

(All information from January to December - 2025)

1. Name of the Centre: Bioinspired Design and Optimization Centre (BIODOC)
Address: Manipal Institute of Technology, Govindapur Village, Yelahanka, Bengaluru
Phone Number: **9620532297**
Email Centre: biodoc.mitblr@manipal.edu
Coordinator Email: patil.arun@manipal.edu
Year of Establishment of Centre: 2024
Name of the Coordinator: Dr. Arun Y. Patil
Members: Dr. Shrirang A Kulkarni, Dr. Tusar Kanti Mishra, Dr. Rajshekhar Choudhari, Dr. Deepa Prabhu, Dr. Roshan Martis, Dr. Sanjukta Ghosh (SMI), Dr. Manasa Nune (MIRM), Dr. Abhilash Tilak, Dr. Jayalaxmi Hanni, Dr. Sumit Kumar and Dr. Jyothi Prasanna (MIRM)

2. Brief about Centre **Unique selling points** (200 words limit):
Vision: To be a world-renowned centre for bio-inspired design by fostering multi-disciplinary research on cutting edge technologies.
Mission: To advance the field of bio-inspired design towards building a dynamic ecosystem of creative and bio-inspired thinkers, scientists, technocrats, and designers.
Objective:
 - Promote Nature-Inspired Innovation: Develop innovative solutions by studying and applying principles from nature to address modern challenges in engineering, technology, and sustainability.
 - Advance Sustainable Development Goals (SDGs): Focus on creating technologies and practices that contribute to SDG 12 (Responsible Consumption and Production), SDG 14 (Life Below Water), and SDG 15 (Life on Land), aligning the centre's goals with global sustainability efforts.
 - Create a knowledge Hub: Develop an initial version of digital library by December 2025, of proven bio-inspired designs helpful to researchers and learners.
 - Develop a digital twin mechanism to verify and aid in gauging the efficiency and accuracy of existing designs or bio-inspired systems to enhance the features of our products.

3. Activities at the centre: (please include Research and SDG-related activities also)

a. BIODOC core team collaboratively working with Prof. Navin Kumar, HOD and Professor from Dept. of Mechanical Engineering, IIT Ropar, Punjab on hard and soft tissue centre. He visited MIT-BLR on 10th June 2025 and discussed possible areas of collaboration. We have applied for ANRF-COE, ANRF-MAHA AI&SE and AICTE-RPS funding proposals with him covering more than 23 Crores in 2025. Currently, all the proposals are under technical evaluation.



b. Dassault Systemes, La Fondation CEO Dr. Huzefa Salim interacted with all the faculties on upcoming CSR funding options and shared the possible collaboration areas for MIT-BLR faculty to apply for fund proposals.



