annual patterns sometimes lead to dry spells or excessive rain, impacting water availability and farming.



Figure 10 Variation of Annual Rainfall from Normal Rainfall in Gonda district





Figure 11 Rainfall distribution in the last 10 years (2012-2021) in Gonda district

S. No.	Year	Annual (mm)	Normal Rainfall (mm)	Deviation (%)
1	2012	1037.4	1020.16	1.7
2	2013	1180.3	1020.16	15.7
3	2014	769.3	1020.16	-24.6
4	2015	622.4	1020.16	39.0
5	2016	843.1	1020.16	-17.4
6	2017	668.2	1020.16	-34.5
7	2018	776.4	1020.16	-23.9
8	2019	1061.8	1020.16	4.1
9	2020	1319.2	1020.16	29.3
10	2021	1478.1	1020.16	44.9

Table 4 Variation of Annual Rainfall from Normal Rainfall in Gonda, U.P.

Under the Amrit Sarovar initiative, a total of 151 pond rejuvenation projects have been implemented in the Gonda district. To verify the accuracy of the rainfall data, IMDB rainfall data will be referenced. The relevant information is presented in the table below:

Rainfall Data					
<u>2014</u>	742.3				
<u>2015</u>	596.3				
<u>2016</u>	877.4				
<u>2017</u>	676.8				
<u>2018</u>	708.1				
<u>2019</u>	958.6				
<u>2020</u>	1114.9				
<u>2021</u>	1311.2				
<u>2022</u>	897.9				
2023	822.5				
<u>2024</u>	853.1				

Table 5 Rainfall Data – Gonda District

S. No.	District	Actual	Normal	% Departue	Category
1	AURAIYA	1089.9	516	111	Large Excess
2	ETAH	1050.7	505.4	108	Large Excess
3	FIROZABAD	1014.6	580.5	75	Large Excess
4	HATHRAS	899.5	549	64	Large Excess
5	BALRAMPUR	1247.6	793	57	Excess
6	BASTI	1276.4	827.9	54	Excess
7	CHITRAKOOT	972.1	785.8	24	Excess
8	KANNAUJ	899.2	668.8	34	Excess
9	MAHARAJGANJ	1267.7	987.1	28	Excess
10	SONBHADRA	1046.8	873.3	20	Excess
11	AGRA	840.6	530.3	59	Excess
12	BADAUN	886.9	672.7	32	Excess
13	BAREILLY	965.4	791	22	Excess
14	HAMIRPUR	988.1	708	40	Excess
15	JALAUN	857.9	642.7	33	Excess
16	KASGANJ	1035.4	666.6	55	Excess
17	LALITPUR	1059.8	805.1	32	Excess
18	MORADABAD	1091.2	872.9	25	Excess
19	AMBEDKAR NAGAR	896.8	853.8	5	Normal
20	AYODHYA	782.1	851.4	-8	Normal
21	AZAMGARH	786.3	854.3	-8	Normal
22	BAHRAICH	1164.3	986.7	18	Normal
23	BALLIA	602.2	718.7	-16	Normal
24	BANDA	871	767.1	14	Normal
25	BARABANKI	838.4	826	2	Normal
26	FARRUKHABAD	645.9	727.9	-11	Normal
28	GONDA	822.4	863.1	-5	Normal
2.5	CONVERTING R	1134.5	12.52.1	-5	Normai

Figure 5 Rainfall 2024 monsoon.pdf

A.6. GROUND WATER

(i) **Description of aquifer:**

Gonda district, covering about 3987 sq km in Uttar Pradesh, is underlain by Quaternary alluvial sediments that host a complex groundwater system. The aquifer system comprises three main groups:

• The shallow, phreatic aquifer (**Group I**) extends from the ground surface to around 97–115 m below ground level and is largely sandy, providing high yield for irrigation and domestic use.

• The deeper, confined aquifers (**Groups II and III**) occur beneath a clay layer and extend down to and beyond 300 m, with sand dominating these layers interspersed with clay bands.

Groundwater from these aquifers is critical for the district—supporting over 90% of its irrigated area—though challenges like water level fluctuations and occasional quality issues (e.g., elevated iron and arsenic) underscore the need for sustainable management strategies.

(ii) Unconfined & confined aquifers

In Gonda district the aquifer system is divided into shallow unconfined (or partially unconfined/semiconfined) aquifers and deeper confined aquifers, and their water quality can be broadly categorized as follows:

(a) Potable: These are the shallow, phreatic aquifers that typically yield fresh, calcium–magnesium bicarbonate type water. In most parts of the district the water quality meets drinking water standards, although routine analysis shows electrical conductivity values ranging from about 300 to 1800μ S/cm at 25°C.

Quality Concerns: In some block headquarters, the unconfined aquifer water exhibits elevated iron levels (and occasionally manganese or arsenic) that may necessitate treatment before use. Despite these localized issues, brackish or saline conditions are not generally observed in these shallow aquifers.

(b) Brackish: Brackish groundwater, characterized by dissolved solids concentrations between 1,000 and 10,000 milligrams per liter, is typically found in coastal regions or areas with specific geological conditions.

Groundwater is generally suitable for drinking and irrigation purposes. However, challenges such as waterlogging and soil salinity have been identified, particularly in canal command areas. The Central Ground Water Board recommends discouraging canal irrigation in waterlogged regions to mitigate these issues.

(c) Saline

Confined Aquifers (Aquifer Groups II and III)

- Potable: Tapped at greater depths (typically starting below 120–130 m bgl), these aquifers are bounded by clay layers that help isolate them from surface contaminants. Their water is generally fresh and, in many cases, preferable for public supply—especially in areas where the unconfined water is affected by iron or arsenic.

