

Driving Clean Energy and Energy-Efficient Technology Support for Government

Manipal University Jaipur functions as a center for advanced research, producing insights that are essential for policymakers. The faculty and research centers engage in comprehensive studies to assess the feasibility, effects, and possibilities of clean energy solutions. By generating reports, white papers, and collaborating directly with governmental agencies, the university offers evidence-based recommendations that guide policy formulation. The research and development divisions at Manipal University Jaipur are pivotal in the advancement of innovative energy-efficient technologies. From solar energy systems to energy storage solutions, the university is leading the charge in innovation, persistently exploring methods to enhance the efficiency and sustainability of energy generation and usage. Additionally, Manipal University Jaipur provides specialized programs and courses centered on clean energy and sustainable technologies, equipping students with the necessary knowledge and skills to assist governmental initiatives in the implementation of clean energy policies and technologies. The university collaborates with governmental and industrial partners to devise and execute strategies for the adoption of clean energy. These partnerships create a conducive environment for the practical application of research outcomes, resulting in the development of tangible solutions that align with governmental goals. Furthermore, Manipal University Jaipur's outreach initiatives bolster both local and global efforts to promote clean energy and energy efficiency. The institution actively engages in climate action events, conferences, and policy dialogues, sharing expertise and advocating for sustainable practices. The commitment of Manipal University Jaipur to research, policy development, innovation, and workforce education highlights the transition towards clean energy and energy-efficient technologies. By persistently enhancing and applying effective solutions, Manipal University Jaipur is aiding governmental efforts and laying the groundwork for a more sustainable and resilient energy future.

In a global context that prioritizes sustainable solutions, the collaborative initiatives between Manipal University Jaipur and governmental bodies serve as symbols of optimism. The exchange of knowledge, innovative practices, and policy assistance provided by Manipal University Jaipur is crucial in guiding the world towards a future reliant on clean energy and energy-efficient technologies. Collectively, these partnerships constitute the foundation of advancement, promoting a shared dedication to a more sustainable and environmentally conscious energy framework.

Dated: 08 December, 2022

ORDER

Subject: Financial Sanction of the research project titled **Computational Study of Nanoalloy Clusters for Potential Applications in Energy Sector** under the guidance of Dr. Prabhat Ranjan, Mechatronics Engineering, Manipal University, Jaipur, Vatika infotech city, near gvk toll plaza, jaipur ajmer express way post thikaria, Jaipur, Rajasthan-302026 - Release of 1st grant.

Sanction of **Science and Engineering Research Board (SERB)** is hereby accorded to the above mentioned project at a total cost of **Rs. 4741264/- (Rs. Forty Seven Lakh Forty One Thousand Two Hundred and Sixty Four Only)** with break-up of **Rs. 2500000/- under Capital (Non-recurring) head** and **Rs. 2241264/- under General (Recurring) head** for a duration of 36 months. The items of expenditure for which the total allocation of **Rs. 4741264/-** has been approved are given below:

The following budget may be considered for **Manipal University, Jaipur, Vatika Infotech City, Near GVK Toll Plaza, Jaipur Ajmer Express Way Post Thikaria**

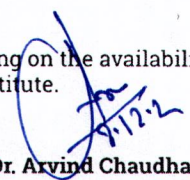
S. No	Head	Total (in Rs.)
A	Non-recurring	
1	Equipment -> High Performance Computing Cluster	2500000
A'	Total (Non-Recurring)	2500000
B	Recurring Items	
1	Recurring - I : (Research Personnel) Recurring - II : (Consumables, Travel, Contingencies) Recurring - III : Scientific Social Responsibility	1350240 400000 60000
2	Recurring - IV : (Overhead Charges)	431024
B'	Total (Recurring)	2241264
C	Total cost of the project (A' + B')	4741264

2. Sanction of the grant is subject to the conditions as detailed in Terms & Conditions available at website (www.serb.gov.in).
3. Overhead expenses are meant for the host Institute towards the cost for providing infrastructural facilities and general administrative support etc. including benefits to the staff employed in the project.
4. While providing operational flexibility among various subheads under head Recurring-II, it should be ensured that not more than Rs. 1.5 lakh each should be spent for travel and contingency.
5. Budget sanctioned under Scientific Social Responsibility (SSR) is meant only for activities enlisted under SSR norms and under no circumstances it can be reappropriated.
6. As per rule 211 of GFR, the accounts of project shall be open to inspection by sanctioning authority/audit whenever the institute is called upon to do so.
7. The sanctioned equipment would be procured as per GFR and its disposal of the same would be done with prior approval of SERB.
8. The institute will furnish to the SERB, separate Utilization certificate(UCs) financial year wise to the SERB for Recurring (Grants-in-aid General) & Non-Recurring (Grants for creation of capital assets) and an audited statement of accounts pertaining to the grant immediately after the end of each financial year.
9. The institute will maintain separate audited accounts for the project. A part or whole of the grant must be kept in an interest earning bank account which is to be reported to SERB. The interest thus earned will be treated as credit to the institute to be adjusted towards further installment of the grant.
10. The research personnel sanctioned in the project, if any is co-terminus with the duration of the project and SERB will have no liability to meet the fellowship and salary of supporting staff if any. beyond the duration of the project
11. The institute may refund any unspent balance to SERB by means of a Demand Draft favoring "FUND FOR SCIENCE AND ENGINEERING RESEARCH" payable at New Delhi.
12. The project File no. CRG/2022/002539 should be mentioned in all communications arising from the above project. The organization/institute/university should ensure that the technical support/financial assistance provided to them by SERB should

invariably be highlighted/ acknowledged in their media releases as well as in bold letters in the opening paragraphs of their Annual Report.

13. In addition, the investigator/host institute must also acknowledge the support provided to them in all publications, patents and any other output emanating out of the project/program funded by SERB.

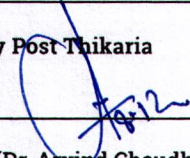
14. Sanction order for release of funds under a) Non-recurring and b) Recurring will be issued separately depending on the availability of funds. The project become operational from the day the first release of grant received by the implementing Institute.


(Dr. Arvind Chaudhary)
Scientist D
ms-ipcpcac@serb.gov.in

To,
Under Secretary
SERB, New Delhi

Copy forwarded for information and necessary action to: -

1.	The Principal Director of Audit, A.G.C.R.Building, IIIrd Floor I.P. Estate, Delhi-110002
2.	Sanction Folder, SERB , New Delhi.
3.	File Copy
4.	Dr. Prabhat Ranjan Mechatronics Engineering Manipal University, Jaipur , Vatika infotech city, near gvk toll plaza, jaipur ajmer express way post thikaria, Jaipur, Rajasthan-302026 Email: prabhat23887@gmail.com Mobile: 919660001868 (Start date of the project may be intimated by name to the undersigned. For guidance, terms & Conditions etc. Please visit www.serb.gov.in .)
5.	Vice Chancellor, Manipal University, Jaipur, Vatika Infotech City, Near GVK Toll Plaza, Jaipur Ajmer Express Way Post Thikaria (Receipt of Grant may be intimated by name to the undersigned)


(Dr. Arvind Chaudhary)
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SCIENCE & ENGINEERING RESEARCH BOARD(SERB)

(A statutory body of the Department of Science & Technology, Government of India)

Science and Engineering Research Board
3rd & 4th Floor, Block II
Technology Bhavan, New Mehrauli Road
New Delhi - 110016

Dated: 08 December, 2022

ORDER

Subject: Research project entitled **Computational Study of Nanoalloy Clusters for Potential Applications in Energy Sector** under the guidance of Dr. Prabhat Ranjan, Mechatronics Engineering, Manipal University, Jaipur, Vatika infotech city, near gvk toll plaza, jaipur ajmer express way post thikaria, Jaipur, Rajasthan-302026.

1. In continuation of SERB's sanction order No. CRG/2022/002539 dated 08 December, 2022, sanction of the competent authority is hereby accorded to the payment of a sum of **Rs. 787100/-** under 'Grants-in-aid General' to Manipal University, Jaipur, Vatika Infotech City, Near Gvk Toll Plaza, Jaipur Ajmer Express Way Post Thikaria, Jaipur, Rajasthan-302026 being the grant for the financial year 2022-2023 for implementation of the above said project.
2. Sanction of the grant is subject to the conditions as detailed in Terms & Conditions available at the website (www.serb.gov.in) and as mentioned in the sanction order of even number dated 08 December, 2022.
3. As this is the first grant being released under 'Grants-in-aid General' for the project, no previous U/C is required.
4. The expenditure involved is debitible to Fund for Science & Engineering Research (FSER) This release is being made under Core Research Grant (**PAC Inorganic Physical Chemistry**) (General) .
5. The Sanction has been issued with the approval of the competent authority on **06 December, 2022** and vide Diary No. SERB/F/7719/2022-2023 dated **07 December, 2022**..
6. The release amount of **Rs. 787100/-** (Rupees Seven Lakh Eighty Seven Thousand One Hundred only) will be drawn by the Under Secretary of the SERB and will be disbursed by means of RTGS transaction as per their Bank details given below:

PFMS Unique Code	MUJ05
Account Name	MANIPAL UNIVERSITY JAIPUR
Account Number	41058604477
Bank Name & Branch	STATE BANK OF INDIA SBI BHANKROTA, JAIPUR-AJMER EXPRESSWAY, BHANKROTA, JAIPUR, PIN- 302026
IFSC/RTGS Code	SBIN0011396
Email id of A/C Holder	pradeep.chaturvedi@jaipur.manipal.edu
Email id of PI	prabhat23887@gmail.com

(Dr. Arvind Chaudhary)
Scientist D
ms-ipcpcac@serb.gov.in

To,
Under Secretary
SERB, New Delhi

Copy forwarded for information and necessary action to: -

1.	The Principal Director of Audit, A.G.C.R.Building, IIIrd Floor I.P. Estate, Delhi-110002
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5.	Vice Chancellor, Manipal University, Jaipur, Vatika Infotech City, Near GVK Toll Plaza, Jaipur Ajmer Express Way Post Thikaria (Receipt of Grant may be intimated by name to the undersigned)

(Dr. Arvind Chaudhary)
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FILE NO. CRG/2022/002539-C
SCIENCE & ENGINEERING RESEARCH BOARD(SERB)
(A statutory body of the Department of Science & Technology, Government of India)

Science and Engineering Research Board
3rd & 4th Floor, Block II
Technology Bhavan, New Mehrauli Road
New Delhi - 110016

Dated: 08 December, 2022

ORDER

Subject: Research project entitled **Computational Study of Nanoalloy Clusters for Potential Applications in Energy Sector** under the guidance of **Dr. Prabhat Ranjan**, Mechatronics Engineering, Manipal University, Jaipur, Vatika infotech city, near gvk toll plaza, jaipur ajmer express way post thikaria, Jaipur, Rajasthan-302026.