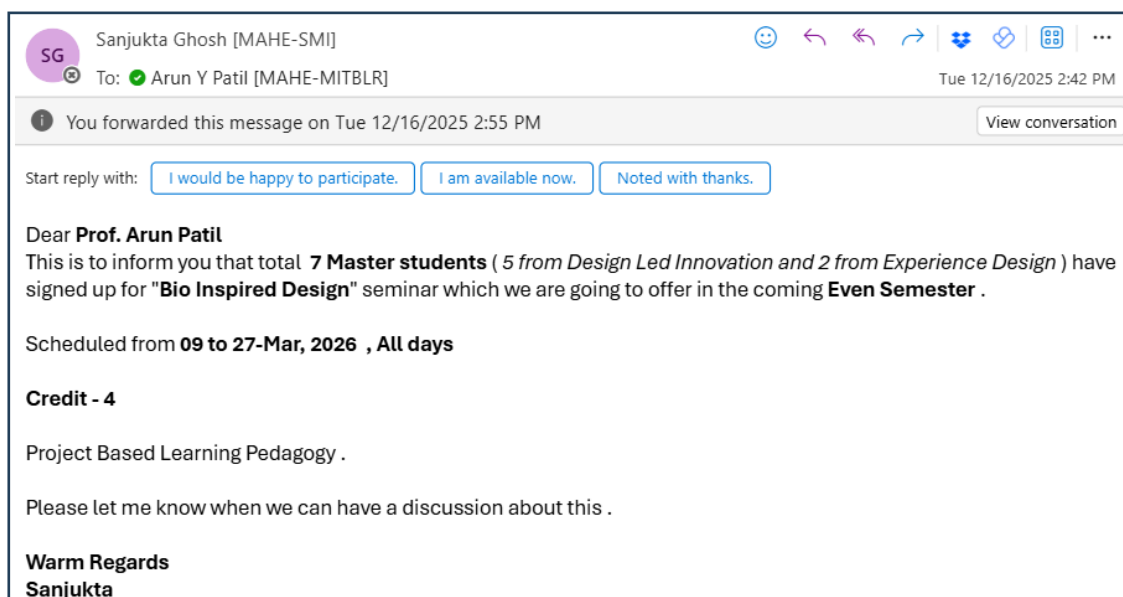
c. PRO-SIGMA workshop conducted for more than 30 faculties of various disciplines such as SMI, MIRM, MCHP, DOC, MLS and DLHS to provide the IDEA 2 POC working with the Bio-inspired design case studies worked at BIODOC. 3 days of FDP organized and conducted by Dr. Arun Y Patil along with Mr. Varun Gupta and Dr. Indranil Saha on 23rd, 30th Aug and 06th of Sept 2025.



d. Collaboration with Dr. Ganiger C Prabhu, Professor in Dept. of Entomology in University of Agricultural Science, Bengaluru with BIODOC project works established. Faculty and research scholar team visited to entomology department on 29th Sept 2025 to discuss the possible projects to be worked.



e. Open elective course floated to Master of Design students in Srishti Manipal Institute on Bio-inspired Design from BIODOC with the support of Dr. Ganiger C. Prabhu, Professor in Dept. of Entomology, University of Agricultural Science, Bengaluru.



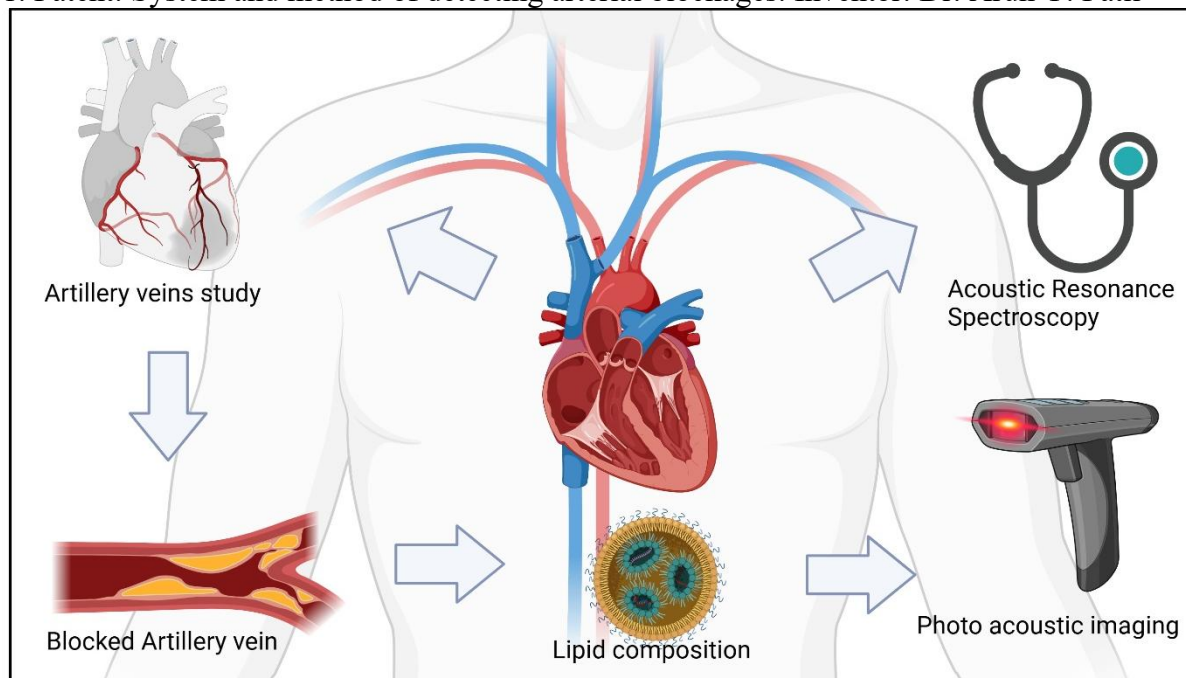
f. In Dec 2025, MOU focusing on innovation, incubation and research with Indian Institute of Technology Ropar, Punjab will be executed.