- Mineralization: Although confined waters can sometimes show a higher degree of mineralization due to longer residence times, in Gonda district they remain within acceptable limits for potable use. There is no widespread occurrence of brackish (moderately mineralized) or saline water in these confined aquifers.

In summary, both the unconfined and confined aquifer systems in Gonda are predominantly fresh and suitable for drinking (potable) purposes. While the shallow unconfined aquifers occasionally show localized issues with iron and arsenic, there is no significant presence of brackish or saline water in either aquifer type across the district. This overall favourable groundwater quality supports extensive domestic and irrigation use throughout Gonda district.

(ii) Any special quality problem, (Seawater intrusion, pollution, high fluoride etc.).

In Gonda district the primary groundwater quality challenges are mainly of natural origin rather than due to seawater intrusion, industrial pollution, or high fluoride. Specifically:



Figure 12 Water Quality Map of Gonda district

• Elevated Iron and Manganese – Analyses indicate that shallow unconfined aquifers in several areas have iron concentrations exceeding permissible limits. Manganese levels, while less frequent, have occasionally surpassed safe thresholds. These issues are linked to the geochemical characteristics of the Quaternary alluvial sediments that dominate the region namely Katra Bazar, Colonelganj, Haldharmau, Rupaideeh, Itiathok, PadriKripal, Mankapur, Chhapia, Babhanjot, Mujhena, Nawabganj, Wazirganj, Belsar, Paraspur.

• Arsenic in Shallow Groundwater – While not widespread, some instances of arsenic presence have been detected in shallow groundwater sources, highlighting the need for monitoring and potential treatment measures to ensure potable quality namely Katra Bazar, Haldharmau, Paraspur and Padri Kripal.

• Absence of Seawater Intrusion or High Fluoride – As an inland district, Gonda does not face seawater intrusion concerns, and reports of high fluoride concentrations are uncommon.

Overall, while Gonda's groundwater is largely fresh and suitable for use, these localized concerns particularly elevated iron and occasional arsenic presence necessitate routine monitoring and targeted interventions to maintain safe drinking water standards.

A.7. ALTERNATIVE METHODS

Challenges in managing its water resources effectively. The district's hydrological conditions, including its reliance on groundwater, necessitate innovative water management strategies.

1. Rainwater Harvesting

Gonda receives an average annual rainfall of <u>869 mm</u>, making rainwater harvesting an effective method to recharge groundwater and reduce runoff.

Implementation: Construct check dams and recharge shafts to enhance groundwater recharge. For instance, if 20% of the rainfall is captured and stored, it could significantly contribute to groundwater replenishment.

<u>Data</u>: The district's water table fluctuates between 4.20 to 5.77 meters below ground level, influenced by rainfall.

2. Storm Water Management

Efficient stormwater drainage systems can manage excess water during monsoons, reducing waterlogging and enhancing water conservation. Gonda's rainfall varies from 797.13 to 1375.73 mm, necessitating robust stormwater management.

Implementation: Improve drainage infrastructure to prevent flooding and allow for better water retention. This can involve constructing stormwater drains and retention ponds.

<u>Data</u>: Non-committed runoff is considered 75% of total runoff, highlighting the potential for stormwater harvesting.

3. Canal Network Optimization

Enhancing the existing 304 km canal network can increase surface water availability for irrigation, reducing reliance on groundwater. Currently, only 6% of the irrigated area is covered by surface water.

Implementation: Improve water distribution efficiency and reduce seepage losses. This can involve lining canals and installing water-saving devices.

Data: The gross irrigated area is 303,586 ha, with about 90% relying on groundwater.

4. Water Conservation through Crop Selection

Promoting water-efficient crops can reduce agricultural water demand, enhancing sustainability. Gonda's agricultural sector is a significant user of groundwater.

Implementation: Encourage farmers to adopt crops like pulses and millets alongside traditional crops. This can reduce water demand by up to 30%.

<u>Data</u>: The net irrigated area is 263,672 ha, with a high potential for water conservation through crop selection.

5. Artificial Recharge Structures

Constructing artificial recharge structures like percolation tanks and recharge wells can stabilize groundwater levels. Gonda's groundwater extraction is 79.30% of its potential.

Implementation: Enhance groundwater recharge through these structures. This can involve constructing recharge shafts in areas with high water table fluctuations.

Data: The annual groundwater recharge is 150,356.64 ham, with a net availability of 142,127.02 ham.

Implementing these alternative strategies can significantly enhance water management in Gonda district. Moreover, initiatives like the **Amrit Sarovar scheme** are moving the district in the right direction by focusing on water conservation and sustainability. The Amrit Sarovar scheme aims to construct or rejuvenate water bodies across the country, enhancing groundwater recharge and supporting rural water security. By integrating such national initiatives with local water management strategies, Gonda district can ensure more efficient use of its water resources and promote sustainable development.

Table 5 Alternative Water Management Methods for Gonda District:		
	Alternative Method	Rationale

Alternative Method	Rationale
Micro-Catchment Management (Bunds, Contour Trenches)	Captures and channels runoff effectively on flat terrain, improving localized infiltration and soil moisture retention.
Recharge Pits & Trenches	Directs runoff into the soil in a controlled manner, enhancing groundwater recharge where aquifers are accessible.
Farm Ponds or Small Check Dams	Provides localized water storage for individual farms or communities, reducing the need for large-scale infrastructure while still supporting irrigation and groundwater recharge.
Infiltration Galleries	Efficiently directs surface water into subsurface aquifers, reducing

A.8. DESIGN SPECIFICATIONS

Due to the diverse nature of the 151 pond sites across Gonda district, no single uniform design approach could be applied. Each pond restoration was customized based on specific local topography, water flow patterns, and existing infrastructure. Key design considerations included:

evaporation losses and maximizing recharge in permeable zones.