1. In continuation of SERB's sanction order No. CRG/2022/002539 dated 08 December, 2022, sanction of the competent authority is hereby accorded to the payment of a sum of **Rs. 2500000/-** under 'Grants-in-aid Capital' to Manipal University, Jaipur, Vatika Infotech City, Near Gvk Toll Plaza, Jaipur Ajmer Express Way Post Thikaria, Jaipur, Rajasthan-302026 being the grant for the financial year 2022-2023 for implementation of the above said project.
2. Sanction of the grant is subject to the conditions as detailed in Terms & Conditions available at the website (www.serb.gov.in) and as mentioned in the sanction order of even number dated 08 December, 2022.
3. As this is the first grant being released under 'Grants-in-aid Capital' for the project, no previous U/C is required.
4. The expenditure involved is debit to Fund for Science & Engineering Research (FSER) This release is being made under Core Research Grant (**PAC Inorganic Physical Chemistry**) (Capital).
5. The Sanction has been issued with the approval of the competent authority on **06 December, 2022** and vide Diary No. **SERB/F/7718/2022-2023** dated **07 December, 2022**.
6. The release amount of **Rs. 2500000/-** (Rupees Twenty Five Lakh only) will be drawn by the Under Secretary of the SERB and will be disbursed by means of RTGS transaction as per their Bank details given below:

PFMS Unique Code	MUJ05
Account Name	MANIPAL UNIVERSITY JAIPUR
Account Number	41058604477
Bank Name & Branch	STATE BANK OF INDIA SBI BHANKROTA, JAIPUR-AJMER EXPRESSWAY, BHANKROTA, JAIPUR, PIN- 302026
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Email id of A/C Holder	pradeep.chaturvedi@jaipur.manipal.edu
Email id of PI	prabhat23887@gmail.com

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5.	Vice Chancellor, Manipal University, Jaipur, Vatika Infotech City, Near GVK Toll Plaza, Jaipur Ajmer Express Way Post Thikaria (Receipt of Grant may be intimated by name to the undersigned)

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Project Completion Report

Project Type: Research Fund Grant/ R21-1877916181

Project title: Harnessing the potential of Polyhydroxyalkanoates (PHA) from *Rhodopseudomonas palustris* as sustainable resource for production of bioplastics

Introduction: Plastics are widely utilized due to their durability and low cost, however, they are mostly generated from non-renewable resources such as natural gas, petroleum, or coal and contain additives such as stabilizers and plasticizers (Filho *et al.*, 2022). These chemicals, which are commonly present in plastics like polyvinyl chloride (PVC), polypropylene (PP), and polyethylene terephthalate (PET), can be toxic, functioning as endocrine disruptors or carcinogens. They can enter the body by skin contact, ingestion, or inhalation, particularly when used in food packaging (Adeniran and Shakantu, 2022; Gaston and Tulve, 2019; Hahladakis *et al.*, 2018; Filho *et al.*, 2021). About 76% of plastic produced globally becomes waste, with 9% recycled, 12% incinerated, and 79% landfilled or released into the environment. This improper disposal harms ecosystems and poses health risks (Geyer, Jambeck and Law, 2017; Sameh S. Ali *et al.*, 2021a; Sameh Samir Ali *et al.*, 2021b). Environmental concerns about plastic waste have driven the shift from petrochemical-based plastics to biobased, biodegradable alternatives, called bioplastics (Reddy, Reddy and Gupta, 2013). Despite their introduction in the 2000s, bioplastics still represent only about 0.5% of the over 400 million tonnes of plastic produced annually (Folino *et al.*, 2020; European Bioplastics, 2023). By 2023, production had reached 2.18 million tonnes, with biodegradable plastics making up roughly 55%. This is expected to rise to 7.43 million tonnes by 2028, driven by increasing demand and advancements in technology (European Bioplastics, 2023). Various types of biobased plastics differ in their raw materials, chemical structures, production methods, and applications, but they offer similar material properties to conventional plastics. One of the most common examples is Polyhydroxyalkanoates (PHA). PHAs are biobased polyesters that are produced as carbon/energy storage materials in microbial cells under stress. These accumulate as intracellular granules without harming the host cell. Their biodegradability and good physical and mechanical qualities make them a viable substitute for conventional petroleum-based plastics (Rajvanshi *et al.*, 2023).

PHAs are produced by various microbial species including *Rhodopseudomonas palustris* (*R. palustris*). *R. palustris* is a versatile purple non-sulfur photosynthetic bacterium popular for its ability to produce bioplastics such as PHAs from diverse carbon and nitrogen sources. It possesses the ability to switch among four metabolic modes, indicating its adaptability to various environments, such as marine sediments and waste lagoons. Along with other bacteria such as *Rhodobacter* and *Rhodospirillum*, it is capable of utilizing various carbon sources for the production of polymers. Other than this, this species possesses potential applications in biotechnology, specifically in hydrogen production, electricity generation, and bioremediation (Brown, Wilkins and Saha, 2022). Despite various attempts to generate industrial PHAs utilizing microorganisms, the costs remain a significant challenge. The high cost of microbial bioplastic synthesis remains a substantial impediment to industry growth. Large-scale PHA manufacturing usually utilizes pure microbial cultures that rely on expensive sugar-based substrates, which raises overall production costs. Furthermore, the process consumes a huge amount of freshwater, reducing availability and increasing expenses (Rajvanshi *et al.*, 2023). Addressing these challenges, the present study has explored the ability of *R. palustris* to use a wide range of substrates in varied conditions for cost-effective PHA production, along with using domestic reverse osmosis (RO) reject water as the major contributor in the production process, hence reducing unsustainable freshwater use. RO reject water is rich in nutrients and free from pathogens, making it an ideal nutrient source for microbial cultivation with minimal alterations. Using this water stream can significantly reduce the costs of expensive nutrient growth media and lessen the reliance on freshwater in cultivation systems (Bhandari and Prajapati, 2022a). This approach enables more cost-effective and large-scale biomass production. This is further helping in repurposing an unmanaged waste stream of RO reject water into a useful and environmentally sustainable process of PHA production.

2. Review of literature:

Based on the literature review, Table 1 summarizes the significance of bioplastic production, highlighting the numerous industries from which waste materials can be derived as substrates. These waste substrates, including agricultural waste, food waste, and industrial byproducts, play an important role in sustainable bioplastic production by lowering dependency on fossil fuels and strengthening waste valorization.

Table 1. List of waste resources used as substrates for cost-effective bioplastic production

S. No.	Waste carbon source	Microorganisms	Cultivation technique	Maximum biomass production	Biobased plastic produced	Maximum production	References
1	Mixture of crude and saponified SCG oil	<i>Cupriavidus necator</i> DSM 545	Shake flask technique	8.5 g/L	Polyhydroxyalkanoate (PHA)	84.4% (w/w)	(Ingram, Martin and Winterburn, 2022)
2	Nitrogen-deficient cheese whey mother liquor	<i>Paracoccus homiensis</i>	Shake flask technique	3.3 g/L	Poly (3-hydroxybutyrate-co-3-hydroxyvalerate) P(3HB-co-3HV)	1.1 g/L	(Mozejko-Ciesielska <i>et al.</i> , 2022)
3	Fermented concentrated cheese whey permeates	Mixed microbial culture (MMC)	Sequencing batch reactor	-	PHA	62% g PHA/ g VSS	(Colombo <i>et al.</i> , 2019)
4	Fermented secondary cheese whey			-		55.1% g PHA/ g VSS	
5	Digestate of chicken manure with sunflower frying oil	<i>Cupriavidus necator</i> H16	Shake flask technique	75.1 % cell dry mass	PHA	4.6 g/L	(Altun, 2019)
6	Waste frying oil with 40 g/L NaCl	<i>Halomonas hydrothermalis</i>	Shake flask technique	3.64 g/L	Polyhydroxybutyrate (PHB)	2.26 g/L	(Pernicova <i>et al.</i> , 2019)
7	Onion peel	<i>Bacillus siamensis</i> PD-A10	Shake flask technique	90.86 g/L	PHA	67.56 g/L	(Vijay and Tarika, 2019)
8	Paper industry effluent	<i>Ancylobacter aquaticus</i>	Shake flask technique	-	PHA	41.7% w/w	(Tyagi and Sharma, 2021)
9	Beer brewery wastewater	<i>Cupriavidus necator</i>	Batch system	7.90 g/L	PHB	3 g/L	(Amini <i>et al.</i> , 2020)
10	Candy industry wastewater	<i>Cupriavidus necator</i> H16	Flask culture	1.11 g/L	PHB/ Polylactic acid (PLA)	65% (w/w)	(Hernández-Herreros <i>et al.</i> , 2024)
11	Digested sludge	<i>Rhodopseudomonas</i> sp. S16-VOGS3	Photobioreactor	0.37 g/L	PHB	18.5 mg/L	(Touloupakis <i>et al.</i> , 2023)
12	Olive mill wastewater	<i>Rhodopseudomonas</i> sp. S16-FVPT5	Tube culture	0.13 g/L	PHB	101 mg/L	(Carlozzi <i>et al.</i> , 2019)

3. Objectives

- Design a novel cost-effective artificial media mimicking seawater and optimize the parameters for the growth of *R. palustris*.
- Optimize culture conditions for high PHA production under different sets of nutrients limiting and stress conditions.
- Screen and qualitatively characterize the PHA granules via staining and microscopy and quantify the percentage of PHA accumulation.
- Augment the extraction of PHA from cell biomass and analyse its molecular structure.

4. Methodology:

The *Rhodospseudomonas palustris* MDOC01 strain, isolated in our lab from dairy waste, was cultured in a synthetic medium called Designed Synthetic Water Medium (DSWM) containing minerals along with glycerol and monosodium glutamate as carbon and nitrogen sources. The cells were grown in 500 ml glass bottles with Q series GL45 caps for sampling and argon gas purging to maintain an anoxic environment. The cultures were kept at 30-35°C with continuous stirring at 500 rpm and 4000 lux light from 60 W incandescent bulbs (Syed, Sogani, Kumar, *et al.*, 2022). Figure 1 describes the detailed methodology followed during the work