g. Number of Articles Published

1. Cordeiro, A., Hussain, M., Ramachandran, T. et al. Advancements in Packaging Materials: Trends, Sustainability, and Future Prospects. *Circ.Econ.Sust.* (2025). <https://doi.org/10.1007/s43615-025-00586-4>. (SCIE, WoS and Scopus) [Q1].
2. Vishalagoud S Patil, Arun Y. Patil, Piyush Kumar, Anil Kumar, Raman Kumar, Chander Prakash, P. C. Arunakumara, Mallikarjungouda B Patil, Keshavmurthy R, Jaber M. Asiri, Yunus Khan T M, Shaik Mohamed Shamsudeen, Enhancing Material Properties with a Sustainable Wood-Quartz-HDPE Composite: A Study on Strength, *Cogent Engineering*, 10.1080/23311916.2024.2434946, **IF:2.1** (ESCI, WoS and Scopus) [Q2]
3. Shridhar H. Budapanahalli, Sandeep C. Dhaduti, Raman Kumar, N. Beemkumar, Abinash Mahapatro, Y. Karun Kumar, Arun Y. Patil, A review on aluminium metal matrix composite for tribological study on gear applications, *Discover Applied Sciences*, Accepted, 2025, 10.1007/s42452-025-07989-w **IF:2.8** (SCIE, WoS and Scopus) [Q1]
4. Mallikarjunagouda Patil, Sridhar N. Mathad, Arun Y. Patil, Abdulaziz abdulah al-kheraif, Sachin Naik, Sajith Vellapally, Enhanced and proficient chitosan membranes embedded with polyaniline-TiO₂ core-shell nanocomposites for fuel-cell hydrogen storage, *Turkish Journal of Chemistry*, Vol. 49 (2025), No. 3, 10.55730/1300-0527.3730. **IF:1.4** (SCIE, WoS and Scopus) [Q3]
5. Shridhar H. Budapanahalli, S. B. Mallur, Arun Y. Patil, Sandeep C. Dhaduti, Experimental Investigation on Hybrid Aluminium Metal Matrix Composite Spur Gears, *J. Inst. Eng. India Ser. D*, <https://doi.org/10.1007/s40033-024-00646-3> (Scopus) [Q2]