1. **Pond Geometry and Size:** Individual ponds varied significantly in depth, width, and storage capacity. The design was tailored to ensure optimal rainwater collection, percolation, and groundwater recharge based on available land contours and soil characteristics.

- 2. **Embankment Construction:** Margins were reinforced with compacted earth and stone pitching to reduce erosion and ensure structural stability.
- 3. **Desilting and Deepening:** Excavation was conducted to enhance the effective storage volume. The depth was adjusted depending on the soil profile and water table level.
- 4. **Overflow Management:** Controlled overflow mechanisms were introduced in select ponds to prevent flooding during peak rainfall events.

A.9. IMPLEMENTATION BENEFITS TO WATER SECURITY

PP has significantly contributed to improving groundwater recharge and water conservation in Gonda District. These restored ponds function as effective artificial recharge structures, strategically designed to enhance rainwater harvesting, groundwater replenishment, and overall water retention.

By implementing this initiative, PP has demonstrated how targeted interventions like pond restoration can effectively address regional water security challenges. The success of these 151 recharge structures highlights the potential for scaling such solutions across other districts facing similar issues. Through careful planning, site selection, and technical execution all overseen by PP this model can serve as a blueprint for achieving broader quantitative targets for groundwater recharge and sustainable water management in vulnerable regions.

The rejuvenation of villages and 151 ponds in Gonda District, Uttar Pradesh, is a strategic initiative aimed at enhancing water security and promoting sustainable rural development.

The rejuvenation efforts focus on:

• Rainwater Harvesting and Groundwater Recharge:

The design of these ponds is centred on maximizing the capture and storage of rainwater during monsoon seasons, ensuring that water remains available throughout the year. With optimized outlet channels and efficient drainage systems, the ponds are adept at collecting a significant volume of rainwater. This stored water not only provides an immediate source of water for various uses but also facilitates groundwater recharge. As water gradually percolates through the pond bed, it replenishes the underlying aquifers, thereby stabilizing the local water table and mitigating the impacts of seasonal water scarcity. This dual functionality enhances overall water security for the community and supports sustainable rural development.

• Enhanced Water Security:

The rejuvenated ponds are designed to capture and store rainwater efficiently, ensuring that a reliable supply of water is available throughout the year. This is particularly important during the dry season when natural water sources are scarce. In addition to direct water storage, these ponds play a crucial role in recharging groundwater. As rainwater percolates through the pond sediments, it helps to replenish the aquifers, thus maintaining or even increasing the local water table. This dual benefit of direct storage and groundwater recharge provides a robust defense against water scarcity in the region.

• Agricultural and Livelihood Support:

The ponds serve as a dedicated source of water for irrigation, which is essential for enhancing agricultural productivity in an agrarian economy. With a consistent water supply, farmers can plan their cropping cycles more effectively, leading to improved yields and reduced crop failures during periods of irregular rainfall. Furthermore, the ponds are multi-purpose in nature; they also provide water for livestock. These activities diversify rural income sources, offering communities additional avenues for economic stability and growth beyond traditional farming.

• Economic Upliftment:

Implementation of the pond rejuvenation project generates significant local employment opportunities. The construction phase, which involves land preparation, excavation, and building of embankments, creates jobs for local laborers and skilled workers. This not only improves the livelihoods of those directly employed but also stimulates the local economy through increased spending and the development of ancillary services. By using locally available materials and sustainable construction practices, the project minimizes costs and fosters economic self-sufficiency in rural areas.

• Community Empowerment and Ownership:

A key aspect of this initiative is its strong emphasis on community participation. Local community leaders, Gram Panchayats, and job card holders, are actively involved in every stage of the project; from planning and construction to ongoing maintenance. This inclusive approach instills a sense of ownership and responsibility within the community, ensuring that the ponds are well cared for and maintained in the long term. Additionally, public events and community-driven maintenance programs help to strengthen social bonds and local pride, further cementing the project's sustainability.

• Environmental and Ecological Benefits:

The pond rejuvenation project also offers significant environmental advantages. By creating a stable water body, the ponds become habitats for a variety of aquatic flora and fauna, thereby enhancing local biodiversity. The strategic plantation of trees, such as Neem, Peepal, and Banyan, around the pond perimeters helps control soil erosion and stabilizes the embankments. These green belts contribute to better micro-climate regulation by cooling the surrounding areas and mitigating the impact of heat. Overall, these measures improve the local ecosystem and increase resilience against the adverse effects of droughts and floods.

• Advanced Monitoring and Sustainability:

To ensure the long-term effectiveness and integrity of the ponds, the project incorporates advanced monitoring tools such as geo-tagging, mobile app tracking, and remote sensing technologies. These tools enable real-time monitoring of water levels, structural health, and maintenance needs, ensuring that any issues are promptly addressed.

Regular audits and technical inspections, carried out by local Panchayat representatives and government officials, safeguard the ponds' functionality and structural integrity. This proactive approach not only extends the lifespan of the infrastructure but also reinforces the community's capacity to manage and sustain the resource over time.

Each of these implementation benefits contributes to a comprehensive strategy that not only addresses immediate water scarcity but also lays the foundation for sustainable rural development and enhanced community resilience.

A9.1 OBJECTIVES VS OUTCOMES

Water scarcity is a critical challenge for rural communities, where access to reliable water sources directly impacts agriculture, livelihood, and the overall well-being of the residents. This concept note outlines a focused initiative for the construction or rejuvenation of 151 ponds (Amrit Sarovars), designed to optimize water storage, enhance groundwater recharge, and create a sustainable, community-centric water resource.