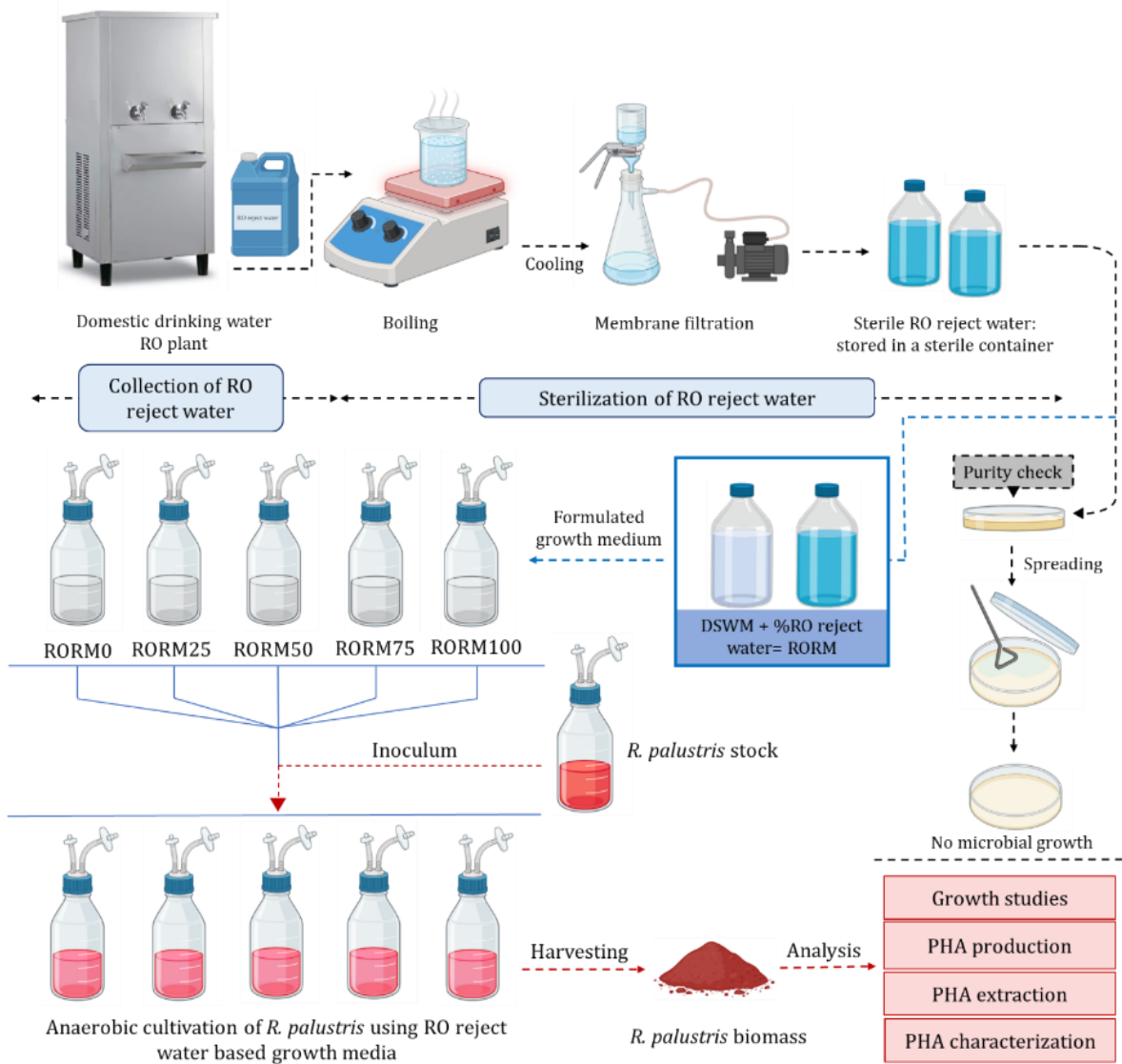


Figure 1. Detailed methodology of the research work

5. Results and discussion:

OBJECTIVE 1

Collection of RO reject water: The reject water coming from a domestic drinking water RO plant has a consistent nutrient and pathogen-free composition (Bhandari and Prajapati, 2022b). RO reject water, collected from a drinking water RO plant, located at Bagru, Rajasthan, was used to develop a novel cost-effective growth media for *R. palustris* culturing. Initially, the water was subjected to physicochemical analysis to determine its composition and suitability as a growth medium. Table 2 reveals that upon comparison with DSWM, the RO reject water was found to be very similar in the ionic and mineral composition to the DSWM. This, in addition to the metabolic adaptability of *R. palustris*, supports RO reject water as a cost-effective growth medium.

Table 2. Physicochemical analysis of the RO reject water

Parameters	Results
pH	7.9
TDS (ppm)	1318
Electrical conductivity ($\mu\text{S cm}^{-1}$)	2636
Salinity (PSU)	1.34
Alkalinity (mg L^{-1})	258.5
Total hardness (mg L^{-1} as CaCO_3)	82.9
Chloride (mg L^{-1})	409
Sodium (mg L^{-1})	265.75
Potassium (mg L^{-1})	6.32
Nitrate nitrogen (ppm)	16.6
Nitrite (ppb)	2.0
Calcium (ppm)	200
Magnesium (ppm)	1000
Ammonical nitrogen (mg L^{-1})	<2.0
Ammonia (ppm)	0.06
Phosphate (ppm)	0.90
Phosphorus (mg L^{-1})	<0.50
Sulphate (mg L^{-1})	54.8
Fluoride (mg L^{-1})	<0.05
Iron (mg L^{-1})	<0.1

As the work was on pure microbial strain, the RO reject water was first subjected to sterilization via boiling followed by filtration. The sterility was confirmed by the spread plate technique and no microbial growth was observed within 24-48 hours of incubation. Further, the RO reject water was provided with glycerol and sodium glutamate as carbon and nitrogen sources, forming RO Reject water Medium (RORM). This, in addition to the metabolic adaptability of *R. palustris*, supports RO reject water as a cost-effective growth medium.

Suitability of RORM as a growth medium for *R. palustris* in terms of biomass and bacteriochlorophyll *a* (Bchl *a*) yields (Syed, Sogani, Sharma, *et al.*, 2022): For this, the sterile RO reject water was mixed with different concentrations of DSWM (RORM0 (Positive control), RORM25, RORM50, RORM75, RORM100) and the N: C ratio of 5.4 mM: 10 mM was made consistent in all media sets (Sogani *et al.*, 2020). During 10 days of growth, RORM75 showed good biomass and Bchl *a* concentration and productivity (Biomass: 1.75 g L^{-1} ; $92.44 \text{ mg L}^{-1} \text{ d}^{-1}$; Bchl *a*: 15.10 mg L^{-1} ; $1.223 \text{ mg L}^{-1} \text{ d}^{-1}$), comparable to the control (RORM0; 2.0 g L^{-1} , $148.8 \text{ mg L}^{-1} \text{ d}^{-1}$).

Microscopic analysis of *R. palustris* in RORM75: Scanning Electron Microscopy (SEM) was used to observe the morphology of *R. palustris*. As illustrated in Figure 2, no significant morphological differences were observed between the cells grown in RORM75 and DSWM (control). This finding suggests that RORM75 does not substantially alter the cell morphology, which is a positive indication regarding its impact on *R. palustris*.

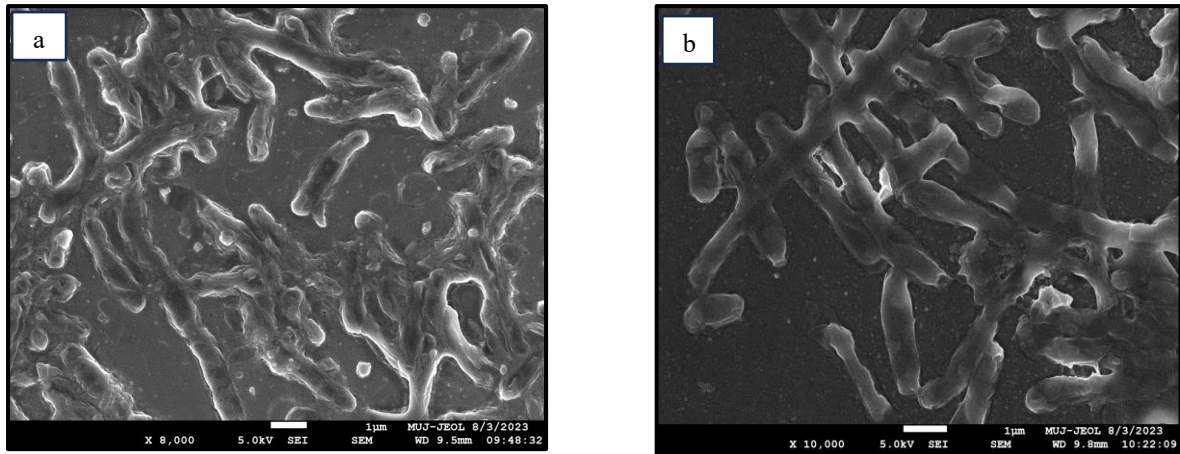


Figure 2. SEM images of *R. palustris* cells grown in (a) DSWM and (b) RORM75

Deliverables:

- RO reject water stream, otherwise discarded and not managed properly, can be repurposed for microbial cultivation for high biomass yield, hence suggesting an environmentally sustainable approach for RO reject water recycling.
- With appropriate adjustments, RORM75 offers both environmental and economic advantages for *R. palustris* cultivation, by replacing expensive nutrients present in the conventional growth media.

OBJECTIVE 2:

Production of PHA under PHA-producing culture conditions: As reported earlier, PHAs are produced by microbial cells under stress conditions (e.g. Nutrient limitation) and high carbon concentration in the form of energy and carbon storage granules (Mannina *et al.*, 2020). The present work used the concept of feast and famine conditions for microbial PHA production. In the feast phase, *R. palustris* was provided with abundant nutrients for maximum growth and then subjected to the famine phase with limited nutrients for PHA production. As RORM75 showed the maximum biomass, it was taken further for PHA production along with RORM0 and RORM100. Figure 3 shows the culture conditions for PHA production from *R. palustris*.

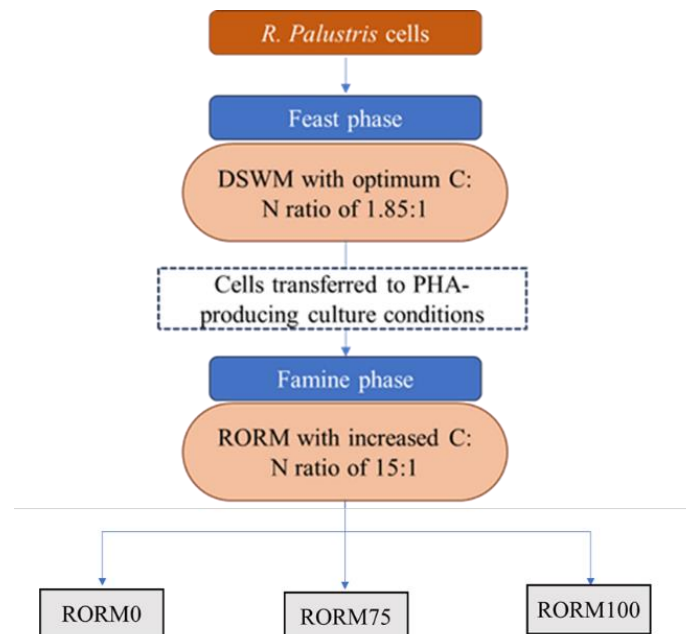


Figure 3. Various culture conditions for PHA production from *R. palustris*

After 7 days of the famine phase, PHA was extracted using the hypochlorite method, and the percent PHA of cell dry weight (CDW) was calculated in each condition (Marudkla *et al.*, 2018). Figure 4 depicts the white-colored PHA extracted from *R. palustris* from RORM75 with a C: N ratio of 15:1 and Table 3 shows the PHA yield

obtained in each culture condition and it can be concluded that RORM75 with a C: N ratio of 15:1 yielded the maximum PHA of 130 % CDW.

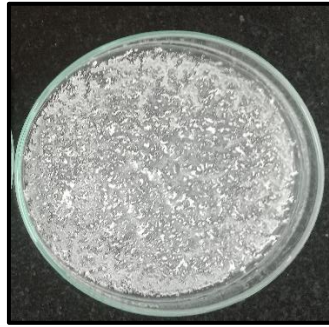


Figure 4. PHA extracted from *R. palustris* cultured in RORM75 with C: N= 15:1

Table 3. Amount of PHA obtained from *R. palustris* in various culture conditions

S. No	Culture conditions with C: N= 15:1	Amount (mg)	% PHA of CDW
1	RORM0	196	10.6
2	RORM75	1336	130
3	RORM100	27	2.4

Deliverables:

- The most suitable combination of feast and famine phases for high PHA production from *R. palustris* is DSWM with an optimum C: N ratio as the feast phase and RORM75 with a high C: N ratio of 15:1 as the famine phase.

OBJECTIVE 3 and OBJECTIVE 4

Characterization of the extracted PHA: The extracted PHA was subjected to Fourier Transform Infrared Spectroscopy (FTIR) and Proton Nuclear Magnetic Resonance (¹HNMR) analysis for its chemical and molecular characterization (El-Kadi *et al.*, 2021). Figures 5 and 6 show the FTIR and ¹HNMR spectra of PHA extracted from RORM75 and the standard PHA obtained from Sigma Aldrich.