h. Patents Filed and Copyrights

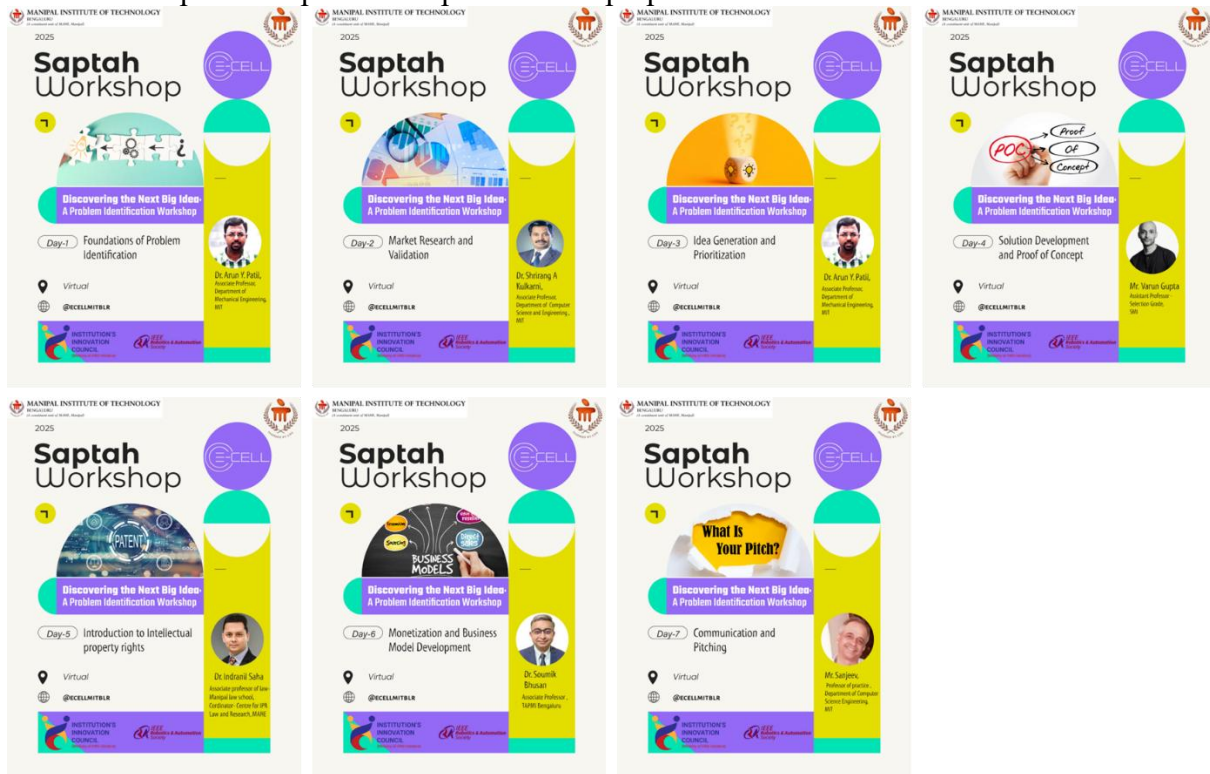
1. Patent: System and method of detecting arterial blockages. Inventor: Dr. Arun Y. Patil



2. Copyrights (Filed:02)

- a. 'Saptah Program' for freshman at under graduation level. Currently, the Saptah program framed to meet the requirement of entrepreneurship journey for students/faculty. The content

initiates with identify the problem statement to idea generation to proof of concepts to business model development to pitch deck presentation preparation for all MAHE-BLR institutes.



b. 3PM analysis (P→Patent; P→Publication; P→Product; M→Megatrends)

It's an innovative platform for students and faculty to get engaged for their idea realization. Identifying their problem statements, feasibility of having the market traction potential are the main salient points of it. It also provides complete data pertaining to what level your concept or proof of concept in terms of Technology Readiness Level (TRL 1-9). The platform will leverage the student/faculty for better connect to the world in terms of the unique and innovative ideas.

3PM Analysis Framework

PATENTS
PUBLICATION
PRODUCTS
MEGA TRENDS

Search Results

Patents

Publications

Products

a.

b.

c.

d.

FILTERS

Year

From To

Sources

Patents: WIPO, EP, IP

Publications: Articles, Book Chapters, Conference paper, Reviews

Products: Amazon, India Mart, GEM

Following activities and work-based outcomes expected:

→ Once the keyword searched accordingly the synonyms for the keyword have to be established and highlighted. Further, option to be given to user to select those synonyms to run the search again if necessary.