Objectives:

Objective	Explanation
Water Conservation Construct or rejuvenate ponds with a minimum pondage area of 1 acre and a capacity of ~10,000 cubic meters.	The initiative aims to address water scarcity by either constructing new ponds or rejuvenating existing ones. With each pond designed to cover at least 1 acre and hold roughly 10,000 cubic meters of water, the project ensures significant rainwater capture during monsoon seasons. This stored water serves as a critical reserve for periods of drought, providing a dependable source of water for both domestic and agricultural uses.
Groundwater Recharge Utilize the ponds as natural recharge basins.	Beyond storing water, these ponds function as natural recharge basins. As water seeps from the pond into the soil, it helps to elevate the groundwater levels over time. This process is particularly valuable in rural settings where groundwater forms a vital part of the water supply, thereby reducing the community's reliance on inconsistent rainfall.
Agricultural Support Provide a consistent water source for irrigation.	Beyond storing water, these ponds function as natural recharge basins. As water seeps from the pond into the soil, it helps to elevate the groundwater levels over time. This process is particularly valuable in rural settings where groundwater forms a vital part of the water supply, thereby reducing the community's reliance on inconsistent rainfall.
Agricultural Support	A consistent water supply is essential for reliable

Provide a consistent water source for irrigation.	irrigation. By securing water availability through these ponds, farmers can expect improved crop yields and better quality produce.
Environmental & Aesthetic Enhancement Restore ecological balance and create community spaces.	Integrating tree and shrub plantations around the ponds will promote biodiversity and transform the area into a recreational and cultural hub for local communities.

Outcomes:

Outcomes	Explanation
Enhanced Water Security - Reliable water storage will help mitigate drought conditions by providing a perennial source of water for domestic and agricultural use. - Improved groundwater recharge will contribute to a higher water table, benefiting the broader community.	The ponds capture and store significant volumes of water, ensuring a steady supply during dry spells. Gradual seepage into the ground boosts the water table, reducing reliance on erratic rainfall.
Economic Upliftment - A consistent water supply will boost agricultural productivity, enabling better crop yields. - Employment opportunities will be generated during construction and maintenance.	Reliable irrigation and diversified income sources support local economies, while job creation during project phases further uplifts rural livelihoods, stabilizing the community's economy.
Environmental & Social Benefits - Increased green cover and enhanced biodiversity will lead to improved ecological balance. - The pond area will serve as a community gathering spot, promoting cultural unity and recreational activities.	Restoration of natural habitats through plantation improves the local ecosystem. Additionally, transforming the pond area into a community space encourages social interactions and cultural activities.

A9.2 INTERVENTIONS BY PROJECT OWNER / PROPONENT / SELLER

The Project Proponent (PP) undertook a series of strategic interventions to achieve the desired outcome of restoring 151 ponds in Gonda District, Uttar Pradesh. These interventions were designed to improve water retention, enhance groundwater recharge, farmers often practice multiple cropping to maximize land use efficiency and increase their income and support sustainable water management in the region.

To restore these water bodies, the PP ensured that each pond underwent excavation, deepening, and desilting. These measures were crucial in improving storage capacity, facilitating rainwater harvesting, and enhancing groundwater recharge. Clear boundaries were established, and embankments were reinforced to prevent soil erosion and maintain structural integrity.

In addition to physical restoration, the PP ensured that all pond areas were verified to fall under governmentdesignated schemes, ensuring clear land titles and eliminating disputes. Regulatory requirements were carefully managed, with the necessary permits and approvals secured to maintain compliance throughout the restoration process.

While technical tasks were carried out by qualified agencies, the PP maintained oversight to ensure that all activities aligned with project objectives and followed best practices for water conservation.

The initiative also contributed to social and economic benefits by generating local employment opportunities during both the restoration phase and ongoing maintenance. This engagement helped foster community involvement, ensuring long-term sustainability and care for the restored ponds.

Through these coordinated efforts, the PP successfully transformed neglected water bodies into effective water management systems, strengthening water security, supporting agriculture, and promoting environmental stability in the region.

A.10. FEASIBILITY EVALUATION

The economic feasibility of the project has been assessed as positive based on several key factors. Prior thirdparty audit reports have indicated that while the upfront investment for constructing or rejuvenating 151 ponds is significant, the long-term benefits including enhanced agricultural productivity, and local employment opportunities justify the expenditure.

These audits recommend a phased implementation approach to manage costs effectively, leverage diverse funding sources such as government schemes and community contributions, and enforce strict cost control and contingency planning measures.

Overall, the projected improvements in water security and economic upliftment are expected to yield a favourable cost-benefit ratio, supporting the project's long-term sustainability and positive impact on rural development in Gonda district.

A.11. ECOLOGICAL ASPECTS & SUSTAINABLE DEVELOPMENT GOALS (SDGS):

The rejuvenation of 151 ponds in Gonda District addresses multiple Sustainable Development Goals (SDGs) by tackling key environmental and socio-economic challenges. By capturing rainwater and recharging groundwater, the project improves water availability, contributing to better access to clean water and sanitation. It also plays a vital role in climate resilience by mitigating runoff, preventing soil erosion, and reducing land degradation.

The restoration of these ponds further revitalizes natural habitats, supports local biodiversity, and enhances ecosystem services such as flood control and water filtration. Improved water retention positively impacts agriculture by maintaining soil moisture, contributing to food security and improved livelihoods. Additionally, better access to cleaner water reduces health risks, supporting overall community well-being.

By strengthening rural ecosystems, this initiative contributes to sustainable rural development and fosters a more resilient microclimate. Below are the specific SDGs that this project aligns with.

