

MEMORANDUM OF UNDERSTANDING

The present Memorandum of Understanding is being prepared on this day August 30, 2023, in furtherance of their mutual interest in the fields of Disaster Risk Reduction and Management and as a contribution towards making Bihar Disaster Resilient,

Between

Bihar State Disaster Management Authority through its Vice Chairman / Secretary, having its address at 5th Floor, Sardar Patel Bhavan, Bailey Road, Patna-800023, Bihar, India (hereinafter referred to as BSDMA) called as 1st Party

And

Indian Institute of Technology, Bihta, represented through its Director/ Registrar Bihar, India (hereinafter referred to as IIT Patna, having its address IIT Campus, Bihta, Patna-801106,), called as 2nd Party

Are hereby entered into this Memorandum of Understanding (MOU) on this August 30, 2023 as set forth below:

ARTICLE I

The MOU involves collaboration between BSDMA (1st Party) and IIT Patna (2nd Party) (both also referred to as institutions) in related disciplines.

Both the institutions shall seek to promote: **Facilitating adoption of IOT-Edge and AI based Technologies for Natural Disaster Management in Bihar.**

ARTICLE II

The activities under this MOU will include: Project implementation, research & development and Training programs as per Annexure-A.

ARTICLE III

Time of completion under this MOU shall be 12 months from commencement of the project.

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Benefit: As the cloud services are readily and globally available, so the IoT and AI based early warning system as a service will be provided under SaaS model for disseminating disaster risk reduction forecasting information to the risk hotspots:

- a. Lightning and Thunderstorm Hotspots: The major hotspots are Kaimur, East Champaran, Gaya, Patna Arwal and Muzaffarpur districts.
- b. Earthquake: The major districts affected are Araria, Darbhanga, Madhubani, Sitamarhi and Supaul which lie in Zone V - a very high risk zone. The south-western districts of Aurangabad, Bhojpur, Buxar, Gaya, Jahanabad, Kaimur, Nawada, and Rohtas lie in Zone III. Remaining districts including state capital Patna lie in Zone IV - High risk zone.
- c. Heat and Cold Waves: major hotspots are Aurangabad, Gaya, Rohtas etc.

IOT based Alerting-and-Early Warning System: Due to the high cost and concerns about safety of devices, it is decided to forego the use of such high cost devices in the early warning system. So the early warning will primarily be based on IoT, AI and Edge technologies. In the first year, the IOT-based Alerting-and-early warning systems deployment of the 100,000 devices will be made by IIT Patna for BSDMA for distribution to farmers by BSDMA for prevention of lives due to disaster events increasing coverage across Bihar risk hotspots/zones.

IoT Device Development at IIT Patna (made in IIT Patna)

1. IoT Disaster Alerting Pendant Device with Human Body Charging, Location-Based Alerts, and Safe Location Guidance Service for Safety.

The IoT Disaster Alerting Pendant Device with Human Body Charging, Location-Based Alerts, and Safe Guiding Assistance epitomizes safety-focused wearable technology. By integrating user guidance during disasters, this device ensures not only information but also actionable steps to protect individuals from potentially life-threatening situations. This project strives to create a wearable device that empowers users with essential information, guidance, and safety during adverse weather conditions.

The device shall be active only during on-body conditions (wearable conditions). The user may send the signal of the alert by pressing the alert switch, which should be indicated on the server that the alert has been received by the user. The server shall monitor health of the device and in case of malfunctioning, shall issue alerts.

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Integrating Additional functionalities in IoT Device Development

2. Integrating IoT Weather Monitoring in Pendant Device with Human Body Charging, Location-Based Alerts, and Safe Location Guidance Service for Farmer Safety in the Field

The IoT Weather Monitoring Pendant Device embodies innovation and user-centric design, combining aesthetics and functionality. By leveraging advanced technologies such as thermoelectric charging and location-based alerts, this pendant is poised to revolutionize how users interact with weather information. This project aims to create a versatile, reliable, and user-friendly wearable device that empowers individuals to stay safe, informed, and connected to their surroundings.

Features of IOT Based Weather Alert Monitoring Device

1. Compact and Portable, can be tied into hand or waist /used as a pendant
2. Live Interconnection with weather stations for alarming Thunderstorm, Heavy Rain, Lightning, earthquake, heat wave, and cold wave through API.
3. Alarming Indicators - Voice Message, Vibration Sensing and LED indication
4. Auto Weather Data Update from Cloud (Response time - 100 to 200 milliseconds)
5. Live OTA updates
6. Connection through GSM Module / Satellite communication for Internet access
7. Capability of charging the device through Body heat (thermoelectricity)
8. Battery Capacity - More than 15 days (use of flexible polymer cells)
9. Devices should be 'ON' during 'on-body' condition.