→ After Clicking the required Patents

- a. Applicant Details
- b. Claims
- c. Drawing
- d. Download (to a folder)

→ After Clicking the Publications

- a. Abstract
- b. Download (to a folder)

→ After Clicking the Products

- a. Product details
- b. Image

→ After Clicking the Megatrends

- a. Market analysis report for future 5 to 10 years
- b. CAGR %
- c. Potential market players

→ All the data collected to be gathered in one template as per the template format.

4. List of ongoing projects/ research grants (only list the projects/research grants that are not included in the institution's annual report):

a. List of ongoing projects/ research grants:

Sl. No.	Title	Funding Agency	Name of the PI	Amount	Date
1	Development of non-invasive Point of Care Testing Device to Screen Oral	ICMR, New Delhi	Dr. Ashiwini Narasannavar, JNMC, Belagavi Dr. Arun Y. Patil (Co-PI)	99,28,000 (Rs. 1500000 received from JNMC, Belagavi as Phase-I work)	Dec 2025

	Potentially Malignant Disorders at all Levels of Health Care				
2	Orchestrating the future of cancer detection with Quantum Innovation: Oral Premalignant detection device OPMD	CMTI, Heavy Industries Ltd, Bengaluru	Dr. Arun Y. Patil	1,66,817	Dec 2025

b. List of projects applied (**More than 26 Crores**)

Sl. No.	Title	Funding Agency	Name of the PI	Amount (Lakhs)	Date
1	Identification of Arterial Blockages via Fatty Acid Profiling and Lipid-Based Diagnostic Techniques	ANRF-ARG	Dr. Arun Y. Patil	72.19	15 th July 2025
2	Real time testing sheep horn as impact resistive material for accident prone regions in consumer vehicles	AICTE-RPS	Dr. Arun Y. Patil	48.6	28 th July 2025
3	Experimental Evaluation and Optimization of Sound level and Sound intensity of an Automobile in closed and open field Environments for the reduction of the Noise	AICTE-RPS	Dr. Vishal Patil (Govt. Engg College, Talkal) and Co-PI: Dr. Arun Y. Patil	49	28 th July 2025
4	Design and Development of a Multi-Stage Post-Harvest Coffee Cherry Sorting Machine: From Lab Prototype to Field Application	AICTE-RPS	Dr. Megha Arakeri (SoCE-MIT) and Co-PI: Dr. Arun Y. Patil	48	28 th July 2025
5	Development of Nature-inspired Compound Self-Heating Mechanism in Batteries for Cold Climate and Rapid Activation Scenarios	ANRF-COE	Dr. Abhishek Kumar Rohit (TAPMI) and Co-PI: Dr. Arun Y. Patil	743.39	9 th Sept 2025

6	Thermo Geo-plastic TGP Technology in pavement construction and manufacturing pavers	DST-Waste Management	Dr. Sumana Vishnu (Civil-MIT) and Co-PI: Dr. Arun Y. Patil	67.10	17 th Sept 2025
7	Development of a hybrid battery thermal management system employing bionic structures and cooling plate	BOSCH-CSR	Dr. Abhilash Tilak and Co-PI: Dr. Arun Y. Patil	50	17 th June 2025
8	Advanced Pyrolysis-Based Circular Economy Solution for Wind Turbine Blades and Thermoset Waste Pilot-Scale Development and Commercialization	CSR Fund	Dr. Harini Santhanam and Co-PI: Dr. Arun Y. Patil	40	10 th Oct 2025
9	GENISIS-D: Generative Evolutionary Nature-Inspired Simulation Intelligence System for Defence Materials	ANRF-MAHA AI&SE	Dr. Arun Y. Patil	1498	27 th Nov 2025