SDG Goals	SDG Target	Project Activity/Component	Impact
	SDG 1.5: Build resilience of the poor and those in vulnerable situations	Improved water availability for agriculture and domestic use, along with job creation through MGNREGS activities (Mahatma Gandhi National Rural Employment Guarantee Scheme.)	Reduces rural poverty by improving livelihoods, ensuring stable incomes, and enhancing food security
2 ZERO HUNGER	SDG 2.3 : Double the agricultural productivity and incomes of small- scale food producers	Provision of water for irrigation rejuvenated ponds	Boosts agricultural productivity by providing a consistent water source, thereby increasing food security and rural incomes
	SDG 6.1 : Ensure universal and equitable access to safe and affordable drinking water for all	Construction/Rejuvenation of ponds to provide reliable water sources for domestic and community use safe, cont supply of water	Increases water accessibility and quality, benefiting households in rural areas by providing a safe, continuous supply of water
6 CLEAN WATER AND SANITATION	SDG 6.4 : Increase water-use efficiency and ensure sustainable withdrawals and supply of freshwater	Creation of Amrit Sarovars with defined water holding capacity (approx. 10,000 cubic meters) and associated water conservation measures	Enhances water storage and sustainable water management, reducing wastage and promoting efficient use of available water resources
	SDG 6.6 : Protect and restore water-related ecosystems	Rejuvenation of degraded ponds, bund strengthening, and implementation of plantation and landscaping around water bodies	Restores and conserves aquatic ecosystems, enhancing biodiversity and the overall health of freshwater resources

	SDG 6.B : Support and strengthen the participation of local communities in water management	Community involvement via MGNREGS employment, active local stewardship, and participatory monitoring (e.g., geo-tagging)	Empowers local communities to take charge of water resource management and maintenance, ensuring long-term sustainability
8 DECENT WORK AND ECONOMIC GROWTH	SDG 8.5 : Achieve full and productive employment and decent work for all	Job creation through construction, maintenance, and ancillary activities under MGNREGS and local participation	Generates employment opportunities and enhances rural economic growth through direct and indirect job creation
11 SUSTAINABLE CITIES	SDG 11.5: Reduce the adverse effects of natural disasters	Integrated water management strategies to reduce flood risks and drought impacts	Improves community resilience by controlling runoff, enhancing water security, and reducing the risk of climate-related disasters
13 CLIMATE ACTION	SDG 13.1: Strengthen resilience and adaptive capacity to climate-related hazards and natural disasters	Integrated water management and groundwater recharge initiatives embedded in the project design	Increases community resilience to climate variability (e.g., droughts and floods) by securing water resources and promoting adaptive strategies
15 LIFE ON LAND	SDG 15.1: Conserve, restore, and promote sustainable use of terrestrial and inland freshwater ecosystems	Restoration and rehabilitation of natural ponds through desilting, bund construction, and ecological landscaping	Enhances the conservation and sustainable use of inland water ecosystems, supporting biodiversity and ecosystem services

	SDG 15.3: Combat desertification, restore degraded land and soil	Desilting and land improvement activities around ponds, including soil stabilization and bund reinforcement	Reverses land degradation and improves soil quality, which in turn supports local agriculture and ecosystem resilience
17 PARTNERSHIPS FOR THE GOALS	SDG 17.16: Enhance the global partnership for sustainable development	Collaboration with government bodies, community groups, NGOs, and technology providers to improve project outcomes	Strengthens multi- stakeholder partnerships that ensure resource mobilization, technical support, and capacity building for long-term success
	SDG17.17:Encourageandpromoteeffectivepublic,public-private,andsociety partnerships	Active engagement with multiple stakeholders for project implementation and monitoring	Ensures sustained community involvement and institutional support for the project's ongoing success

A.12. RECHARGE ASPECTS:

Please document efforts taken to ensure that the *Quality of Surplus Recharge water is clean, free from contamination and has compatibility with quality of native ground water in aquifers.*

A.12.1 Solving for Recharge

Ultimately, the volume of groundwater recharge benefit to the subbasin is the most critical aspect for such MAR activities. Groundwater recharge is quantified as the deep percolation of surface water applied during project implementation. Using a field-scale water budget, deep percolation can be calculated as the difference between all other inflows and outflows, per the equation below, with each other inflow and outflow being quantified:

```
Recharge = Rainfall + Surface Inflow – Evapotranspiration – Surface Outflow – Change in Storage
```

<u>Evapotranspiration & Other Data: https://datameet-pune.github.io/open-water-data/docs/open-water-data-paper.pdf (or available under Documents Section- Water Data Guide)</u>

Root Zone = The root zone is comprised of the upper portion of the soil where water extraction by roots occurs, above the depth at which water infiltrates to the groundwater system. The depth to the bottom of the root zone varies by crop, but typically extends up to seven feet.

Surface Inflow= Surface inflows can be either directly measured or calculated from measured values. In fields directly served by metered lift pumps or metered gates, the volume of surface inflows to the field can be

directly measured or calculated from totalized measurements. Typical accuracies of pipe flow measurements range from 1-12 percent. In fields that are indirectly supplied with surface water, surface inflows may need to be calculated from upstream and downstream flow measurements, or through theoretical or empirical equations relating available data to field surface inflows. For example, fields served from canals measured using weirs, or fields served from canals that deliver water to multiple locations downstream of a measurement device may require site-specific calculations to quantify surface inflows to a specific field. Low-cost in-field measurements can also be made by setting up flashboards at the measurement location and correlating the "runup" of an unsubmerged weir overflow on a flat weir stick to the flow rate using standardized equations. Typical accuracies of "runup" or indirect flow measurements may exceed 10 percent, depending on site conditions and the accuracy of measurement data.