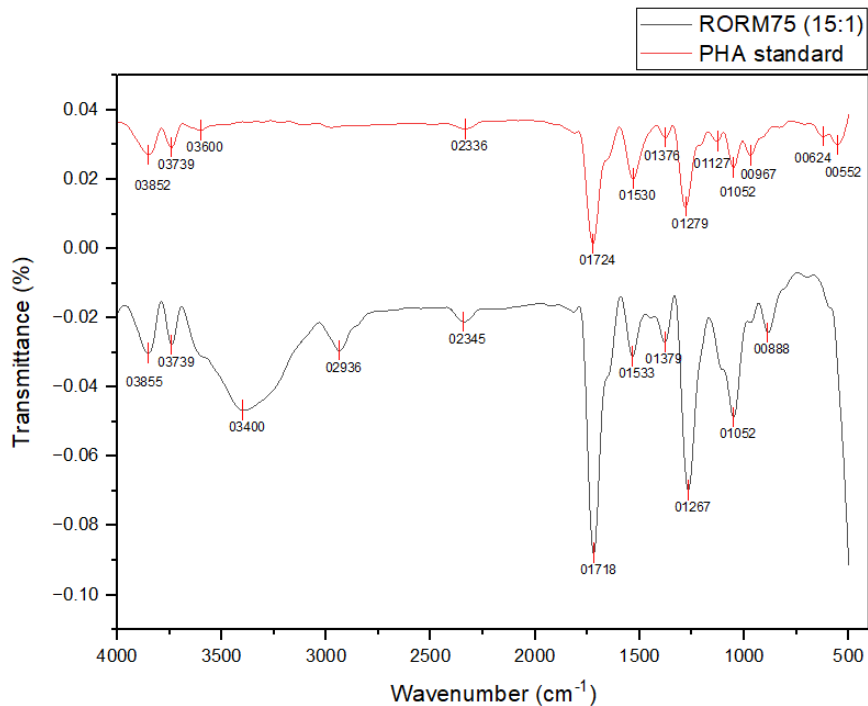


Figure 5. FTIR spectra of PHA extracted from RORM75 and the standard PHA obtained from Sigma Aldrich

PHA was characterized in the range of 500–4000 cm^{-1} . A broad and weak band around 3600 cm^{-1} in the standard indicates O-H stretching, showing the presence of hydroxyl groups like alcohols or carboxylic groups. A similar but less prominent band is seen around 3700–3600 cm^{-1} in the case of PHA extracted from RORM75 (15:1). The O-H or N-H stretching is seen in both the cases but the intensity in PHA extracted from RORM75 (15:1) is weaker, possibly due to lower concentration or interaction of the hydroxyl groups. A sharp and intense peak at 1724 cm^{-1} in standard PHA might indicate strong C=O stretching, which is typical for esters or carboxylic acids. This is a defining feature of PHA, which contains ester bonds. PHA from RORM75 (15:1) also has strong C=O peaks, but it is slightly shifted (1718 cm^{-1}) which may reflect different carbonyl environments or interactions with other groups. Peaks at 1376 cm^{-1} and 1279 cm^{-1} , correspond to C-H bending and C-O stretching in esters in the standard. Similar peaks are present but with some shifts in the PHA extracted from RORM75 (15:1), such as peaks at 1379 cm^{-1} and 1267 cm^{-1} . This region may also show contributions from other functional groups. The fingerprint region which is unique to each compound, shows that PHA extracted from RORM75 (15:1) has structural differences compared to the PHA standard, likely due to differences in its polymeric structure or side chain composition.

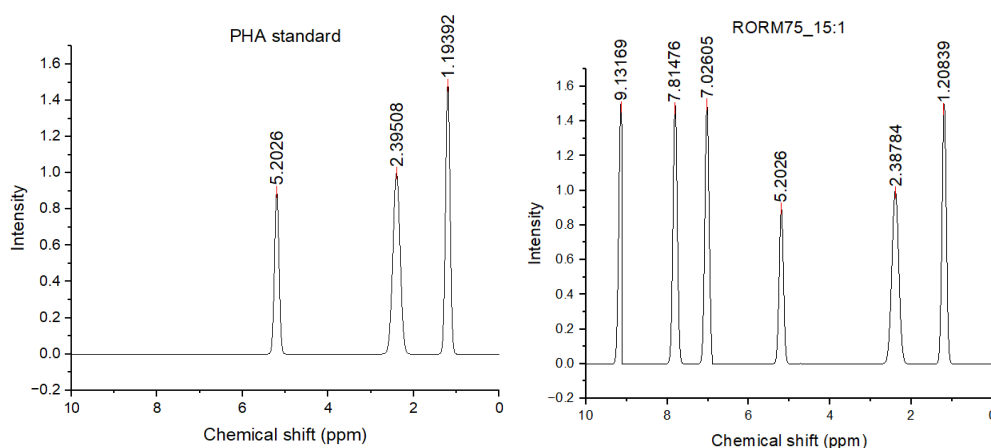


Figure 6: ^1H NMR spectra of PHA extracted from RORM75 (15:1) and the standard PHA obtained from Sigma Aldrich

The key observations from the spectra of standard PHA include a peak at 5.20 ppm showing the methine proton (-CH), attached to the carbonyl group in the polymer backbone, typical of PHA. This indicates an ester linkage where a proton is adjacent to a carbonyl group. Another peak at 2.39 ppm corresponds to methylene protons (-CH₂) adjacent to the carbonyl group in the PHA structure, again indicating ester functionality. Lastly, a peak at 1.19 ppm represents a methyl group (-CH₃) at the end of the alkyl chain, commonly found in PHAs where the chain ends with methyl groups. Comparing both spectrums, additional peaks at 9.13 ppm, 7.81 ppm, 7.02 ppm are unique to PHA extracted from RORM75 and absent in the PHA standard, suggesting the presence of aromatic groups, but the common peaks at 5.20 ppm, 2.38 ppm, and 1.20 ppm, in the spectrum of PHA obtained from RORM75 (15:1) are comparable to the standard and indicates that both materials contain ester groups (C=O) and aliphatic chains.

Deliverables:

- FTIR: PHA extracted from RORM75 (15:1) appears to share a similar backbone to PHA but with structural variations, possibly due to the presence of different side groups, chain lengths, or copolymer compositions.
- ^1H NMR: The PHA produced by *R. palustris* in RORM75 (15:1) is a modified version of the PHA, containing the same core ester and aliphatic groups as the PHA standard, but with significant modifications involving the addition of aromatic components.

6. Conclusion:

RO reject water can be used as a growth medium for cost-effective culturing and high biomass production of *R. palustris*. This concept not only makes the process of microbial cultivation economical but also provides an environmentally sustainable and safe approach for RO reject water management, thus avoiding environmental issues like groundwater and soil contamination caused by its current improper management strategies. Further, in the study, *R. palustris* stands out as an efficient microbial system for high PHA production, using RO reject water for the famine phase, thus also suggesting an approach for large-scale cost-effective production of PHA from *R. palustris*. The present study addresses various environmental issues, including improper RO reject water management, huge freshwater and expensive nutrient demand for high microbial biomass production, and plastic

pollution caused by the increased use of petro-based plastic materials. Moreover, a switch from using nonrenewable resources to renewable ones for developing materials like plastics would also help in dealing with climate change mitigation. Overall, the study focuses on exploiting the possible benefits of versatile microbes like *R. palustris* in maintaining the quality, health, and sustainability of the environment.

Outcomes:

Journal publications

- Rajvanshi, J., **Sogani, M.**, Kumar, A., Arora, S., Syed, Z., Sonu, K., Gupta, N.S. and Kalra, A., 2023. Perceiving biobased plastics as an alternative and innovative solution to combat plastic pollution for a circular economy. *Science of The Total Environment*, 874, p.162441; (Q1, **Impact factor: 8.2**)
- Rajvanshi, J., **Sogani, M.**, Tziouvaras, G., Kumar, A., Syed, Z., Sonu, K., Gupta, N.S. and Sen, H., 2024. An analytical review on revamping plastic waste management: exploring recycling, biodegradation, and the growing role of biobased plastics. *Environmental Science and Pollution Research*, pp.1-19; (Q1, **Impact factor: 5.8**)
- Rajvanshi, J., **Sogani, M.**, Kumar, A. and Arora, S., 2023. Biomaterials: A Sustainable Solution for a Circular Economy. *Engineering Proceedings*, 59(1), p.133; (**SCOPUS Indexed conference proceeding**).

Acknowledgement:

We want to express our sincere gratitude to the Royal Society of Chemistry (RSC), UK, for their generous funding and unwavering support through the Research Fund Grant (R21-1877916181). Their financial support was crucial in enabling us to get the necessary materials and resources for our project, making it possible to achieve our objectives. The funding also granted us access to advanced instrumentation and cutting-edge tools, which were crucial in expanding the frontiers of knowledge in the bioplastic field. The RSC's immense support has been instrumental to the successful completion of this project. Future publications resulting from this study will include an acknowledgment of RSC, and they will be kept updated by email.

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GOVERNMENT OF INDIA
Ministry of Science & Technology
Department of Science & Technology
DST/TMD-EWO/WTI/2K19/EWFH/2019/102 (G)/2
Terms & Conditions

1. The grantee organization will furnish to the Department of Science & Technology, financial year wise Utilization Certificate (UC) in the proforma prescribed as per GFR 2017 and audited statement of expenditure (SE) along with up to date progress report (Vis-a-Vis Target Vs-Achievement) at the end of each financial year duly reflecting the interest earned / accrued on the grant received under the project. This is also subject to the condition of submission of the final statement of expenditure, utilization certificate and project completion report within one year from the scheduled date of completion of the project.
2. The grantee organization will have to enter & upload the Utilization Certificate in the PFMS portal besides sending it in physical form to this Division. The subsequent/final installment will be released only after confirmation of the acceptance of the UC by the Division and entry of previous Utilization Certificate in the PFMS.
3. If the grant has been released under capital head through separate sanction order under the same project for purchase of equipment(s), separate SE/UC has to be furnished for the released Capital head grant.
4. The grant-in-aid being released is subject to the condition that:-
 - a) A transparent procurement procedure in line with Provisions of General Financial Rules 2017 will be followed by the Institute/Organization under the appropriate rules of grantee organization while procuring capital assets sanctioned for the above mentioned project and a certificate to this effect will be submitted by the Grantee organization immediately on receipt of the grant.
 - b) While submitting Utilization Certificate/Statement of Expenditure, the organization has to ensure submission of supporting documentary evidences with regard of the purchase of equipment/capital assets as per the provisions of GFR 2017. Subsequent release of grants under the project shall be considered only on receipt of the said documents.
5. As per the GFR 2017 Rule 230 (8) the Grantee Institute should ensure that all the interests or other earnings against Grant-in-Aid or advances (other than reimbursement) released to any Grantee institution should be mandatorily remitted to the Consolidated Fund of India immediately after finalization of the accounts. Such advances will not be allowed to be adjusted against future releases.
6. As per the GFR 2017 Rule 230 (17) "the Grantee Institute should agree to make reservations for Scheduled Castes and Scheduled Tribes or OBC in the posts or services under its control on the lines indicated by the Government of India"
7. The grantee organization will maintain separate audited account for the project and the entire amount of grant will be kept in an interest bearing bank account. For Grants released during F.Y. 2017-18 and onwards, all interests and other earnings against released Grant shall be remitted to Consolidated Fund of India (through Non-Tax Receipt Portal (NTRP), i.e. www.bharatkosh.gov.in), immediately after finalization of accounts, as it shall not be adjusted towards future release of Grant. A certificate to this effect shall have to be submitted along with Statement of Expenditure/ Utilization Certificate for considering subsequent release of Grant/ Closure of Project accounts.
8. DST reserves sole rights on the assets created out of grants. Assets acquired wholly or substantially out of government grants (except those declared as obsolete and unserviceable or condemned in accordance with the procedure laid down in GFR 2017), shall not be disposed of without obtaining the prior approval of DST.
9. The account of the grantee organization shall be open to inspection by the sanctioning authority and audit (both by C&AG of India and Internal Audit by the Principal Accounts Office of the DST), whenever the organization is called upon to do so, as laid down under Rule 236(1) of General Financial

Rules 2017.