5. Any SDG-related activities:

Currently centre is working on the following SDGs. Namely,



We have initiated collaboration with following universities with BIODOC

- London College of Fashion at UK - Prof. Veronika Kapsil, Professor, Bio-inspired Textile Design ([4th Best fashion school in the world for 2025](#))
- Universität of Rovira at Spain – Dr. Sergio Gomez, Professor, Computer Networks and Bioinspired Algorithms ([As per QS Ranking 2025:731-740](#))
- Queensland University of Technology, Australia: Dr. Mohamed Shahriar, Associate Professor (Area: Biomedical device development and Engineering) ([As per QS Ranking 2025:40](#))
- Singapore University of Technology and Design, Singapore: Centre Head - Dr. Pablo Valdivia y Alvarado, Associate Professor (Area: Bio-inspired design, Soft robots and sensors) ([As per QS Ranking 2025:519](#))

- e. University of North Carolina at Charlotte US -Erina B Joyee, Ph.D. Assistant Professor, Mechanical Engineering & Engineering Science (As per QS Ranking 2024:1001-1200)

6. International Projects:

a. Title: Tissue Modeling and Simulation for Low-Intensity Vibration Devices

The work in progress with Universität of Rovira at Spain by Master of Science student Mr. Miguel working on the feasibility study of mammary gland study with respect to acoustic and harmonic responses of cells and stacking of the cells. The work is jointly handled with Prof. Sergio Gomez, Professor, Computer Networks and Bioinspired Algorithms as shown in figure 1.

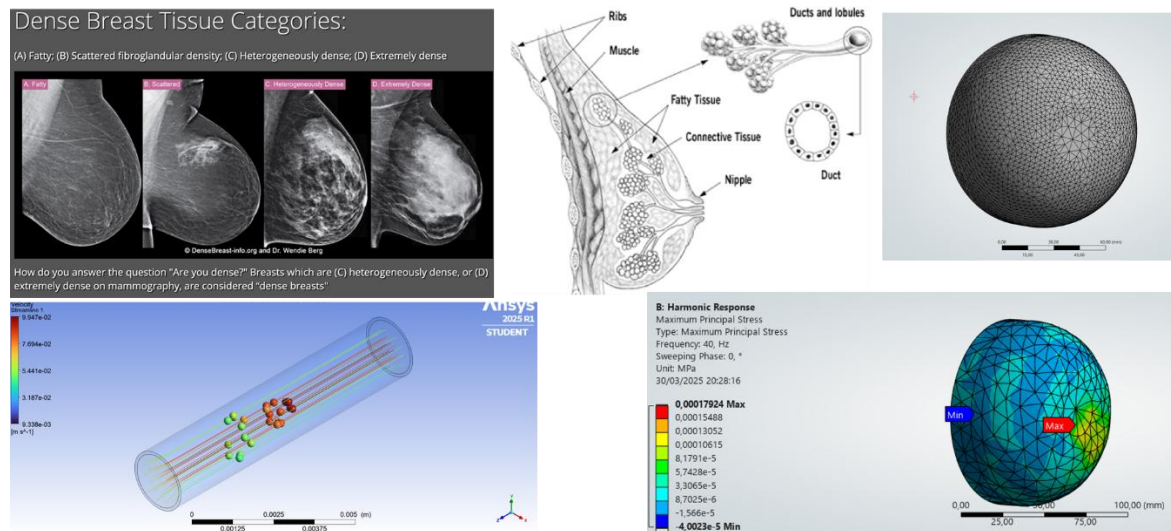


Figure 1. Mammary gland study with respect to acoustic and harmonic responses of cells

b. Title: Biomimicking the earthworm for artificial Vermi compost development

Currently, there is a limitation of biofertilizer, and government is insisting on switching to organic farming but the availability of biofertilizer is the constraint as highlighted in figure 2. Earthworms are the key promoters for biofertilizer, seeing the requirement we are working on the biodigester to mimic the earthworm conversion process of biowaste to biofertilizers. This is in collaboration with University of North Carolina at Charlotte US, Dr. Erina B Joyee and UAS Bengaluru Dr. Muthuraj R, Professor, Dept. of Microbiology.