To monitor surface inflows, project owners may record flow data, maintain irrigation logs, and maintain logs of any other parameters required to calculate field deliveries, depending on the unique conditions of their field. Project owners may also consider using mobile flow monitoring equipment to measure or verify surface inflows.

Surface Outflows: To monitor surface outflows, users may record flow data or water level data and maintain logs of any other parameters required to calculate outflows, depending on the unique conditions of their project activity. Pressure transducers and data loggers may be used to automatically monitor water levels, or users may install wooden stakes to manually monitor water depths.

Change in Storage = the change in surface storage, or average ponded water depth, can be calculated from measured and observed changes in water surface levels at points throughout the project field. Over the annual project implementation period, the total change in surface storage is typically zero, provided that the surface of a field is dry and free of ponded water at the start and end of the project.

While the uncertainty of each inflow and outflow will vary based on field conditions and measurement devices, typical uncertainties associated with each water budget component are summarized in the table below. The uncertainty of deep percolation (i.e., recharge) can then be calculated from these other uncertainties, for example following the process described by Clemmens and Burt (1997). Users can use the following table to eliminate uncertainty from their estimates.

Water Budget Component	Typical Estimated Uncertainty (%)	Description
Surface Inflow	NA	Typical range of accuracy from meters to minimum delivery accuracy requirements of delivery and diversion measurement devices.
Precipitation	2%	Typical range of accuracy from field-level rain gauges to extrapolation of local weather station data
Surface Outflow	6%	Typical range of accuracy from meters to estimated outflow relationships

Evapotranspiration	10%	Clemmens and Burt, 1997; typical accuracy based on free water surface evaporation coefficient.
Change in Storage	10%	Estimated accuracy of change in storage calculation based on field scale water budget calibration to observed water levels.
Deep Percolation	5%	Typical range of calculated accuracy from field-scale water budget results (fields ranging from 56 to 125 acres)
Total	33%	

Other factors of uncertainty to consider when quantifying recharge are:

- Deep percolation does not immediately recharge the groundwater system. There is a time lag between when deep percolation occurs through the root zone and when that water reaches the saturated groundwater system.
- Subsurface inflows and outflows can occur through the groundwater system. While deep percolation may supply water to the groundwater system, that water may migrate away from the field along groundwater gradients.

Groundwater recharge can also be monitored and verified through groundwater level measurements at groundwater wells adjacent or near to the project activity. For instance, groundwater level measurements collected before, during, and after implementation can potentially help verify that net recharge is occurring, especially in well-positioned wells with continuous monitoring.

A.13. QUANTIFICATION TOOLS

The following tools are recommended to be used to estimate the quantity of RoUs in the absence of tamperproof flow meters or systems that accurately quantify the volume in litres or m3 of water being harvested or conserved by the project activity.

Water Harvesting Potential

Water harvesting potential of any catchment area is to be calculated under this methodology for each given year that the RoU is being claimed. The total amount of water that is received from rainfall over an area is called the rainwater legacy of that area. The amount that can be effectively harvested is called the water harvesting potential.

The formula for calculation for harvesting potential or volume of water received or runoff produced or harvesting capacity is given as:-

Harvesting potential or Volume of water utilized (liters) = Area of Catchment/Roof/Collection Zone (m²) X Amount of rainfall (mm) X Runoff coefficient*uncertainty Factor (1-0.33= 0.67)

Runoff coefficient

Runoff coefficient for any catchment is the ratio of the volume of water that runs off a surface to the volume of rainfall that falls on the surface. Runoff coefficient accounts for losses due to spillage, leakage, infiltration, catchment surface wetting and evaporation, which will all contribute to reducing the amount of runoff. Runoff coefficient varies from 0.5 to 1.0. Rooftop rainwater harvesting systems shall use the runoff coefficient equal to 1 as the rooftop area is totally impervious. Eco-climatic conditions (i.e. Rainfall quantity & Rainfall pattern) and the catchment characteristics are considered to be most important factors affecting rainwater harvesting potential.

Type of Area	Recommended Runoff Coefficient (K)
Residential	0.3 to 0.5
Forest	0.5 to 0.2
Commercial & Industrial	0.9
Parks and Farms	0.05- 0.3
Asphalt or Concrete Paving	0.85
Road surface	0.8-0.9

Annual Rainwater harvesting Potential

Annual rainwater harvesting potential is given by $V = K \times I \times A$

Where, V=Volume of water that can be harvested annually in liters.

K = Runoff coefficient I = Annual rainfall in (mm)

A = Catchment area in (m²)

Runoff Coefficient (K) selected = 0.3

Rainfall intensity in the catchment area

The rainfall intensity of the area is to be found out from the local IDF -curves (intensity-duration frequency curve), if IDF-curve is not available, rainfall intensity default of 100 mm/hr shall be considered (this value is for tropical countries, with catchment areas smaller than 150 ha).

Analysis of the catchment area

The gradient of the catchment area, terrain configuration in the catchment area can be found out from the State Maps and the Runoff factors for the different terrain are given as below. Coefficient of Runoff Values for Different Terrains

Terrain type	'C' Coefficient of Runoff (Flat terrain)
Clayey soil	0.82
Parking area	0.75
Roads and other concrete works	0.85
Green belts	0.1

Rainfall infiltration method

In areas where ground water level monitoring is not adequate in space and time, rainfall infiltration may be adopted. The norms for rainfall infiltration contributing to ground water recharge are evolved, based on the studies undertaken in various water balance projects in India. The norms for recharge from rainfall under various hydrogeological situations are recommended in the following table