10. Due acknowledgement of technical support / financial assistance resulting from this project grant should mandatorily be highlighted by the grantee organization in bold letters in all publication / media release as well as in the opening paragraphs of their Annual Reports during and after the completion of the project.

11. Failure to comply with the terms and conditions of the Bond will entail full refund with interest in terms of Rule 231 (2) of GFR 2017.

12. It is mandatory to use EAT module in PFMS, failing which no further funds shall be released.

13. Goods (Consumable/Equipment) available in GeM portal are to be procured mandatorily online through GeM only as per the provisions of Rule 149 of GFR.

14. The Grantee Institute should follow Global Tendering Enquiry (GTE) conditions as per Department of Expenditure ID Note No:4/1/2021-PPD dated 10.09.2021.

15. If One time assistance or non-recurring grant as Grant-in-Aid for Rs. 10.00 lakhs to Rs. 50.00 lakhs, it should be included in the Annual Report of the Institute.

16. The Grantee Institute must ensure any other provisions of GFR-2017 and guidelines/amendments issued from Govt. of India from time to time.





भारत सरकार
विज्ञान और प्रौद्योगिकी मंत्रालय
विज्ञान और प्रौद्योगिकी विभाग

DST/TMD-EWO/WTI/2K19/EFWH/2019/102 (G)/2

निबंधन और शर्तें

1. अनुदानग्राही संस्थान प्रत्येक वित्त वर्ष के अंत में इस परियोजना के अंतर्गत प्राप्त अनुदान पर अर्जित/प्रोद्भूत ब्याज को विधिवत रूप से दर्शाते हुए अद्यतन प्रगति रिपोर्ट (लक्ष्य बनाम उपलब्धि) के साथ जीएफ़आर 2017 में विनिर्दिष्ट प्ररूप में वित्तीय वर्ष-वार उपयोग प्रमाण पत्र (यूसी) और व्यय का लेखापरीक्षित विवरण (एसई) विज्ञान और प्रौद्योगिकी विभाग को प्रस्तुत करेगा। यह परियोजना की समाप्ति की निर्धारित तारीख से एक वर्ष भीतर व्यय का अंतिम विवरण, उपयोग प्रमाण-पत्र और परियोजना समाप्ति रिपोर्ट प्रस्तुत करने की शर्त के भी अध्वधीन है।
2. अनुदानग्राही संस्थान को उपयोग प्रमाण-पत्र इस प्रभाग में भौतिक रूप में भेजने के साथ-साथ पीएफ़एमएस पोर्टल पर प्रविष्ट और अपलोड करना होगा। अनुवर्ती/अंतिम किस्त प्रभाग द्वारा यूसी की स्वीकृति की पुष्टि और पीएफ़एमएस में पूर्ववर्ती उपयोग प्रमाण-पत्र की प्रविष्टि के बाद ही जारी की जाएगी।
3. यदि अनुदान एक ही परियोजना के अंतर्गत उपस्कर (रों) की खरीद के लिए पृथक संस्वीकृति आदेश के माध्यम से पूंजी-शीर्ष के अंतर्गत जारी किया गया है तो जारी किया गया पूंजी-शीर्ष अनुदान के लिए पृथक एसई/यूसी प्रस्तुत करना होगा।
4. जारी किया जा रहा सहायता अनुदान निम्नलिखित शर्तों के अध्वधीन है-
 - क) उपर्युक्त परियोजना के लिए संस्वीकृत पूंजी आस्तियों की खरीद करते समय अनुदानग्राही संस्थान के उचित नियमों के तहत संस्थान/संगठन द्वारा सामान्य वित्तीय नियमावली 2017 के उपबंधों के अनुरूप पारदर्शी खरीद प्रक्रिया का अनुपालन किया जाए और अनुदान प्राप्ति पर तुरंत प्रभाव से अनुदानग्राही संगठन द्वारा इस आशय का प्रमाण-पत्र प्रस्तुत किया जाए।
 - ख) उपयोग प्रमाण-पत्र/ व्यय विवरण प्रस्तुत करते समय, संगठन को जीएफ़आर 2017 के उपबंधों के अनुसरण में उपस्कर/पूंजी आस्तियों की खरीद के संबंध में संबन्धित दस्तावेज़-साक्ष्य प्रस्तुत करना सुनिश्चित करना होता है।
5. जीएफ़आर नियमावली 2017 के नियम 230 (8) के अनुसार अनुदानग्राही संस्थान को सुनिश्चित करना चाहिए कि किसी भी अनुदानग्राही संस्थान को जारी किए गए सहायता अनुदान या अग्रिम (प्रतिपूर्ति से भिन्न) पर प्राप्त समस्त प्रकार के ब्याज या अन्य आय को लेखों को अंतिम रूप दिए जाने के तुरंत बाद भारतीय समेकित निधि में अनिवार्य रूप से विप्रेषित किया जाए। ऐसे अग्रिमों को भविष्य में जारी की जाने वाली निधियों में समायोजित करने की अनुमति नहीं दी जाएगी।
6. जीएफ़आर नियमावली 2017 के नियम 230 (17) के अनुसार, "अनुदानग्राही संस्थान को भारत सरकार के निर्देशानुसार अपने नियंत्रणाधीन पदों या सेवाओं में अनुसूचित जाति या अनुसूचित जनजाति या ओबीसी के लिए आरक्षण रखने पर सहमत होना चाहिए।"
7. अनुदानग्राही संस्थान परियोजना का पृथक परीक्षित लेखा रखेगा और अनुदान की समस्त राशि बैंक खाते में सब्याज रखी जाएगी। वित्तीय वर्ष 2017-18 के दौरान और उसके बाद जारी अनुदान के लिए, अनुदान के लिए सभी प्रकार के ब्याज या अन्य आय ऐसे लेखों को अंतिम रूप दिए जाने के तुरंत बाद भारतीय समेकित निधि में

(गैर कर प्राप्ति पोर्टल (एनटीआरपी) अर्थात www.bharatkosh.gov.in के माध्यम से) विप्रेषित की जाएगी, क्योंकि यह राशि भविष्य में जारी की जाने वाली राशि में समायोजित नहीं की जाएगी। अनुवर्ती अनुदान के निर्गम/परियोजना खाते को बंद करने पर विचार किए जाने के लिए, व्यय विवरण/ उपयोग प्रमाण-पत्र के साथ इस आशय का प्रमाण पत्र प्रस्तुत करना होगा।

8. डीएसटी, अनुदान से सृजित परिसंपत्तियों पर एकमात्र सुरक्षित अधिकार रखता है। सरकारी अनुदानों से पूरी तरह से या पर्याप्त रूप से अर्जित संपत्ति (जीएफआर 2017 में निर्धारित प्रक्रिया के अनुसार अप्रचलित और अनुप्रयोज्य, अनुपयोगी घोषित अनुदानों से इतर), का निपटारा डीएसटी का पूर्व अनुमोदन प्राप्त किए बिना नहीं किया जाएगा।

9. जैसा कि सामान्य वित्तीय नियमावली 2017 के नियम 236 (1) के तहत निर्धारित किया गया है, अनुदानग्राही संगठन का लेखा स्वीकृति प्रदाता प्राधिकारी और लेखा परीक्षक (भारत के नियंत्रक एवं महालेखापरीक्षक और डीएसटी के प्रधान लेखा कार्यालय दोनों द्वारा आंतरिक लेखा परीक्षा) द्वारा निरीक्षण किए जाने, जब भी संगठन को ऐसा करने के लिए कहा जाता है, हेतु अभिगम्य होगा।

10. इस परियोजना अनुदान से प्राप्त तकनीकी सहायता/वित्तीय सहायता की उचित पावती को अनुदानग्राही संगठन द्वारा सभी प्रकाशनों/मिडिया प्रकाशनी में मोटे अक्षरों में और परियोजना के पूरा होने के दौरान और तदुपरांत उनकी वार्षिक रिपोर्टों के शुरुआती पैराग्राफों में अनिवार्य रूप से दिखाया किया जाना चाहिए।

11. बॉन्ड के नियमों और शर्तों का पालन करने में असफल होने पर जीएफआर 2017 के नियम 231 (2) के अनुसार पूरी राशि सब्याज वापस करनी होगी।

12. पीएफएमएस में ईएटी मॉड्यूल का उपयोग करना अनिवार्य है, ऐसा न करने पर अन्य कोई भी आगामी निधि जारी नहीं की जाएगी।

13. जीएफआर के नियम 149 के उपबंधों के अनुसार जीईएम पोर्टल पर उपलब्ध वस्तुओं (उपभोज्य वस्तु / उपस्कर) का अनिवार्यतया आर्न लाइन प्रापण जैम (जीईएम) ही के माध्यम से किया जाना है।

14. अनुदान ग्राही संस्थान को व्यय विभाग के आईडी नोट संख्या: 4/1/2021-पीपीडी दिनांक 10.09.2021 के अनुसार वैश्विक निविदाकरण जांच-पड़ताल (जीटीई) नियमों का पालन करना चाहिए।

15. यदि एकबारगी सहायता या गैर-आवर्ती अनुदान 10.00 लाख रुपये से 50.00 लाख रुपये के सहायता अनुदान का हो तो इसे संस्थान की वार्षिक रिपोर्ट में दर्ज किया जाना चाहिए।

16. अनुदान ग्राही संस्थान को जीएफआर-2017 के किसी भी अन्य उपबंध और समय-समय पर भारत सरकार द्वारा जारी दिशा-निर्देश/संशोधन का अनुपालन सुनिश्चित करना चाहिए।



GOVERNMENT OF INDIA
Ministry of Science & Technology
Department of Science & Technology
DST/TMD/EWO/WTI/DM/2021/20 (G)
(Technology Mission Division)

Technology Bhawan, New Delhi
Dated: 23/02/2023

Sanction Order

Subject: Financial assistance for the project entitled "Providing low cost solution and appropriate management framework for the reject disposal of Community-based RO Plants in many areas of Rajasthan" submitted by Dr. Monika Sogani, MANIPAL UNIVERSITY JAIPUR, DEHMI KALAN, OFF JAIPUR-AJMER EXPRESSWAY, BAGRU-JAIPUR, 303007
Release of the first installment regarding

Sanction of the President is hereby accorded to the approval to the above mention project at a total cost of Rs. 82,48,118/- (Rupees Eighty Two Lakh Forty Eight Thousand One Hundred Eighteen only) for a duration of 3 Years Days . The detailed breakup of the grant for General as well as Capital Components are given below:-