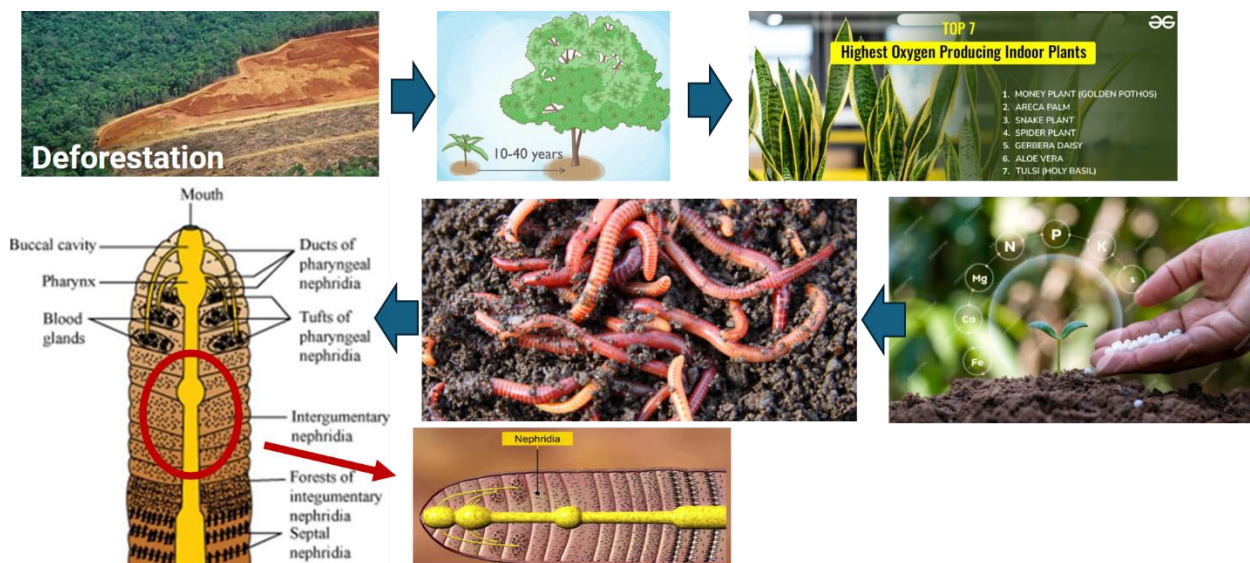


Figure 2. Biomimicking the earthworm digestive system with biodigester

c. Title: Traffic Jam: Acoustic Noise, Air Pollution, Road infrastructure, Traffic violation leading to hazardous health issues

The metropolitan cities around India are heavily subjected to traffic-based congestion leading to many included issues such as acoustic Noise, air pollution, road infrastructure, traffic violations leading to unnecessary stress and tension in the driver's daily routine travel. The whole project is to study the mental effects and stress-based problems faced by the travelers as depicted in figure 3. Ministry of Road and Transportation is connected, and the data is gathered with respect to mortality and accidents.