S.No	Hydrogeological situation	Rainfall infiltration factor
0	i i geological citation	
1	Alluvial areas	
	a. Sandy Areas	20 to 25 percent of normal rainfall
	b. Areas with higher clay content	10 to 20 percent of normal rainfall
2	Semi-Consolidated Sandstones	
	(Friable and highly porous)	10 to 15 percent of normal rainfall
3	Hard rock area	
	a. Granitic Terrain	
	(i) Weathered and Fractured	10 to 15 percent of normal rainfall
	(ii) Un-Weathered	5 to 10 percent of normal rainfall
	b. Basaltic Terrain	
	(I) Vesicular and Jointed Basalt	10 to 15 percent of normal rainfall
	(ii) Weathered Basalt	4 to 10 percent of normal rainfall
	c. Phyllites, Limestones, Sandstones,	3 to 10 percent of normal rainfall
	Quartzites, Shales, etc.	
		1

Table : Rainfall infiltration factor in different hydrogeological situations

Additional Guidance on Groundwater Recharge estimates and guidelines:

UWR recommends following the estimates and guidelines outlined here <u>http://cgwb.gov.in/documents/Manual%20on%20Artificial%20Recharge%20of%20Ground%20Water.pdf</u>

Interim Report on Project wise Impact Assessment of Completed Demonstrative Artificial Recharge Projects of XI Plan (<u>http://cgwb.gov.in/Ar-reports.html</u>)

Quantification of ROUs

Table 6 ROUs Table

Year	Crediting Period (DD/MM/YYYY)	RoUs (1000 Litres)/Year
	······································	Total
2014	1/1/2014-31/12/2014	120700
2015	1/1/2015-31/12/2015	96947
2016	1/1/2016-31/12/2016	145873
2017	1/1/2017-31/12/2017	112770
2018	1/1/2018-31/12/2018	120052
2019	1/1/2019-31/12/2019	164469
2020	1/1/2020-31/12/2020	194256
2021	1/1/2021-31/12/2021	231312
2022	1/1/2022-31/12/2022	169799
2023	1/1/2023-31/12/2023	159668
2024	1/1/2024-31/12/2024	170226
	Total ROUs	1686072

A.14. UWR RAINWATER OFFSET DO NO NET HARM PRINCIPLES

PP has undertaken a pioneering water conservation initiative in the Gonda District through the rejuvenation of 151 ponds, addressing the region's persistent water challenges. This effort targets areas where overdevelopment has depleted groundwater reserves, ensuring improved water availability for both agricultural and domestic use.

By carefully restoring these ponds, the project enhances rainwater capture and prevents unutilized water from flowing into storm drains or sewers. The ponds act as vital reservoirs, conserving excess water during the monsoon season and ensuring availability during dry periods, enhancing resilience against droughts.

The project has notably improved agricultural productivity by enabling farmers to expand from single-season to multi-season cropping and diversify into higher-value crops. By stabilizing water availability, rural incomes have increased, contributing to better food security and economic stability.

Women's participation has been actively encouraged through community engagement programs, where they have taken key roles in pond maintenance, construction, and documentation processes. This involvement has fostered skill development and improved their standing within the community.

The initiative has also played a crucial role in preventing soil erosion and preserving fertile land, ensuring long-term soil health. Furthermore, the rejuvenated ponds have revitalized local ecosystems, supporting the return of native vegetation and wildlife.

By integrating environmental restoration with social and economic impact, PP's efforts in Gonda District have set a powerful example of sustainable water management, ensuring long-term resilience and prosperity for the region.

A.15. SCALING PROJECTS-LESSONS LEARNED-RESTARTING PROJECTS

The Gonda District Pond rejuvenation project has strong potential for scaling by integrating additional water management practices and leveraging existing frameworks to expand its impact.

Scaling Opportunities and Integrated Practices

1. Integration with Agricultural Irrigation Systems:

The rejuvenated ponds can be linked to efficient irrigation systems such as drip or sprinkler irrigation, improving water-use efficiency in nearby farmlands. This integration would optimize water distribution, particularly for multi-season cropping, reducing overall water demand while boosting agricultural productivity.

2. Incorporating Wastewater Recycling:

While Gonda's project currently focuses on rainwater capture and groundwater recharge, adding decentralized wastewater treatment units could provide an additional water source. Treated wastewater can be reused for non-potable purposes such as irrigation, landscape maintenance, and community sanitation facilities. This practice would further conserve fresh water resources.

3. Expanding Community Participation and Training:

Building on the existing involvement of local women in pond maintenance, the project can scale further by forming dedicated water management committees. These groups can oversee maintenance, promote water conservation practices, and provide training to community members, strengthening long-term sustainability.

4. Replicating the Project in Similar Regions:

The successful rejuvenation model in Gonda can be replicated in other drought-prone districts with depleted groundwater reserves. By adapting the design to local hydrology and community needs, the project can be expanded to improve water security in additional vulnerable areas.

5. Funding:

Revenue generated from water credit sales could support scaling efforts. Funds could be reinvested to revive abandoned ponds or introduce new water conservation infrastructure in underserved communities.

6. Urban Integration for Enhanced Water Management:

While the Gonda project primarily targets rural areas, its principles can be adapted for urban settings. Integrating restored ponds with urban rainwater drainage networks could reduce urban flooding risks while promoting groundwater recharge.

Addressing Potential Duplication Risks

- 1. **Overlap with Existing Rainwater Harvesting Efforts:** Coordination with ongoing state-led initiatives such as *Amrit Sarovar Mission* and MGNREGS pond-revival programs is essential to avoid redundant efforts. Aligning resources and responsibilities will ensure efficient implementation and prevent duplication.
- 2. **Balancing Cost Efficiency:** Certain scaling strategies, such as wastewater recycling or advanced irrigation systems, may have higher initial costs. Ensuring the financial feasibility of these expansions is critical, and partnering with gram panchayat to secure funding or utilize UWR water credits can mitigate this challenge.