General Component : ₹ 73,58,118/-
Capital Component : ₹ 8,90,000/-

Items	(All Institute) Budget Summary (in Rs.)			Total
	Year-1	Year-2	Year-3	
I- Non-Recurring				80000
Electronic TDS Meter-1 Unit - 1	80000	0	0	80000
Dissolved Oxygen Meter-1Unit - 1	250000	0	0	250000
Chlorophyll Meter-1Unit - 1	300000	0	0	300000
Magnetic stirrer (10 plate)- 1 Unit - 1	100000	0	0	100000
Laptop-1 Unit - 1	60000	0	0	60000
Water analyser-1 Unit - 1	100000	0	0	100000
Subtotal (Capital)	890000	0	0	890000
2- Recurring				3370080
Project Staff	1104480	1104480	1161120	3370080
Junior Research Fellow (JRF)-1 ((@ 31,000/- + 18% HRA (For 1st & 2nd Year & SRF 35,000/- +18% HRA for 3rd year)	438960	438960	495600	1373520
Research Associate-II-1 ((@ 47000/-+ 18% HRA for full three years))	665520	665520	665520	1996560
Consumables	200000	125000	50000	375000
Contingency	150000	100000	50000	300000
Travel	250000	175000	150000	575000
Overhead	248669	198669	190700	638038
Other Cost-(fabrication of Lab Scale CW-MDC Unit and its Operation, fabrication of Culture Cabinet, Designing and Construction of Pilot Scale CW-MDC unit of Cement Concrete, Operation & maintenance and various testing cost of Pilot Scale CW-MDC unit, Outsourcing and Stakeholders workshop organization for dissemination of key findings and knowledge generated)	500000	600000	600000	1700000
Other Cost-(Membrane development for CW- MDC using agro based material,	400000	0	0	400000

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Development of agro based PNSB absorbent, Outsourcing)				
Subtotal (General)	2853149	2303149	2201820	7358118
Total Project Cost (Cap.+ Gen.)	3743149	2303149	2201820	8248118

1 MANIPAL UNIVERSITY JAIPUR (Dr. Monika Sogani)

Items	Budget Summary (in Rs.)			Total
	Year-1	Year-2	Year-3	
1- Non-Recurring				60000
Laptop-1 Unit - 1	60000	0	0	300000
Chlorophyll Meter-1Unit - 1	300000	0	0	250000
Dissolved Oxygen Meter-1Unit - 1	250000	0	0	80000
Electronic TDS Meter-1 Unit - 1	80000	0	0	100000
Magnetic stirrer (10 plate)- 1 Unit - 1	100000	0	0	790000
Subtotal (Capital)	790000	0	0	
2- Recurring				1996560
Project Staff	665520	665520	665520	1996560
Research Associate-II-1((@ 47000/-+ 18% HRA for full three years))	665520	665520	665520	225000
Consumables	100000	75000	50000	150000
Contingency	50000	50000	50000	350000
Travel	150000	100000	100000	442156
Overhead	146552	149052	146552	
Any Other (Other Cost)-(fabrication of Lab Scale CW-MDC Unit and its Operation, fabrication of Culture Cabinet, Designing and Construction of Pilot Scale CW-MDC unit of Cement Concrete, Operation & maintenance and various testing cost of Pilot Scale CW-MDC unit, Outsourcing and Stakeholders workshop organization for dissemination of key findings and knowledge generated)	500000	600000	600000	1700000
Subtotal (General)	1612072	1639572	1612072	4863716
Total Project Cost (Cap.+ Gen.)	2402072	1639572	1612072	5653716

2 UNIVERSITY OF RAJASTHAN (Dr. Placheril John)

Items	Budget Summary (in Rs.)			Total
	Year-1	Year-2	Year-3	
1- Non-Recurring				100000
Water analyser-1 Unit - 1	100000	0	0	100000
Subtotal (Capital)	100000	0	0	
2- Recurring				1373520
Project Staff	438960	438960	495600	1373520
Junior Research Fellow (JRF)-1((@ 31,000/- + 18% HRA (For 1st & 2nd Year & SRF 35,000/- +18% HRA for 3rd year)	438960	438960	495600	100000
Consumables	50000	50000	0	100000
Contingency	50000	50000	0	125000
Travel	50000	50000	25000	135882
Overhead	47117	47117	41648	1834402
Subtotal (General)	636077	636077	562248	1024402

3 KASHI INSTITUTE OF TECHNOLOGY (Mr. Kumar Sonu)

Items	Budget Summary (in Rs.)			Total
	Year-1	Year-2	Year-3	
1- Non-Recurring				
Subtotal (Capital)	0	0	0	
2- Recurring				
Consumables	50000	0	0	50000
Contingency	50000	0	0	50000
Travel	50000	25000	25000	100000
Overhead	55000	2500	2500	60000
Any Other (Other Cost)-(Membrane development for CW- MDC using agro based material, Development of agro based PNSB absorbent, Outsourcing)	400000	0	0	400000
Subtotal (General)	605000	27500	27500	660000
Total Project Cost (Cap.+ Gen.)	605000	27500	27500	660000

2. The sanction of the President is also accorded to the release of Rs. 28,53,149/- (Rupees Twenty Eight Lakh Fifty Three Thousand One Hundred Forty Nine only) to the "Director/Registrar/Principal/Controller/Comptroller, MANIPAL UNIVERSITY JAIPUR" being the first installment of grant as mentioned above table under "General Component" for the above mentioned project.

3. The expenditure involved is debitable to Demand No. 89, Department of Science & Technology for the year 2022-23:

3425	Other Scientific Research(Major Head)
3425.60	Others : (Sub-Major Head)
3425.60.200	Assistance to Other Scientific Bodies(Minor Head)
3425.60.200.70	Innovation,Technology Development and Deployment
3425.60.200.70.00	Detailed Head
3425.60.200.70.00.31	Grants-in-aid General
	(Previous: 3425.60.200.26.01.31)

4. The amount of Rs. 28,53,149/- (Rupees Twenty Eight Lakh Fifty Three Thousand One Hundred Forty Nine only) will be drawn by DDO, DST and disbursed to the "CNA account of Autonomous body SERB in respect of Innovation,Technology Development and Deployment Scheme".

Name of A/C Holder	Innovation Technology Development and Deployment
Bank A/C No	349902010051240
Name of the Bank & branch	Union Bank of India, Safdarjang Enclave - New Delhi
RTGS/IFSC code	UBIN0534994

5. The amount of Rs. 28,53,149/- (Rupees Twenty Eight Lakh Fifty Three Thousand One Hundred Forty Nine only) will be drawn by the "CNA account of Autonomous body SERB and will be disbursed to the Director/Registrar/Principal/Controller/Comptroller, MANIPAL UNIVERSITY JAIPUR . The bank details for electronic transfer of funds through RTGS are given below:-

Name of A/C Holder	MANIPAL UNIVERSITY JAIPUR
Bank A/C No	219012010000703
Name of the Bank & branch	Union Bank of India
RTGS/IFSC code	UBIN0821900

6. As per Rule 234 of GFR 2017, the sanction has been entered at S. No 200, in the register of grants maintained in the Technology Mission Division for the scheme WTI Call 2021 on Desalination Technologies .

7. This issues with the concurrence of IFD vide their Concurrence Dy. No. IFD/C/III/170223/31/03435 dated 17/02/2023.

8. The GI will keep all the funds received in the Central Nodal Account only and shall not transfer the funds to any other account or not divert the same to Fixed Deposits/ Flexi-Account/ Multi-Option Deposit Account/ Corporate Liquid Term Deposit (CLTD)

account etc. The funds released to GI shall not be parked in bank account of any other agency.

9. The GI will ensure the compliance of OM. No. F. No. 1/(18)/PFMS/FCD/2021 dated March 9, 2022 of Department of Expenditure, Ministry of Finance.

10. Out of the release of Rs. 28,53,149 / - (G) (Rs. 16,12,072/- for Manipal University Jaipur, (Darpan ID-RJ/2017/0115730), Rs. 6,36,077/- for University of Rajasthan and Rs. 6,05,000/- for Kashi Institute of Technology (Darpan ID-UP/2017/0152961) under the recurring head and out of release of Rs. 8,90,000/- (C) (Rs. 7,90,000/- (Manipal University Jaipur) and Rs.1,00,000/- (University of Rajasthan, Jaipur) towards the First-year installment.

11. This sanction order is subject to the **Terms & Conditions** as annexured .



Dr. Sanjai Kumar
(Scientist - 'D')
sanjai.k@gov.in


To,
The Pay & Accounts Officer,
Department of Science & Technology,
New Delhi - 110 016.

Copy of information and necessary action to:

1. The Principal Director of Audit, Scientific Department, IIIrd floor, AGCR Building, I.P. Estate, New Delhi.
2. The Financial Advisor, Integrated Finance Division, Technology Bhavan, New Mehrauli Road, Block C, Qutab Institutional Area, New Delhi, Delhi 110016
3. The Internal Audit Wing, Department of Science & Technology, Technology Bhavan, New Mehrauli Road, Block C, Qutab Institutional Area, New Delhi, Delhi 110016
4. Drawing and Disbursing Officer, DST, Cash Section. (two copies)
5. Dr. Monika Sogani, Associate Professor Senior Scale, Department of Biosciences, MANIPAL UNIVERSITY JAIPUR, Dehmi Kalan. Off Jaipur-Ajmer Expressway, Jaipur, Rajasthan - 303007
6. Dr. Placheril John, Professor and Head, Department of Zoology, UNIVERCITY OF RAJASTHAN, Jaipur, Jaipur, Rajasthan - 302004
7. Mr. Kumar Sonu, Assistant Professor, HoD, Mechanical Engineering, KASHI INSTITUTE OF TECHNOLOGY, Varanasi, Varanasi, Uttar Pradesh - 221307
8. The Director/Registrar/Principal/Controller/Comptroller, KASHI INSTITUTE OF TECHNOLOGY, Varanasi, Varanasi, Uttar Pradesh - 221307
9. The Director/Registrar/Principal/Controller/Comptroller, MANIPAL UNIVERSITY JAIPUR, Dehmi Kalan, Off Jaipur-Ajmer Expressway, Jaipur, Rajasthan - 303007
10. The Director/Registrar/Principal/Controller/Comptroller, UNIVERCITY OF RAJASTHAN, Jaipur, Jaipur, Rajasthan - 302004
11. Secretary, SERB, New Delhi (for allocation of limits to implementing agency)
12. Head (Technology Mission Division) DST
13. Sanction Folder (Technology Mission Division)



Dr. Sanjai Kumar
(Scientist - 'D')
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	Manipal University Jaipur - Academic Block 3	
	Project Name – Manipal University Jaipur - Academic Block 3	
	Project Code – 22GR0118	
	Address: - Jaipur, Rajasthan	
	Site area: - 14,809 m² (As per online panel)	
	Total built-up – 21,525 m² (As per online panel)	
	No. of buildings – 1 Building (Institutional)	
<i>Compiled by GRIHA Council</i>		
General Comments:		
Criterion	Appraisal	Feedback Comments
Criterion 4	Air and Soil Pollution Control	
	Partly Mandatory – 4.2.1 Adopt at least six measures to minimize air and soil pollution during construction, with the first three strategies being mandatory. <ul style="list-style-type: none"> Provide 3m high continuous barricading along the site boundary/virtual boundary. Provide wheel washing facility/gravel bed at all vehicular entrances and exits of the site. Ensure DG sets have an exhaust with stack height of at least 2m from the top of the generator with a cowl. Ensure DGs are in compliance with CPCB norms. 	4.2.1 Submittal has been provided consisting of the following documents- - Narrative, site visit reports, and compliance report have been submitted stating that the following strategies were adopted in the project to minimize air and soil pollution during construction: <ul style="list-style-type: none"> Provision of 3 m high continuous barricading is provided along the site boundary. Wheel washing facility is provided at the vehicular entry and exit of the site. DG sets were not used on site. The demand is being met through campus level facility. Hence this measure is not applicable for the project.