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Project Cost

Sr. No	Major Activity	Cost (in lacs)
1	AR/VR Technology Awareness	
	AR/VR/Metaverse Equipment	10
	AR/VR Content Development	10
2	E-Governance Solution for Disaster Events	
	GIS, Portal, APP, Cloud,(Integration with BSDMA server for API), Advanced IOT development Center – power from human body, Location based, GSM module	100
4	Advanced IOT Device Manufacturing	
	IOT Pendent/Locket Disaster Management Early Warning gadget for farmers (supply IOT-Pendenet 10,000 devices, Rs 1000/device)	100
5	Adoption of Best Practices, Manpower, Research	
	Junior Research Fellow (03 nos)	12
	Project Assistant for field work (03 nos)	09
6	Training For BSDMA	08
7	Contingency (3% of project cost)	7.49
	Total(items 1-7)	256.49
	Institute overhead(5% of Total)	12.8245
	Grand Total(1-7)	269.3145

Justification for Locket Pendant IoT-Device for Early Warning

The IoT-based Early warning pendent/loket to enable early warning at the IOT device and commination module, energy module development and supply of 10,000 IoT devices at cost of Rs 1,000 per device in the first phase.

In the subsequent version of the IOT device, the number shall go up and the cost per unit is likely to come down depending upon the innovations at IIT Patna in collaboration with BSDMA. In such eventuality, the MOU shall be modified accordingly by mutual consent.

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Payment Schedule

1. 20% of the total cost - Submission of Initial Report within 15 days of the signing of MOU
2. 30% of the total cost - Submission of the prototype in next 30 days
3. 20% of the total cost - Delivery of the first consignment of 5,000 active devices in next 30 days
4. 10 % of the total cost - Testing and validation by the third party in next 15 days
5. 10% of the total cost - Training for BSDMA officials in next 15 days
6. 10% of the total cost - Delivery of Full consignment after testing and validation in next 15 days

Maintenance

The device shall be fully maintained by IIT Patna for a period of 1 year from the date of delivery of the last consignment in case of malfunctioning of any device as detected on the server the same shall be replaced within 48 hours without any extra cost to BSDMA. The lump sum amount of **Rs 10,00,000** (Ten lakhs only) shall be paid to IIT Patna as the maintenance cost after successful completion of a period of one year.

ARTICLE IV

In future Preparation of **Facilitating adoption of IOT-Edge and AI based Technologies for Natural Disaster Management in Bihar** shall be taken up on mutual consent of BSDMA and IIT Patna. Activities of the works, Time of completion and terms of fees shall be decided for future works on mutual consent of the competent authorities from both the parties.

ARTICLE V

Implementation of cooperation based on this MOU shall be dealt with between the relevant Faculties and Divisions/ Departments of both institutions. Wherever necessary, a specific plan shall be worked-out for each activity setting-forth detailed arrangements for collaboration. Such plans shall be subject to approval of the appropriate authorities of each institution. To facilitate development of such plans, each institution shall nominate a member of its staff to coordinate activities arising under this MOU.

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ARTICLE VI

Both institutions agree and undertake to keep confidential at all times information and/or data that may be exchanged, acquired and/or shared in connection with the area of cooperation, as mentioned above, unless otherwise the same information already exists in the public domain.

ARTICLE VII

Ownership of findings of any joint research shall be vested in both institutions to this MOU and any publications regarding the same shall only be possible after prior approval from both institutions.

ARTICLE VIII

Both the BSDMA and IIT Patna reserve the right to terminate this MOU by either institution giving 3 (Three) months written notice to the other. Where such termination occurs, the provisions of this MOU shall continue to apply to on-going activities until their completion.

ARTICLE IX



Participating teaching and non-teaching staff and students and any other member from the participating institutions involved in any activities under this MOU must adhere to the law of the country and the rules & regulations of the host institutions.

ARTICLE X

BSDMA and IIT Patna welcome establishment of this MOU for cooperation and jointly agree to provisions as set out above. There are two copies of this MOU equally valid, one for each institution, effective from the date of its signing and shall be valid for a period agreed upon by both parties under this MOU.

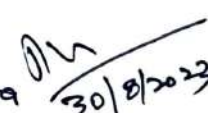

**Bihar State Disaster Management
Authority Patna**


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SARDAR PATEL BHAWAN, PATNA

Witness 1. Dilip Kumar  30/08/2023
2. Rurandam K. Kanohar  30/08/2023
Date: 30/08/2023

Indian Institute of Technology Patna


Prof. T. N. SINGH
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Witness 1. Prof. Rajiv Misra  30/8/2023
2. Dr. Arijit Roy  30/8/23
Date: 30/08/2023