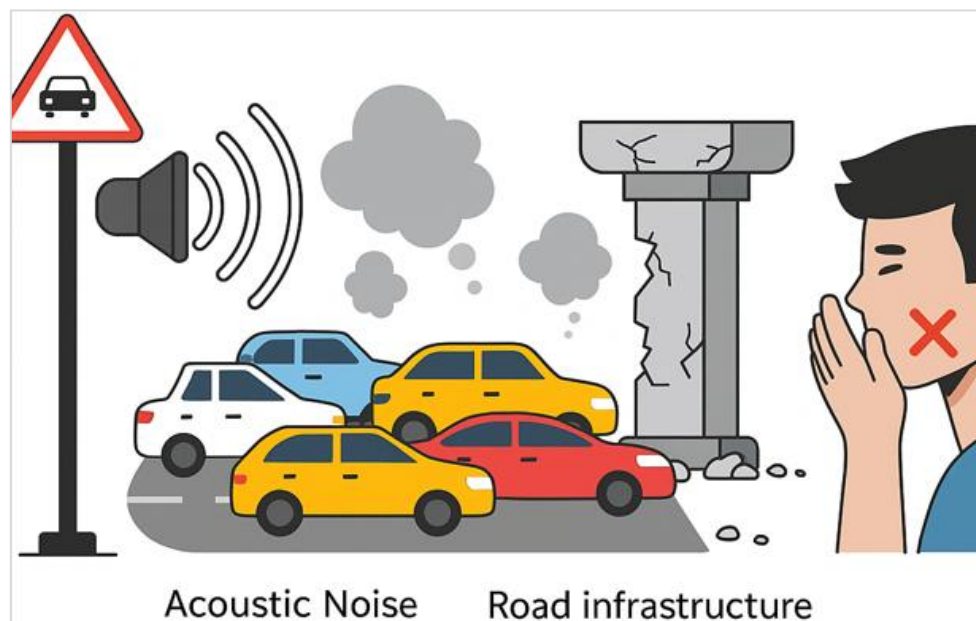


Figure 3. Traffic Jam: acoustic noise, air pollution, road infrastructure, traffic violation

d. Title: Heart disease risk stratification calculator

As per the data from World Health Organization, heart disease risk stratification score is not tabulated currently in India. Whereas in USA, UK and Germany it's been in use, but the risk factors cause is supposed to be tabulated authentically by every hospital and testing unit. This data as per National institute of health is not available for India. So, to initiate with one primary health centre the work on large scale model in the days to come as shown in figure 4.

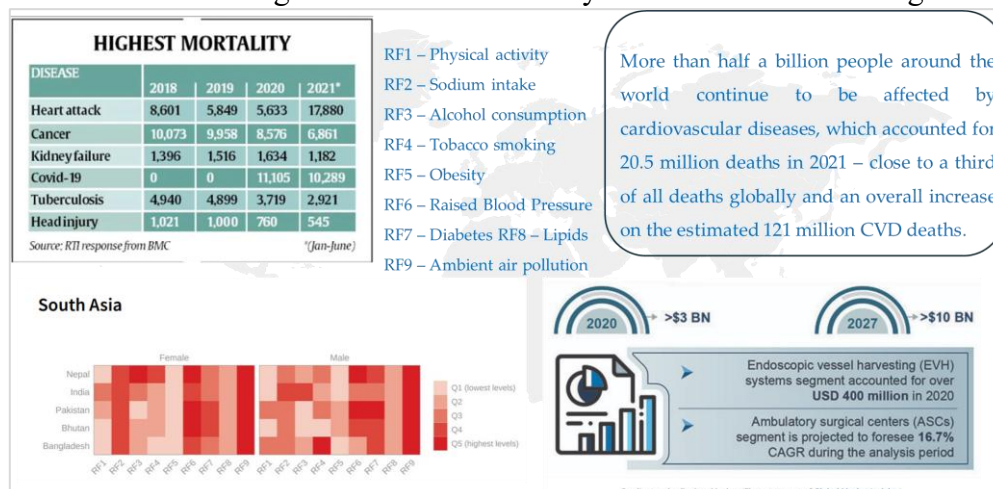


Figure 4. Heart disease risk stratification calculator

e. Title: Agricultural left-over waste to wealth creating mission

In India, there is huge amount of agricultural waste gets generated after every crop harvest. How to convert this into useful product is the aim of the study highlighted in figure 5. Currently, we have tied up with University of Agricultural Science Bengaluru Dr. Jayashree Dept. of Agri Engineering.



Figure 5. Agri as waste to wealth creation

7. Awards & recognition:
NA