	<ul style="list-style-type: none"> • Implement a spill prevention plan for storage of diesel, admixtures, curing compounds, bitumen, and other hazardous materials. • Ensure that fine aggregate, excavated earth, and other construction materials with a tendency to get airborne are covered or are sprinkled regularly with non-potable water. • Ensure sprinkling of water on unpaved pathways on the site with non-potable water. • Limit the speed of vehicular movement on-site to 10km/hr. • Ensure that vehicles carrying waste materials out of the site are covered 	<ul style="list-style-type: none"> • Hazardous materials were stored in an enclosed space on an impervious surface. • Fine aggregate, excavated earth, and other construction materials with a tendency to get airborne were covered. • Speed limit on site has been restricted to 10km/hr. Signages for the same were displayed onsite. • Vehicles carrying waste materials out of the site were covered. <p>- Photographs of the measures implemented onsite have been submitted.</p> <p>- Site management plan has been submitted in Criteria 6. However, location of wheel washing facility, Diesel storage and storage of fine aggregate, excavated earth, and other construction materials were not highlighted in the same.</p> <p>Required:</p> <ul style="list-style-type: none"> • Submit site management plan (during construction stage) highlighting location of DG, wheel washing facility, Diesel storage, soil erosion channels, sedimentation tank, storage of fine aggregate, excavated earth, and other construction materials.
	<p>4.2.2 Ensure that the soil erosion channels are constructed, and they are connected to a sedimentation tank in order to reduce movement of soil outside the site throughout the construction phase of the project.</p>	<p>4.2.2 Submittal has been provided consisting of the following documents-</p> <p>- As per the site visit reports, and compliance report, soil erosion channels and sedimentation tanks were provided on site. Photographs of the soil erosion channels & sedimentation tank have been submitted in due diligence I & II compliance documents.</p> <p>Site management plan highlighting location of soil erosion channels and sedimentation tanks provided on site has been submitted.</p> <p>The documentation is complete.</p>
<p>Criterion 5</p>	<p>Topsoil Preservation</p>	

	<p>5.1.1 Ensure that topsoil from disturbed areas on the site is preserved, stabilized, and its fertility is maintained throughout the construction period. Additionally, ensure that 100% of the soil requirement for landscaping including roof garden(s) is met through this preserved soil.</p>	<p>5.1.1 Submittal has been provided consisting of the following documents-</p> <ul style="list-style-type: none"> - Narrative has been submitted stating the topsoil from the disturbed areas on-site is preserved and 100% of the soil requirement for project landscaping is met through this preserved soil. - Images of topsoil preservation have been submitted. - Calculation have been submitted in the online panel indicating the following: <ul style="list-style-type: none"> ▪ Total topsoil preserved – 1,135.6 m³. ▪ Soil requirement for project landscaping – 572.6 m³. ▪ Total area from where topsoil was excavated – 5,678 m². However, the same has not been highlighted in the site management plan. ▪ Percentage of fertile soil used in landscape – 198.32 %. - Soil fertility test report of the project from state level soil testing laboratory has been submitted. - A site management plan highlighting location of topsoil preservation area has been submitted. However, location of topsoil excavation area has not been highlighted. <p>Required:</p> <ul style="list-style-type: none"> • Submit a site management plan in .dwg format highlighting location of topsoil excavation/disturbed area for the project.
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Criterion 6

<p>Construction Management Practices</p>	
<p>6.1.1 Adopt construction management practices (e.g., stacking and storage of construction materials at different stages of construction) and ensure safe disposal of waste generated during construction.</p>	<p>6.1.1 Submittal has been provided consisting of the following documents-</p> <ul style="list-style-type: none"> - Narrative has been submitted stating that construction management practices such as stacking and storage of construction materials at different stages of construction were adopted on site and all the construction waste is safely disposed of through agreements with waste haulers and recyclers. - As per the site visit reports compiled by GRIHA officials, staging was adopted on site.

		<ul style="list-style-type: none"> - Photographs of construction management practices adopted on-site have been submitted. - Site management plan has been submitted highlighting the locations of different material & waste storage. - Log sheets of total quantities of waste generated on site as steel, wood, packaging materials, cement bags etc. have not been submitted. - Challans/Sell invoices reflecting full quantities of waste such as MS scrap, wood, packaging materials, cement bags etc. sold to recyclers have not been submitted. <p>Required:</p> <ul style="list-style-type: none"> • Submit detailed narrative about quantum of waste generated during construction, storage facilities for inert and hazardous wastes and measures employed for its safe disposal/recycling. • Submit Log sheets of total quantities of waste generated on site as steel, wood, packaging materials, cement bags etc. • Submit challans reflecting full quantities of waste such as steel, wood, packaging materials, cement bags etc. sold to recyclers.
	<p>6.1.2 Adopt at least two strategies from the list, as given below, to minimize water consumption during construction, with the first strategy being mandatory.</p> <p>Mandatory –</p> <ul style="list-style-type: none"> ○ Use gunny bags, ponding technique, or curing compound. ○ Meter and monitor the consumption of water during construction. ○ Use water-reducing admixtures in concrete mix. ○ Use treated wastewater and/or captured storm water 	<p>6.1.2 Submittal has been provided consisting of the following documents-</p> <ul style="list-style-type: none"> - As per the site visit reports compiled by GRIHA officials, the following measures were adopted in the project: <ul style="list-style-type: none"> • Use of gunny bags and ponding technique for curing of columns and slabs, respectively. Photographs of the same has been submitted. • Use of water reducing admixtures (SAINT GOBAIN CHRYSO Delta G6541C-ADS) in concrete. Batch mix report of M25, M30 & M40 concrete grades were shared during the visit indicating the use of admixture was submitted. However, purchase order and technical specification sheet of the admixture was not submitted which confirms water reducing properties. Further, design mix reports for M25, M30 & M40 concrete grades have not been submitted.

		<p>Required:</p> <ul style="list-style-type: none"> • Submit purchase order and technical specification sheet of SAINT GOBAIN CHRYSO Delta G6541C-ADS confirming it's water reducing properties. • Submit design mix reports for M25, M30 & m40 concrete grades highlighting the make and name of admixtures used in the concrete grades.
<p>Criterion 23</p>	<p>Safety and Sanitation for Construction Workers</p> <p>Mandatory – 23.1.1 Ensure compliance with the requirements of NBC 2016 for all the following:</p> <p>Part 1: Provision of necessary safety equipment and safety measures for construction workers.</p> <p>Part 2: Provision of clean drinking water, hygienic working and living conditions, and sanitation facilities for the workers.</p> <p>Part 3: Provision of crèche facility for children of construction workers in case their families are allowed to work/live at the construction site.</p> <p><i>Applicability check: If there are only male workers employed and residing on site, the project is exempt from Appraisal 23.1.1 - Part 3</i></p>	<p>23.1.1 Submittal has been provided consisting of the following documents-</p> <p>- Narrative, drinking water test report and date stamped photographs have been submitted indicating the following:</p> <ul style="list-style-type: none"> • Construction workers were wearing hard-hats and safety boots. • Temporary railings were provided on the staircases. • Safety nets were provided in accident-prone areas as well as adjacent to the scaffolding. • Safety equipment such as gloves and safety harnesses were provided to workers depending on the nature of their work. • Safety signage in local languages were displayed at multiple locations on site. • First aid facility was provided on site. • Drinking water facility was provided on site and in the labour accommodation area. Drinking water test report was submitted by the project team along with the compliance report. • Clean and hygienic toilets were provided for the construction workers on site and in the labour accommodation area. • Clean and hygienic bathing area was provided at the labour accommodation area. • Clean and hygienic labour accommodation was provided for the construction workers. The hutments were made of GI sheets and sharp edges of the same were secured.

		<ul style="list-style-type: none"> • The hutments had provision for daylight and ventilation. General cleanliness was maintained in the area surrounding the labour accommodation. • Dustbins were provided in the labour accommodation area. • Creche facility was provided near the labour accommodation. <p>Site visit reports confirm the same.</p> <p>The documentation is complete.</p>
	<p>23.1.2 Adopt one alternative out of the following for the construction workers on-site.</p> <p>Alternative 1: Provide a grocery store/canteen within the site premises and/or labour accommodation.</p> <p>Alternative 2: Organize at least two events during the entire construction phase to create environmental awareness among the construction workers.</p>	<p>23.1.2 Submittal has been provided consisting of the following documents-</p> <p>- As per the due diligence II site visit, two environmental awareness programs were conducted for the construction workers during the construction phase. The photographs have been submitted highlighting awareness programs have been conducted among the construction workers.</p> <p>The documentation is complete.</p>
<p>Criterion 26</p>	<p>Positive Social Impact</p>	
	<p>Mandatory –</p> <p>26.1.4 Ensure that tobacco smoking is prohibited on-site during the entire construction phase.</p>	<p>26.1.4 Submittal has been provided consisting of the following documents-</p> <p>- Photographs have been submitted indicating that tobacco is prohibited on site and ‘no smoking’ signages were displayed in multiple locations. Site visit report compiled by GRIHA Council officials and the compliance report submitted by the project team confirms the same. A non-smoking policy document highlighting prohibition of tobacco smoking within the site premises during the construction phase has been submitted.</p> <p>The documentation is complete.</p>



Head Office HBC

Rajasthan State Pollution Control Board
4, Institutional Area, Jhalana Doongari, Jaipur-302 004

Phone: 0141-2716840



Registered

File No : F(HDF)/JAIPUR(Sanganer)/6935(1)/2023-2024/5986-5988

Order No : 2023-2024/HBC/2809

Dispatch Date: Dec 14 2023 1:06PM

Unit Id : 27890

M/s Manipal University, Jaipur

Khasra No 467,469,474,458/1,473,475, 542, 544

Village Dehmi Kalan, Tehsil Sanganer, Ajmer Road ,

Dehmi Kalan Tehsil:Sanganer

District:JAIPUR

Sub: Consent to Establish under Section 25/26 of the Water (Prevention & Control of Pollution) Act, 1974 and under Section 21(4) of Air (Prevention & Control of Pollution) Act, 1981.

Ref: Your application(s) for Consent to Establish dated 16/06/2023 and subsequent correspondence.