By combining these strategies, the Gonda pond rejuvenation initiative can expand its reach, enhance water security, and contribute to improved rural and urban water management practices.

Annexure I

ः आदेशः

इनोबेटर्स इन्झाटेक एलएलपी, महानगर, लखनऊ के पत्र दिनांक-12.07.2024 द्वारा अवगत कराया गया है कि जनपद-गोण्ठा में एक पायलट प्रोजेक्ट के माध्यम से UNFCCC के ग्रीन क्रेडिट इनिशिएटिव के अन्तर्गत वॉटर क्रेडिट दिलवाने हेतु परामर्श सेवायें प्रदान किये जाने के लिए आवेदन किया गया है। वर्णित कार्यक्रम को सुचारू रूप से चलाये जाने एवं सूचनाओं के संकलन हेतु किसी अधिकारी को नोडल नियुक्त करने का अनुरोध किया गया है, जिससे कि जनपद-गोण्ठा में पायलेट प्रोजेक्ट हेतु वयनित सभी तालाबों की सूचनायें एवं अन्य विभागीय सूचनाओं का संकलन किया जा सके, तत्कम में जिलाविकारी/जिला कार्यक्रम समन्वयक महोदया, गोण्डा के पृष्ठांकन आदेश दिनांक-30.07.2024 के अनुपालन में निम्नानुसार अधिकारियों को नोडल अधिकारी नामित किया जाता है-

जिला विकास अधिकारी, गोण्डा।

अतिरिक्त कार्यक्रम अधिकारी–मनरेगा, जिला मुख्यालय, गोण्डा।

अतः नामित नोढल को आदेशित किया जाता है कि संस्था-इनोवेटर्स इन्फ्राटेक एलएलपी, महानगर, लखनऊ के द्वारा वांछित सूचनाओं को समय समय पर उपलब्ध कराना सुनिश्चित करें। .

> (एम० अक्तन्मोली) (आई.ए.एस.) मुख्य विकास अधिकारी गोण्डा ।

गोण्डा |

07.2024

टिनांक

कार्यालय मुख्य विकास अधिकारी

/ आoलिo / लेखा / 2024-25

प्रतिलिपि–निम्नांकित को सूचनार्थ एवं आयश्यक कार्यवाही हेतु प्रेषित – 1. जिलाधिकारी/जिला कार्यक्रम समन्वयक, गोण्डा।

उपायुक्त, श्रम–रोजगार, गोण्ठा ।

पत्रांक

जिला विकास अधिकारी, गोण्डा।

अतिरिक्त कार्यक्रम अधिकारी-मनरेगा, जिला मुख्यालय, गोण्डा।

- समस्त खण्ड विकास अधिकारी / कार्यक्रम अधिकारी, गोण्डा।
- इनोवेटर्स इन्फ्राटेक एलएलपी, महानगर, लखनऊ।

मुख्य विकास गोण्डा ।

Figure 13 Work Order from Govt. Authority to PP

Annexure II

कार्यालय जिला विकास अधिकारी, गोण्डा

पत्रांवः 1628(A)/आ०लि०/2024-25

विनांक 07.10. 2024

LETTER OF INTENT

To:

M/s. Innovators Infratech LLP, (LLPIN: ACD-6448), (GSTIN: 09AAKFI3502M126) 108, Silver Height Badshahnagar, Mahanagar, Lucknow. Uttar Pradesh-226006

Subject: Appointment of exclusive consultant for Development and Assistance for Validation, Registration, Verification, Issuance and Trading of Carbon and Water Credits.

Reference: Your proposal Reference No. IIL/YS/2024-25/CCWC/1010 with Annexure - 1 and Annexure - 1 (Continued) dated 24.05.2024

Dear Sir,

In continuation to your proposal to our office with the above-mentioned reference Number, we are pleased to appoint you for the services mentioned in the above-referred proposal, for providing consultancy services for as mentioned under:

Nature of the work	Exclusive rights for Development and Assistance for Validation, Registration, Verification, Issuance & Trading of Water Credits
Scope of the work	As per the enclosed list in the Proposal/Offer Letter Annexures.
Services fees	50% of the water credits accumulated since the project's inception. (it includes all costs related to reports, verification, etc.)

As per the above details, you are hereby directed to start the work immediately.

योण हा

Figure 14 Letter of Intent

Annexure III



Figure 15 Actual Image of Pond



					माजा संदया : 00455	
का बना : चनारका परण्डा : (प्यारण) तहकात : कर सरणाव चननद : ' डेइर का राम / सिड पदी इंस्डक का यम / निकार स्थल	गाबा पन्धता बन : 5 खसरा सेंटवा	बेराव्स (हे.)	अदेव		टिम्म्सी	
এ : চ-1 / সন্টাক খুনি - তলেনশ খুনি ।		1		Sec. 14		
तमन्त्र भूमि//	18	0.1500		81553		
	65	0.0200				
	1719	1,4120	_	1.17.18	1	
	310	0.2230				
	331	0.0160				
	378	0.0410				
	44019.	0.1050				
	4669.	1.2870	-			
	529	0.3880				
	610	0.1660				
	686	0.6540	-			
	687	0.2910		· · .		
	741	0.0530				
	758	0.1980				
	791	0.0450				
	841	0.0200				
	848	0.0490				
	848 909	0.0490				

Figure 16 Area of the Pond – Bhulekh, Uttar Pradesh

Annexure III



Figure 17: Self Declaration of Gonda Amritsarovar Pond projects

Annexure IV



Figure 6 Digital Monitoring – Amrit Sarovar Portal

Link: Mission Amrit Sarovar

Annexure VI











Figure 7 Satellite image from 2014-2024 Geo Cordinates: 27.20453, 81.8168