Sir,

Consent to Establish under the provisions of Section 25/26 of the Water (Prevention & Control of Pollution) Act, 1974 (hereinafter to be referred as the Water Act) and under Section 21 of the Air (Prevention & Control of Pollution) Act, 1981, (hereinafter to be referred as the Air Act) as amended to date and rules & the orders issued thereunder **is hereby granted** for your **Manipal University Jaipur plant** situated / proposed at **Khasra No 467,469,474,458/1,473,475, 542, 544 village Dehmi Dehmi Kalan Tehsil:Sanganer District:JAIPUR** , Rajasthan under the provisions of the said Act(s). This consent is granted on the basis of examination of the information furnished by you in consent application(s) and the documents submitted therewith, subject to the following conditions:-

- 1 That this Consent to Establish is valid for a period from **16/06/2023 to 31/05/2028 or date of commencement of production / commissioning of the project or activities whichever is earlier .**
- 2 That this Consent is granted for manufacturing / producing following products / by products or carrying out the following activities or operation/processes or providing following services with capacities given below:

Particular	Type	Quantity / Capacity
Gross Built up Area	Product	21,525.00 SQ. METER

- 3 That in case of any increase in capacity or addition / modification / alteration or change in product mix or process or raw material or fuel, the project proponent is required to obtain fresh consent to establish.





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- 4 That the control equipment as proposed by the applicant shall be installed before trial operation is started for which prior consent to operate under the provision of the **Water Act and Air Act** shall be obtained. This consent to establish shall not be treated as consent to operate.
- 5 That the quantity of effluent generation and disposal along with mode of disposal for the treated effluent shall be as under:

Type of effluent	Max. effluent generation (KLD)	Quantity of effluent to be recycled (KLD)	Quantity of treated effluent to be disposed (KLD) and mode of disposal
Domestic Sewage	24.000	16.000	5.000 Plantation and Horticulture within premises

- 6 That the sources of air emissions along with pollution control measures and the emission standards for the prescribed parameters shall be as under:





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Sources of Air Emissions	Pollution Control Measures	Prescribed	
		Parameter	Standard
Dg set(1010KVA)	ACOUSTIC ENCLOSURE , ADEQUATE AIR POLLUTION CONTROL MEASURES , ADEQUATE STACK HEIGHT , ADEQUATE STACK HEIGHT OF 30 MTR.	NOx (as NO2) (at 15% O2) day basis in ppmv	710 mg/Nm3
		NMHC (as C) (at 15% O2)	100 mg/Nm3
		PM (at 15% O2)	75 mg/Nm3
		CO (at 15% O2)	150 mg/Nm3

7 That the Domestic Sewage shall be treated before disposal so as to conform to the standards prescribed by the Board as notified under the Environment (Protection) Act-1986 for disposal **Into Inland Surface Water**. The main parameters for regular monitoring shall be as under:





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Parameters	Standards
Oil and Grease	Not to exceed 10 mg/l
pH Value	Between 6.5 to 9.0
Biochemical Oxygen Demand (3 days at 27C)	Not to exceed 10 mg/l
Chemical Oxygen Demand	Not to exceed 50 mg/l
NH4 (N)	5 mg/l
N total	10 mg/l
Total Suspended Solids	Not to exceed 20 mg/l
Fecal Coliform (MPN per 100 ml)	Not to exceed 100

- 8 That the unit shall obtain all necessary permission from District Administration, Jaipur and Government of Rajasthan related to establishment of new academic block "Block-3" in "Manipal University", Khasra No 467, 469, 474, 458/1, 473, 475, 542, 544 Village Dehmi Kalan, Tehsil Sanganer, Ajmer Road, Tehsil: Sanganer District: JAIPUR, Rajasthan.
- 9 That this consent to establish is being issued for Academic Block-3 for Gross Built Up area: 21,525 Sq.m. For any change in area, the unit has to seek fresh consent to establish.
- 10 That if the project cost exceeds Rs. 104 Crore, the unit shall take/obtain modification in consent after paying fee as applicable.
- 11 That the unit shall provide adequate & safe infrastructure facility (step ladder) for monitoring at stack of D.G. set.
- 12 That the unit shall apply for CTO for Built up area @ 21,525 sq.m. within 15 days time period.
- 13 That the unit shall get amendment in all the previous CTOs for correct Built up area, where the same have been obtained for increased Built up area as compared to approved map.





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- 14 That unit shall comply standards as specified in Environment (Protection) Act,1986, (Limiting concentration in mg/l, except for pH):
 - i. pH: 6.5-9.0
 - ii. BOD 3days, 27 degree Celsius: 10
 - iii. COD: 50
 - iv. Oil & Grease : 10
 - v. TSS: 20
 - vi. N-total : 10
 - vii. Fecal Coliform : 100 MPN/100 ml
 - viii. NH₄-N : 5
- 15 That the unit shall comply with the standards as prescribed vide MOEF notification no. GSR 826(E) dated 16th November, 2009 with respect to National Ambient Air Quality.
- 16 That the unit shall ensure compliance of ambient air quality standard in respect of noise as prescribed under Environment (Protection) Act & Rules made therein.
- 17 That unit shall provide adequate stack height along with acoustic enclosures on one D.G. set of 1010 KVA. Further unit shall not allow installing any air pollution source i.e. Boiler/Hot water generation etc. without prior consent to establish from the Board under the Air Act 1981.
- 18 That the total water consumption shall not exceed 30 KLD. The ground water shall not be abstracted without prior NOC from Central Ground Water Authority.
- 19 That the water flow meters shall be provided at all suitable points to measure quantity of daily water consumption, waste water generation, waste water treated and treated waste water recycled and utilized for plantation/gardening purposes. Daily record of the same shall be maintained and to be submitted to the Board.
- 20 That the unit shall ensure proper recycling and reuse of domestic waste water after adequate treatment.
- 21 That the entire domestic waste water generated in tune of 24 KLD shall be treated through existing sewage treatment plant having capacity of 500 KLD (150 KLD +350 KLD).
- 22 That the unit shall maintain condition of STP of capacity 500 KLD (150 KLD +350 KLD) to achieve the standards prescribed under EP Act 1986 and the unit shall dispose the sludge of STP in scientific manner.
- 23 That the unit shall provide disinfection system for STP treated water before its utilization in plantation/horticulture purpose.
- 24 That the unit shall dispose the sludge of STP in scientific manner.
- 25 That the unit shall not allow making any obstacles to any natural water flow i.e. natural nallah/stream carrying rain water to any water body.





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- 26 That the unit shall install adequately designed rain water harvesting structure for prevention and recharge of ground water in and around the area.
- 27 That energy conservation measures like installation of CFLs/FLs for lighting the areas outside the building should be integral part of the project design and should be in place before project commissioning.
- 28 That used CFL/FLs/LEDs should be properly collected and disposed off/sent for re-cycling as per prevailing rules/guidelines issued by regulatory authority. Use of solar panels also be done to the extent possible.
- 29 That the solid waste generated should be properly collected & segregated. Wet garbage should be composted and dry/inert solid waste should be disposed off at approved sites for land filling after recovering recyclable materials.
- 30 That the unit shall comply with the provisions of Hazardous and Other Wastes(Management and Transboundary Movement) Rules, 2016; Solid Waste Management Rules, 2016; Plastic Waste Management Rules 2016; Construction And Demolition Waste Management Rules 2016; Bio-Medical Waste Management Rules, 2016 and E- Waste Management Rules, 2016.
- 31 That the unit shall ensure proper recycling and reuse of domestic waste water after adequate treatment.
- 32 That waste water shall always be conveyed/ carried through closed conduit pipe line and no other measure of carrying waste water such as tankers, flexible or temporary pipe line shall be used/practiced.
- 33 That water meters shall be installed at suitable locations at closed conduit pipe line to measure the quantity of effluent reaching to 500 KLD (150 KLD +350 KLD) STP for treatment.
- 34 That the surplus/excess/unutilized treated water shall be used for agriculture/plantation.
- 35 That unit shall utilize entire treated waste water for flushing/process/gardening/non-potable uses and other gainful purpose and zero discharge status shall be maintained outside the premises. No waste water shall be discharged on land/ into sewer line/into natural nala/water body/drain
- 36 That the unit shall not allow making any obstacles to any natural water flow i.e. natural nallah/stream carrying rain water to any water body.
- 37 That this consent is being issued on the basis of information /documents submitted by the industry. In case, it is found during post inspection that, the unit has flouted the conditions of consent or provided inadequate control measures & wrong information, the consent may be revoked and action may be initiated under the Provisions of Water Act & Air Act without any further notice.





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- 38 That the industry shall comply provisions 9(4) & 13(2) of Plastic Waste Management (PWM) Rules -2016 and as amended & shall submit application for registration in form-I to State Board.
- 39 That no Single use Plastic (SUP) items, which are banned vide Ministry of Environment, Forest and Climate Change (MoEF& CC), Government of India notification dated 12/08/2021 shall be used in the unit premises.
- 40 That this consent to establish shall be subject to compliance of any direction or order passed by Court of Law/NGT/CAQM in the matter.
- 41 That the unit shall obtain necessary permission from National Board for Wildlife Clearance (NBWL), if the project falls in ESZ of Notified protected Area and the activity is not covered under permitted activity. The consent is granted under the provisions of Water Act, 1974 and Air Act, 1981 and any other permission/consent w.r.t. Environment Protection Act, 1986 and Forest Conservation Act, 1980, if required, shall have to be obtained before implementation of the project.
- 42 That all the green building concepts/ norms shall be adopted in all possible ways which includes Green walls, solar energy etc., and compliance of this condition shall be submitted along with photograph during the time of CTO application.
- 43 That proper C&D mechanism shall be adopted, and compliance of this condition shall be submitted along with photograph during the time of CTO application.
- 44 That proper wash disposal system shall be developed, and compliance of this condition shall be submitted along with photograph during the time of CTO application.
- 45 That water harvesting system shall be developed for maximum storage and moisture improvement, and compliance of this condition shall be submitted along with photograph during the time of CTO application.
- 46 That proper ventilation measures for energy saving, less toxic materials for reducing indoor pollution and usage of certified wood shall be considered, and compliance of this condition shall be submitted along with photograph during the time of CTO application.
- 47 That proper waste segregation system to be developed.
- 48 That the unit shall take steps to enhance landscaping and green cover in all possible spaces and develop green belt in at least 33% of the total project area.
- 49 That, notwithstanding anything provided hereinabove, the State Board shall have the power and reserves its right, as contained under Section 27(2) of the Water Act and under Section 21(6) of the Air Act to review anyone or all of the conditions imposed here in above and to make such variation as it deems fit for the purpose of compliance of the Water Act and Air Act.





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50 That the grant of this **Consent to Establish** is issued from the environmental angle only, and does not absolve the project proponent from the other statutory obligations prescribed under any other law or any other instrument in force. The sole and complete responsibility, to comply with the conditions laid down in all other laws for the time-being in force, rests with the industry/ unit/ project proponent.

51 That the grant of this **Consent to Establish** shall not, in any way, adversely affect or jeopardize the legal proceedings, if any, instituted in the past or that could be instituted against you by the State Board for violation of the provisions of the Act or the Rules made thereunder.

This **Consent to Establish** shall also be subject, besides the aforesaid specific conditions, to the general conditions given in the enclosed Annexure. The project proponent will comply with the provisions of the **Water Act and Air Act** and to such other conditions as may, from time to time, be specified by the State Board under the provisions of the aforesaid Act(s). Please note that, non compliance of any of the above stated conditions would tantamount to revocation of **Consent to Establish** and project proponent / occupier shall be liable for legal action under the relevant provisions of the said Act(s).

This bears approval of the competent authority.

Yours sincerely,

Group Incharge[HBC]

(A): **Copy to:-**

- 1 Regional Officer, Regional Office, Rajasthan State Pollution Control Board, Jaipur (south) with request to ensure compliance of consent conditions.
- 2 Master File.

Group Incharge[HBC]

